DUAL
DATA USE ACCELERATION AND LEARNING

Digital Transformation to Accelerate Data Use

A Model for Success

Table of Contents

Abbreviations

CDH	Center of Digital Health
DUAL	Data Use Acceleration and Learning
DHILC	Digital Health Innovation Learning Center
DHIS2	District Health Information System 2
HIS	health information system
ICT	information and communication technology
ITU	International Telecommunication Union
MOH	Ministry of Health
M&E	monitoring and evaluation
NDHSC	National Digital Health Steering Committee
NHIS	National Health Information System
WHO	World Health Organization

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Executive Summary

The Data Use Acceleration and Learning (DUAL) initiative documented the experiences of five African countries digitalizing their health systems. Many countries are working with partners to strengthen the use of health data and improve health outcomes by digitalizing their health care systems. However, the digital health investments, guidelines, and policies that global stakeholders promote do not always reflect countries' priorities or progress toward digital transformation. The innovation and lessons that emerge at a country level often do not get included in financing, normative guidance, and programmatic approaches. DUAL's goal is to share best practices in using digital transformation to accelerate data use and improve health outcomes. The initiative's findings form the basis of the "DUAL" model, which country governments, policymakers, implementers, and funders can use to strengthen the uptake of digital technologies. The DUAL model identifies ten digital transformation elements, adding two new components to the WHO-ITU eHealth Strategy building blocks: change management and data use ecosystems. The model distills the key factors of success for each element and recommends specific practical actions for countries.

Introduction

The Data Use Acceleration and Learning (DUAL) initiative aims to share what works to achieve digital transformation based on the experiences of five African countries that are digitalizing their health systems. Using qualitative analysis of documentation and interviews with key informants, DUAL identified enabling factors, tools, and approaches from the five focal countries and validated these learnings with in-country stakeholders. The DUAL model for data use acceleration distills these learnings into practical, measurable recommendations of best practices for digital transformation. Countries can apply the model's key factors for success at any stage in the data use acceleration process as well as to global policies, funding mechanisms, and future interventions.

Digital transformation involves moving manual and paper-based processes for data collection, reporting, and analysis to digital tools and formats, a process that includes reengineering and optimizing organizational processes, culture, and client experiences.

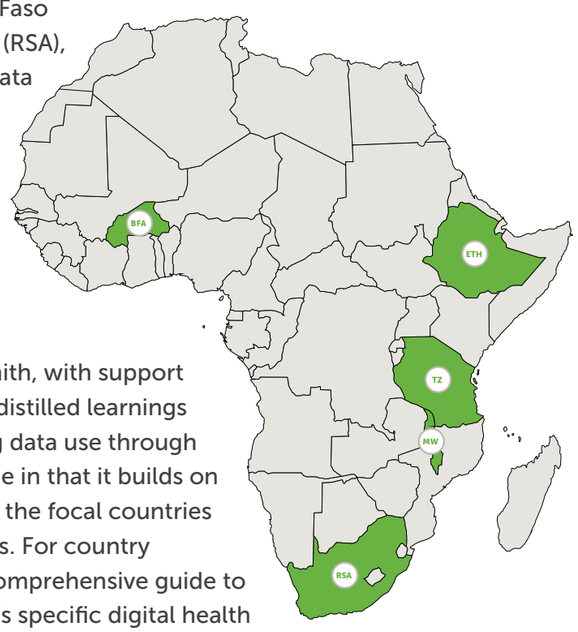
WHO SHOULD USE THE DUAL MODEL?

The DUAL model aims to support a range of digital health stakeholders—country governments; global and regional policymakers; implementers, including the private sector; and funders operating at a regional or global scale—collaborating with countries to help digitally transform their health systems in alignment with their health targets and digital maturity.

HOW STAKEHOLDERS CAN USE THE MODEL	KEY ACTIONS TO TAKE
Country governments Apply the DUAL model to digital transformation for data use efforts to align digital health initiatives and integrate the model's key factors within national strategies.	**Establish governance bodies to oversee and enforce digital health policies, guidelines, and standards.** **Develop investment roadmaps to accurately budget and scope a national digital transformation for data use strategy.** **Support existing technical working groups and committees in applying and institutionalizing digital health guidelines, systems, and tools that advance digital transformation.** **Develop an enterprise architecture to define the current and future state of the national digital health system.** **Increase coordination between sectors as well as regional, subnational, and national digital transformation efforts.** **Use data, assessments, and evaluations to make digital transformation investment and programmatic decisions.** **Build multiuse digital health systems and tools that can be applied across different scenarios, uses, and landscapes (as appropriate), rather than rebuilding applications for every new environment.** **Design digital and data tools that are responsive to infrastructure challenges and limitations.** **Cultivate champions at all levels of the government and within other relevant sectors to advocate for digital transformation for data use.** **Motivate and empower health workers to use and act on data, rather than just serving as data collectors.** **Identify and build the capacity of health actors at all tiers of the health system to model and cultivate a culture of data use.** **Develop long-term, country-generated funding streams to finance the real and ongoing costs of digital and data infrastructure.**
Policymakers Champion the DUAL model and develop policies and guidance in accordance with its recommendations.	**Develop guidance for and promote adoption of two new elements: data use ecosystems and change management.** **Use evidence generated from country implementations to define policies and guidance.** **Encourage development of investment roadmaps at the country level to accurately budget and scope digital transformation for data use strategies.**
Implementers Apply the DUAL model to current and future projects to optimize the impact of digital and data interventions.	**Ensure digital health activities are government-driven by aligning to country strategies, policies, and health visions.** **Apply user-centered design approaches to develop interoperable digital health systems.** **Build the capacity of health actors at all tiers of the health system to model and cultivate a culture of data use.** **Work within existing governance bodies, technical working groups, and committees to ensure buy-in for and support the design of digital and data initiatives.** **Build multiuse digital health systems and tools that can be applied across different scenarios, uses, and landscapes (as appropriate), rather than rebuilding applications for every new environment.**
Funders Champion the DUAL model and invest in programming that reflects its findings and recommendations.	**Ensure digital health investments align with countries' visions and strategies.** **Work with other funders to align investments and harmonize with country priorities for digital transformation to reduce the burden on countries and implementing partners.** **Invest in foundational country-led activities to lay the groundwork for sustainable, long-term digital transformation, including the development of:** » **national-level digital health strategies and roadmaps;** » **policies to support digital transformation for data use;** » **governance mechanisms to enforce new digital health policies, guidelines, and standards; and** » **enterprise architecture to define the current and future state of the national digital health system.** **Advocate for countries to establish governance bodies to oversee digital transformation for data use.** **Invest in global goods, standards, and interoperable systems instead of standalone systems.** **Leverage data, assessments, and evaluations to make investment decisions.** **Invest in building the capacity of health actors at all tiers of the health system to model and cultivate a culture of data use.** **Encourage user-centered design and interoperability during the development of digital health systems.** **Contribute to the evidence base for how digital health can improve health outcomes and advance health equity.** **Identify the true costs of digital and data infrastructure and work with country governments to determine sustainable funding streams.**

THE DUAL MODEL FOR DATA USE ACCELERATION

Governments in five African countries—Burkina Faso (BFA), Ethiopia (ETH), Malawi (MW), South Africa (RSA), and Tanzania (TZ)—are accelerating the use of data within their national health systems through digital transformation. The experiences of these countries—their successes, challenges, and what they have learned about the enabling factors of digital transformation—present a learning opportunity for the larger global health community.



Under the DUAL initiative, PATH and Cooper/Smith, with support from the Bill & Melinda Gates Foundation, have distilled learnings from these countries into a model for advancing data use through digital transformation. The DUAL model is unique in that it builds on the direct experiences and lessons learned from the focal countries going through the digital transformation process. For country governments, the model serves as a practical, comprehensive guide to advancing the use of data based on the country's specific digital health systems context and data practices.

The DUAL model identifies ten critical elements of a comprehensive approach to transforming a country's health data systems and digital tools to advance data use: change management, data use ecosystems, the health workforce, governance and leadership, strategy, investment, policy and standards, systems architecture, services and applications, and digital health infrastructure. The model suggests specific actions to support each of the elements drawn from successful interventions in the five focal countries. Countries with health systems at any stage of the digital transformation process can use the model to identify areas for intervention and incorporate recommended actions that make sense for their context into their ongoing work.

In addition to the experiences of the five focal countries, the DUAL model builds on the guidelines, frameworks, and models that preceded it, specifically the World Health Organization (WHO) and International Telecommunication Union (ITU) eHealth Strategy building blocks.[1] Other key resources, including WHO's Digital Investment Implementation Guide (DIIG),[2] the Performance of Routine Information System Management (PRISM) learning framework,[3] and several change management models, contributed to determining the elements of digital transformation for data use included in the DUAL model.

Since the WHO-ITU eHealth Strategy building blocks were released in 2012, countries and their partners have increasingly realized the importance of data use and change management to the digital transformation process. The DUAL model introduces data use ecosystems and change management as essential elements of advancing data use. The data use ecosystem comprises all the activities that improve access to and use of data, including data collection, quality, demand, and analysis. In this way, the model emphasizes the foundational importance of developing a culture of using data for evidence-based decision-making and action throughout the health system. The model also acknowledges the essential role of employing proven strategies to introduce new technologies, systems, and processes to the health workforce to ensure a smooth transition and widespread adoption. Research from DUAL's five focal countries highlights the importance of these two new elements for advancing data use via digital transformation. Without an intentional focus on fostering a culture of data use and supporting the workforce throughout the organizational change that this entails, the digital transformation would not be sustainable.

HOW TO USE THIS MODEL

Successful efforts to advance data use depend not just on putting tools and systems in place within the health sector but also on improving areas that affect and are affected by these technologies, such as governance, policies, infrastructure, and capacity building for the health workforce. The DUAL model is not intended to be a step-by-step procedure for how to "do" digital transformation but rather presents all of the necessary "ingredients" of digital transformation success. The model identifies ten essential elements of sustainable digital transformation for data use that include but go beyond technological advancements, elements that depend on and enable one another. The model supports countries with taking a holistic view of digital transformation and considering all of these elements in their plans. It helps countries to identify challenges or gaps within elements and take specific actions to address them—actions based on what is already working for other countries.

1 World Health Organization & International Telecommunication Union. (2012). *National eHealth strategy toolkit.* International Telecommunication Union. https://apps.who.int/iris/handle/10665/75211
2 World Health Organization. (2020). *Digital implementation investment guide (DIIG): Integrating digital interventions into health programmes.* https://www.who.int/publications/i/item/9789240010567
3 Measure Evaluation. P*RISM: Performance of routine information system management.* https://www.measureevaluation.org/our-work/prism.html

The DUAL Model

Key enabling factors for each element were identified based on evidence of what worked and what presented barriers to success in the five focal countries DUAL studied. As the model elements are highly interrelated, many enabling factors cut across elements. For instance, strengthening governance structures improves leadership and governance and contributes to a stronger strategic plan, more aligned investments, and more effective policies and standards. Countries can use the model as a reference for focusing on the elements that their plans prioritize or identifying the underlying causes of challenges they may be experiencing in their current work.

Specific actions are recommended for each enabling factor that countries can take to strengthen digital transformation plans or address challenges. This is not intended to be a linear process. Rather, actions can be applied at any stage of a digital transformation effort, whether a country is just beginning to strategize or has several implementations already deployed. Countries can implement the actions that best fit their context or prioritize a few that will have the greatest impact. Countries are encouraged to consult the model throughout their digital transformation journey.

CROSS-CUTTING THEMES

Digital transformation is not just about putting digital solutions in place within health sectors but also requires alignment in areas like governance, policy, and capacity building. All systems interrelate and must be addressed together to achieve project goals.

Committed **leadership** drives progress forward in every area. Specifically, a wide range of key stakeholders should be engaged early in any process to advance data use, including from lower levels of the health system and outside the health sector. Establishing **governance** structures to approve, manage, and monitor each element is key to operationalizing plans.

Strengthening the **data use ecosystem** is an ongoing, integrated, and necessary effort. Bringing change nationwide by developing a culture in which quality data are collected, analyzed, and used requires intentional, continuous effort at all health system levels, across the adequately trained, resourced, and equipped **workforce**.

Context-appropriate approaches to **change management** need to be interwoven into every aspect of digital health development and implementation. Change management plans should focus on the human resourcing and capacity building required for digital transformation.

Change Management

Organizations often need to adjust operations and workflows to improve data use. Processes to manage these organizational changes are critical to successful implementation, making change management an essential new building block of digital transformation.

Change management is a set of interventions to support the successful adoption of new tools, practices, and procedures and achieve behavioral change and improvement in organizational performance. Organizations use a combination of methods, processes, skills, techniques, and tools to manage the people side of the change process, addressing necessary preparations, expectations, and mindsets and equipping people to transition within a supportive organizational environment. Change management strategies can also include developing guidelines and sensitizing key decision-makers on digital health systems.

Key Factors in Change Management	
	01. Incorporate change management strategies targeting the health workforce into implementation plans.
	02. Proactively raise awareness with leadership and key stakeholders to increase buy-in.

KEY FACTOR **01**

Incorporate change management strategies targeting the health workforce into implementation plans.

While much work goes into planning the technical aspects of digital health transformation, often less consideration is given to how those changes will affect health workers. Changing existing views around digital technologies and how people engage with digital tools can be a challenge. Change management, particularly around enforcing changes in standard operations, needs to be an integral part of digital health implementations, not an afterthought. Many strategies can be employed to support change management and should be included in the digital health strategic plan. However, an understanding of the work culture where the changes occur is needed to tailor change management approaches that will yield the greatest results.

KEY FACTOR 01

Action Steps

✓	**Create an action plan for change sustainability that balances the technical, organizational, and behavioral changes needed for successful digital health implementations.**
✓	**Use staff with experience and expertise in system implementation and change management practices.**
✓	**Create awareness among managers and health workers of the digitalization of health services and gain managerial support at all levels to ensure that interventions are integrated into workflows and administrative operations.**
✓	**Incorporate language, communication, and cultural considerations of different target audiences into change management approaches.**
✓	**When developing plans, consider the implications of short-term goals so that the necessary resources (funding, staff, equipment) can be allocated to their long-term impacts.**
✓	**Although people often want sophisticated digital products, the more straightforward tools are the ones that most often end up being used. Keep development plans simple and focused on user needs to improve uptake.**
✓	**Use pilot projects to develop best practices, work out issues, and refine interventions.**
✓	**Develop and enforce a plan to manage the changes in business processes and workflows required by transitioning from manual systems to digital systems or by upgrading or integrating older systems. The plan for transitions from older systems to newer ones should minimize negative impacts on service provision as much as possible.**
✓	**Strengthen national, regional, and international collaborations as a vehicle for capacity building on emerging data tools.**
✓	**Implement continuous learning mechanisms, like help desks, to support staff capacity strengthening.**

MW

COUNTRY EXAMPLE

Data use campaigns for change management

To contribute to a culture of data use in Malawi, the government introduced data use campaigns. These were implemented to train health workers to use indicator dashboards on District Health Information System 2 (DHIS2) mobile apps and ensure that all health workers had personal login information and were aware of the digital tools available to them.

KEY FACTOR **02**

Proactively raise awareness with leadership and key stakeholders to increase buy-in.

The best way to bring political leaders and other stakeholders on board with digital and data initiatives is by demonstrating the value of these initiatives and showing evidence of what can be achieved with them, such as the results of pilot projects. Taking an evidence-based approach in communications and awareness-raising campaigns can help leaders feel confident integrating new practices into their standard operations.

KEY FACTOR 02

Action Steps

✓	**Consider political readiness among leadership at all levels of the health system to drive change and increase the uptake of digital health interventions in change management plans.**
✓	**Help political leaders understand the time it takes to advance digital health interventions and the challenges that may arise.**
✓	**Educate political leaders on the value of digital health activities by using evidence to show what can be achieved.**
✓	**Plan educational and awareness-raising campaigns to promote tools and encourage health workers to explore them as well as to raise awareness of the role digital health plays in improving the quality of health care.**

ETH

COUNTRY EXAMPLE

Building reward systems for health worker and leadership buy-in

In Ethiopia, the implementation team worked with select learning districts and hospitals to test a series of digital health interventions for replicability and scalability. As part of this process, they also trialed a rewards system within one health facility to better understand how incentivization might improve data-informed decision-making. The results were presented to digital health leadership to improve their confidence in integrating new practices and procedures into the health system.

Cross-Cutting Considerations

Workforce	Train health workers to use new services and applications Employ capacity-building programs to overcome barriers to data use Make technical and professional support available to help users overcome challenges with using digital tools
Leadership & Governance	Engage stakeholders and other participants Cultivate champions Anticipate changes in political leadership
Strategy	Develop a strategic plan
Services & Applications	Develop services and applications with a user-centered design approach

*Click on a **Key Factor** to jump to that section*

Data Use Ecosystem

Improving a country's data use for decision-making and action is the ultimate goal of digital transformation efforts, so the data use ecosystem is an important new component of the digital transformation process. The data use ecosystem encompasses the activities and motivations of health care workers that enable data-informed decision-making. This includes data collection, management, analysis, and dissemination; feedback on data and data use; data quality assurance; accessibility for relevant data users; demand for and confidence in available data; and incentivized, skilled decision-making and evidence-based action. Improving the overall data use ecosystem depends on developing the systems architecture and its interoperability so that data can be collected, shared, and monitored across systems and deploying appropriate services and applications that help improve data quality and analysis. Enthusiastic digital champions and leaders who are invested in digital health implementations foster a culture of data use. The more that leaders are engaged and use the data, the more likely they are to support the implementations and proactively encourage data use by others.

Key Factors
in Data Use Ecosystem

	01. Ensure that data are collected, shared, and monitored across systems at all levels of the health system.
	02. Focus on the use of data first, and data quality will follow.

KEY FACTOR **01**

Ensure that data are collected, shared, and monitored across systems at all levels of the health system.

A robust data use ecosystem depends on a cohesive, aligned systems architecture in which systems can connect and share data collected from multiple sources. Without this architecture in place, data remain siloed, contributing to duplicative data collection efforts and incomplete data.

KEY FACTOR 01
Action Steps

✓	**Improve services and applications to make data collection easier and reduce the burden on health workers.**
✓	**Deploy systems in all regions to ensure that national data are complete.**
✓	**Standardize the process and protocols for validating data across regions and facilities and put oversight in place to ensure they are followed consistently.**
✓	**Harmonize person-level data to enable access to complete patient records by facilities, laboratories, and pharmacies.**
✓	**Consolidate data from different sources into one interface to enable greater access to complete data records.**
✓	**Expand the interoperability layer to support data sharing between HIS and lower-level applications.**
✓	**Implement a supportive supervision system to align health programs' supervision checklists into one system and routinely provide feedback.**

MW

COUNTRY EXAMPLE

Adapting digital systems to meet COVID-19 challenges

Malawi's strong data use ecosystem and existing interoperability between systems allowed the country to pivot quickly to respond to the COVID-19 crisis. Malawi repurposed the country's digital architecture to respond to the COVID-19 pandemic, resulting in the development and deployment of a health surveillance system using DHIS2. The system supported data collection on case investigation, patient tracking and follow-up, case management, and vaccine delivery.

KEY FACTOR **02**

Focus on the use of data first, and data quality will follow.

Making data available to health workers regardless of whether the data are "perfect" can kickstart a culture of data use and help solve issues with data quality. Countries learn in real time how the health workforce uses data and where data quality issues are occurring toward an end goal of providing consistent, high-quality data. As health workers use data more often to make decisions, they become motivated to improve the quality of the data. Supervision and regular feedback from management around data use can also improve data consistency.

KEY FACTOR 02

Action Steps

✓	**Build staff capacity to enter and analyze data and increase their technological savviness, especially for health workers at the forefront of data collection.**
✓	**Compile a data toolkit to guide all aspects of data use and institute supporting policies that will empower health workers to act on health data.**
✓	**Update or develop templates for data use information products.**
✓	**Introduce dashboards to bring timely, available data to end-users, including policies and guidance for accessing and using the dashboard data.**
✓	**Look for ways to make data accessible, such as displaying data on TV screens or sending data to mobile phones.**
✓	**Institute working groups to learn how data are being used and develop the next steps for improving the culture of data use.**
✓	**Establish a multidisciplinary team responsible for monitoring the progress of data use and quality improvement efforts across the health system.**
✓	**Install data quality assurance mechanisms in health facilities and at administrative levels that measure data quality by completeness, timeliness, and consistency between reported and recounted figures.**
✓	**Institutionalize mechanisms that include simple ways for sharing feedback regularly with health workers around their use of and the quality of data.**
✓	**Review current policies, strategies, and guidelines to identify opportunities to strengthen data governance.**

RSA

COUNTRY EXAMPLE

Making data more visible and accessible to promote data use

In South Africa, the implementation team supported the development of a Provincial Health Data Centre in Western Cape Province in which person-level data were harmonized. As a result, data have been democratized, enabling greater data access and helping researchers conduct health-related research. In addition, having data in a single environment allows for efficient data storage and dissemination and enables the team to provide ongoing technical assistance and data quality loops.

Cross-Cutting Considerations

Workforce	Train health workers to use new services and applications Employ capacity-building programs to overcome barriers to data use Address staffing challenges
Leadership & Governance	Establish clear, strong governance structures Cultivate champions
Strategy	Use initial assessments and evaluations as an evidence base
Policy	Use existing policies and standards to develop a digital health policy Create or update policies and standards
Systems Architecture	Develop a systems architecture plan to support interoperability between systems and tools Connect or phase out existing systems
Services & Applications	Develop services and applications with a user-centered design approach.

*Click on a **Key Factor** to jump to that section*

Workforce

Digital transformation depends on the digital literacy and capacity of the health workforce as well as their motivation and incentives to use data for decision-making. Health workers at all health system levels need support, skills, training, and learning curricula to learn how to access and use data. Challenges arise when staff do not have the time or capacity for data analysis and use in their roles or lack the skills to use technical interventions appropriately. If data use is not a priority when making decisions, that also contributes to health workers not understanding the importance of quality data management.

Key Factors in Workforce	
	01. Train health workers in how to use new services and applications.
	02. Employ capacity-building programs to overcome barriers to data use throughout the health sector.
	03. Address staffing challenges such as understaffing and high turnover.

KEY FACTOR **01**

Train health workers in how to use new services and applications.

Capacity building helps health care workers evolve from being just data collectors who report information up to higher levels to becoming data users who can access and use data for improved decision-making and service delivery. Planning for application development and technical support includes understanding how workforce capacity needs to be increased.

KEY FACTOR 01

Action Steps

✓	**Provide opportunities to increase workers' access to systems and their knowledge of them, such as how-to guides, ongoing training, supervision, and assessments.**
✓	**Make technical and professional support available to help users overcome challenges with using digital tools.**
✓	**Develop a mechanism, such as an online platform, to improve collaboration, communication, and knowledge sharing on tools and facilitate the use of new applications.**
✓	**Create a library of documentation and other related information to improve access and transparency.**
✓	**Update university and health workforce training curricula to align better with digital and data tools currently in use or planned for implementation.**
✓	**Provide professional learning development opportunities for health workers, such as certification of excellence in HIS.**
✓	**Apply digital and data tools to health professionals' learning environments, such as by using eLearning platforms.**
✓	**Plan for retraining or refreshing health workers when services and applications are updated.**

TZ

COUNTRY EXAMPLE

Building capacity for the future digital landscape

In Tanzania, the government and implementing partners updated and synchronized its eLearning platform for in-service health workers. Previous eLearning platforms had been scaled to varying degrees and were not interoperable. By streamlining the platform, Tanzania reduced the operational costs required for in-person learning and made learning easier for health workers in remote areas who previously traveled long distances for training. It also enabled faster curriculum updates to keep pace with a changing evidence base and teaching standard.

KEY FACTOR **02**

Employ capacity-building programs to overcome barriers to data use throughout the health sector.

Beyond technical barriers, the biggest challenge to improving data use is the health workforce's ability to access and use data. Addressing this challenge offers the opportunity to introduce a variety of capacity-building efforts based on what is learned from evaluating user needs and how those needs relate to the uptake of data access and use. Capacity-building efforts often focus initially on national or district-level health workers. However, frontline workers are frequently the biggest collectors and users of data, so focusing on capacity building at the lower levels can have a more significant overall effect on developing the data use ecosystem. Government leaders also need capacity building to use data to make decisions, supported by tools such as dashboards. Building capacity for data use in the health workforce can occur in school curricula, during professional development, and on the job. However, capacity building can extend well beyond training by incorporating innovative ways of strengthening the culture of data use at all levels of the health system through intentional efforts, such as data use campaigns or as part of broader change management strategies.

KEY FACTOR 02

Action Steps

✓	**Develop and standardize preservice and in-service training, curricula, and manuals to include data use skills and digital health systems.**
✓	**Bring academic partners and training institutions into a consortium focusing on updating medical school curricula and health worker training to ensure that the health workforce builds data use skills.**
✓	**Provide continuing education for health workers that promotes data use as part of their training.**

RSA

COUNTRY EXAMPLE

Developing the health workforce into data users

In South Africa, the COVID-19 pandemic elevated the importance of digital and data tools for fighting the pandemic. Recognizing this, the implementation team worked to increase the government's capacity to access and use data at a national level and in select provinces. This enabled the government to pivot operations rapidly to make data-informed decisions around disease surveillance and the pandemic.

KEY FACTOR **03**

Address staffing challenges such as understaffing and high turnover.

Staffing challenges are often at the core of workforce barriers to using data and digital health systems, including understaffed health sectors and where there is high turnover. Staff who are overburdened or untrained will be disincentivized to use data. These challenges can result in the loss of institutional knowledge or training gaps. There may also be a lack of candidates with the expertise or skillsets to carry out digital transformation activities and support digital health systems. Establishing a functional governance framework for the lower levels of the health workforce provides a mechanism for addressing workforce challenges, such as lack of capacity.

KEY FACTOR 03

Action Steps

✓	**Develop an incentives mechanism to retain existing health workers. However, be aware that performance-based incentives mechanisms may work against data quality by provoking workers to collect data just for the sake of data collection rather than because the data are useful.**
✓	**Implement a mentoring program to continuously advance health workers' and managers' skills.**
✓	**Train ICT students in digital health systems to encourage them to develop careers in the field.**
✓	**Dedicate civil service staff to work with implementation teams who can later transfer skills and knowledge to government staff.**
✓	**Provide a platform where lower-level health workers can raise and discuss issues, identify needed resources, and develop solutions.**

ETH

COUNTRY EXAMPLE

Providing mentorship opportunities

Ethiopia launched a Capacity Building and Mentorship Program in partnership with six universities, regional health bureaus, and other partners. The program is designed to advance health worker and manager skills on an ongoing basis using new training manuals, technology courses, and other activities.

Cross-Cutting Considerations

Change Management	Incorporate change management strategies targeting the health workforce
Data Use Ecosystem	Ensure that data are collected, shared, and monitored across systems Focus on the use of data first
Leadership & Governance	Establish clear, strong governance structures Cultivate champions
Strategy	Take a user-centered approach to strategic planning
Policy	Develop or update policies and standards
Systems Architecture	Engage stakeholders in planning systems
Services & Applications	Develop services and applications with a user-centered design approach

*Click on a **Key Factor** to jump to that section*

Leadership and Governance

Committed leaders and political champions drive digital transformation efforts and promote data use for decision-making throughout the national health system. They engage with stakeholders both within the health system and across sectors to work toward achieving national digital health goals. To advance their priorities, governments can work with partners and funders to align with their needs, priorities, and resources. These relationships and the governance structures established to manage, monitor, and report on activities underpin all other elements of the model and therefore are foundational to overall success.

Key Factors in Leadership and Governance	
	01. Engage stakeholders and other participants who understand the importance of digital health and data use.
	02. Determine an approach for governing digital transformation efforts.
	03. Establish clear, strong governance structures.
	04. Cultivate champions who model commitment to digital health and data use at all health system levels.
	05. Anticipate and plan for changes in political leadership.

KEY FACTOR 01

Engage stakeholders and other participants who understand the importance of digital health and data use.

Stakeholders represent anyone supporting or affected by efforts to advance data use within the health system. They include not only those who are leading and implementing the efforts but also end-users and beneficiaries, such as health workers and managers; departments and ministries outside the Ministry of Health (MOH) that may use or fund digital health systems; and policymakers, funders, and technical experts, including from the private sector. Engaging multisectoral partners from the outset raises awareness of digital health interventions and increases their uptake. Involve stakeholders in all stages of digital transformation: from strategic visioning to defining monitoring and evaluation (M&E) plans to sharing best practices. Together, these stakeholders should have the technical expertise to move processes along and achieve implementation objectives.

KEY FACTOR 01

Action Steps

✓	**Establish or work with existing working groups to deliberate on digital health policies, standards, procedures, and strategies. However, don't make the processes or the number of groups too burdensome for already-busy participants.**
✓	**Develop communication mechanisms to coordinate among different groups and avoid duplication of effort.**
✓	**Conduct brainstorming sessions to articulate strategic visions, objectives, and activities.**
✓	**Define key performance indicators and M&E plans with stakeholders.**
✓	**Facilitate regular workshops with stakeholders to share lessons learned and best practices.**
✓	**Use the process to create a long-term "community of practice" of stakeholders and partners focused on digital health, with the government providing stewardship and leadership.**

TZ

COUNTRY EXAMPLE

Fostering digital champions both within and beyond the health sector

In Tanzania, implementing partners and the MOH established a project governance unit that engaged champions both within the MOH and beyond, helping to secure buy-in and create digital health advocates within various ministries and departments. It also included funder representation. The governance unit helped to manage project work across multiple ministries and agencies.

KEY FACTOR 02

Determine an approach for governing digital transformation efforts.

Country governments should lead their own digital transformation efforts to ensure that all activities align with national health priorities and the vision for digital health. Adopting a clear model for governing the work also makes certain that partners and stakeholders share the vision for digital health, which can help avoid implementations outside the scope of strategic plans, redundancies in effort, or misaligned tools. The different approaches taken by each of the five focal countries provide models for working with implementing partners that countries can adapt. Which approach to use depends on the maturity of existing digital health implementations, funding strategies, the level of support needed from external partners, current governance structures in the country, and the general enthusiasm among government leadership for data use and access.

KEY FACTOR 02

Action Steps

✓	***Embedded approach:*** **Key implementation partner staff are embedded within the MOH or another governmental body. Of the five focal countries, Ethiopia and Malawi took this approach.**
✓	***Collaborative approach:*** **The prime implementer coordinates implementation activities and liaises between the government and work being done "on the ground" by technical and academic partners. South Africa took this approach to its digital health implementation work.**
✓	***Hybrid approach:*** **Government agencies lead the implementation team in collaboration with partners providing technical support; the team itself includes both government and partner staff. This was the approach taken by Tanzania.**

ETH

COUNTRY EXAMPLE

Applying an embedded approach to strategic planning

In Ethiopia, the implementation team adopted an embedded approach to project implementation to build capacity and ensure that the government was involved from the outset in strategic planning. Project staff worked within and alongside the MOH to realize digital health objectives and eventually transition responsibility for leading the agenda to the government.

KEY FACTOR **03**

Establish clear, strong governance structures.

Strong governance structures define a framework for endorsing digital health implementations, gaining approval for activities, and general decision-making; establish oversight and accountability for implementation objectives; oversee compliance with policies and procedures; and can be adapted and operationalized at lower levels. Without strong governance structures in place, challenges can arise with endorsing activities in a timely manner and aligning investments with activities. Steering committees, task forces, and similar governance structures are typically used for oversight and accountability.

KEY FACTOR 03
Action Steps

- **Establish a national steering committee that can give leadership and strategic guidance to all digital health implementations and supports stakeholder engagement.**
- **Put processes in place for endorsing new projects and making decisions about activities to help prevent slowdowns and ensure that roles and responsibilities are clear.**
- **Create an HIS governance framework and definitions that districts or regions can adapt.**
- **Establish a digital health task force to catalog and evaluate the digital health systems and other tools in use in the country.**
- **Put a governing body in place to review and approve new services and applications.**
- **Develop governance structures to oversee enforcement of and compliance with policies and standards.**
- **Include knowledge management functions in governance structures to document activities and advance the global evidence base.**

MW

COUNTRY EXAMPLE

Using an embedded approach to project governance to engage stakeholders

In Malawi, 24 staff positions were seconded to the MOH to launch the country's first Digital Health Division (similar to Tanzania's Center of Digital Health; see Services & Applications). This approach helped build champions within the MOH, determine processes for decision-making, lead and coordinate the implementation of digital projects and investments, and ensure project sustainability. When faced with project delays and setbacks under COVID-19, the Malawi MOH coordinated partners and adapted digital health solutions swiftly to provide surveillance and monitoring tools for the pandemic, partly because of the strong project governance structures that placed implementation staff directly within government operations.

KEY FACTOR **04**

Cultivate champions who model commitment to digital health and data use at all health system levels.

Digital health champions are critical allies who can connect with other leaders and rally stakeholders to advance digital health implementation objectives.

KEY FACTOR 04
Action Steps

- **Have government champions run working group or steering committee meetings to facilitate good engagement among the group's members.**
- **Seek out champions within ministries and departments beyond the MOH to demonstrate the value-add of the work and ensure that a wide range of government staff is involved in digital health implementations.**
- **Cultivate champions at the local level to help gain buy-in from facilities and demonstrate the value of the innovations to frontline health workers.**
- **Implement communities of practice around digital health and data use topics: groups of professionals who share a passion or interest for what they do and meet regularly to collaborate and learn from one another.**

ETH

COUNTRY EXAMPLE

Engaging digital health champions at multiple levels

In Ethiopia, implementation teams identified government champions, such as the state minister, to collaborate on and drive forward digital health programming. The minister led all National Advisory Group and Steering Committee meetings and was able to build momentum and raise awareness for digital transformation among other members. Thanks to early stakeholder engagement, the state minister's office led the development of new standards, governance, and enforcement mechanisms for Ethiopia's multiple digital health systems, helping to operationalize and build support at the highest levels of leadership.

KEY FACTOR **05**

Anticipate and plan for changes in political leadership.

Changes in leadership are inevitable and often bring shifts in priorities, management structures, and staff that can slow activities and alter timelines. Developing a sustainability plan and other documentation and remaining nimble to shifts in leadership priorities can help navigate these challenges. Regularly demonstrating how interventions are working helps leadership feel confident and comfortable with new systems, technologies, and procedures.

KEY FACTOR 05

Action Steps

✓	**Create a sustainability plan to address ways to help mitigate the challenge of staff turnover—by embedding partner staff within the MOH, for example.**
✓	**Maintain thorough documentation of existing processes, roles, and decision-making channels that can be used to bring new leadership and staff up to speed quickly.**
✓	**Set clear expectations from the outset on what can reasonably be accomplished in the short and long term.**
✓	**Create a consortium of technical experts outside government to vet digital health policies and decisions.**
✓	**Plan to demonstrate the value of digital health activities and interventions to government leaders as part of routine reporting practices.**
✓	**Take advantage of timely opportunities to show the value of digital health activities that are underway.**

TZ

COUNTRY EXAMPLE

Accounting for change in government leadership

In Tanzania, the implementation team (made up of government staff and partners like PATH) experienced three major turnovers within the government since the start of the project in 2017, including full administration changes under new presidents, ministers, and permanent secretaries. These turnovers contributed to project delays and made it difficult to sustain and achieve project goals. Building strong champions across the health system helped foster champions between subsequent administration changes so that new leadership could be oriented more quickly to project goals. It also helped to navigate political turnover by advancing project objectives and maintaining political momentum throughout periods of change.

Cross-Cutting Considerations

Change Management	Proactively raise awareness with leadership and key stakeholders
Workforce	Employ capacity-building programs to overcome barriers to data use
Strategy	Use initial assessments and evaluations as an evidence base Develop a strategic plan Establish oversight and accountability for the strategic plan
Investment	Coordinate and align funders and investments with strategic plans
Policy	Develop or update policies and standards
Systems Architecture	Engage stakeholders in planning systems
Services & Applications	Establish a governing body to approve new services and applications

*Click on a **Key Factor** to jump to that section*

Strategy

Strategic planning for data use acceleration is the process of developing and aligning digital health plans and goals and planning for their implementation. Unique to each country, strategic plans may build on past planning efforts and go hand-in-hand with leadership and governance. The strategic plan depends on an in-depth assessment of the existing digital health landscape, including user needs. Stakeholders across health, ICT, and other relevant sectors can use these assessments to make decisions on goals, priorities, and implementation plans.

Key Factors in Strategy

01.	Use initial assessments and evaluations as an evidence base for decision-making.
02.	Take a user-centered approach to strategic planning.
03.	Develop a strategic plan that facilitates clear, well-defined interventions but also allows for flexibility.
04.	Establish oversight of and accountability for the implementation of the strategic plan.

KEY FACTOR **01**

Use initial assessments and evaluations as an evidence base for decision-making.

The strategic-planning process first involves conducting an in-depth assessment of existing digital and data operations. The assessment creates an evidence base for making informed funding and policy decisions and guiding discussions on how to implement interventions. This assessment not only identifies and quantifies issues but also shows what interventions are already working. These successful interventions can provide a foundation for improving and expanding existing systems rather than starting from scratch.

KEY FACTOR 01

Action Steps

✓	**Document and map all health-related tools, databases, forms, and applications within the national health system.**
✓	**Assess the existing data use ecosystem by cataloging decisions, data elements, users, and systems and identifying gaps in data collection, flow, use, and reporting.**
✓	**Use an assessment approach to develop or renew the eHealth strategy. Conduct stakeholder interviews and review current policies, strategies, and guidelines, taking the opportunity to bring in new stakeholders, such as regional organizations.**

BFA

COUNTRY EXAMPLE

Assessing data user needs

In Burkina Faso, the implementation team conducted a data user study to understand the gaps between what decision-makers know, what they need to know, and the types of data that are collected to strengthen the country's national HIS. The study revealed more than 110 active databases, applications, and digital tools in use and helped to inform a series of recommendations to better align data users' and decision-makers' needs.

KEY FACTOR **02**

Take a user-centered approach to strategic planning.

Developing strategic plans with data users in mind helps ensure that digital health interventions are accessible and used once implemented.

KEY FACTOR 02
Action Steps

✓	**Hold focus groups with health workers to gain insights into their needs.**
✓	**Conduct studies on how data users collect, analyze, and use data with existing tools and systems to learn how best to optimize these processes.**
✓	**Obtain domain knowledge from experts "on the ground."**
✓	**Employ an agile methodology in the planning process to work with users to develop systems and tools.**
✓	**Foster collaboration and gain feedback from users by forming a user advisory group or through culturally appropriate interview and survey methods and documentation of users' insights.**

RSA

COUNTRY EXAMPLE

Centering user needs in strategic planning and design

User-centered approaches varied across countries but included data user studies, focus groups with health workers, and user advisory groups to test and iterate on new digital health systems. In South Africa, for example, the implementation team hosted consortium meetings, stewarded by the government, to discuss the planning and implementation of digital solutions. These meetings allowed technical staff and government officials to discuss new technologies in great depth and in a noncompetitive environment with peers who had strong on-the-ground and domain knowledge about the planning and implementation of digital solutions.

KEY FACTOR **03**

Develop a strategic plan that facilitates clear, well-defined interventions but also allows for flexibility.

Over the long term, the strategic plan should maintain a vision and goals for how digital health will be implemented in the country that can align stakeholders around common objectives and activities. The plan can be used to prioritize which interventions to implement first, such as those that are simpler to develop, build on existing systems, and will quickly show value by meeting user needs.

KEY FACTOR 03
Action Steps

✓	**Determine who will own systems, whether they will be centralized, and what standards will ensure interoperability.**
✓	**Include in the plan new or revised policies, standards, and guidelines.**
✓	**Take an iterative approach to implementation that develops interventions in planned stages and tests them with pilots or proofs of concept.**
✓	**Empower implementers to be flexible to on-the-ground realities and revise plans based on what they have learned through pilot projects.**
✓	**Build in regular reviews of strategic plans with stakeholders to ensure that plans are still aligned and achievable and to account for changes in the country's sociopolitical or digital health landscape.**

TZ

COUNTRY EXAMPLE

Building flexible digital health strategies

In Tanzania, the implementation team supported the government of Tanzania and key partners to develop a national digital health strategy. The strategy provided a clear vision for digital health and defined the policies and governance structures necessary for digital health harmonization. Recognizing that a strategy is only beneficial if operationalized, implementers also helped socialize the strategy among key donors and partners to ensure it aligned with the country's strategic goals. This helped future investments and digital initiatives map back to this vision and reflect government priorities.

KEY FACTOR **04**

Establish oversight of and accountability for the implementation of the strategic plan.

Just having a strategy is not enough—plans need to be operationalized to be truly effective. A management team should be accountable for implementing the plan according to policies and guidelines and showing progress toward goals. Monitoring and reporting on progress against strategic plans helps to demonstrate the value of digital health interventions to leadership.

KEY FACTOR 04

Action Steps

✓	**Institute policies that support governance of the national health strategy across partners.**
✓	**Develop intermediate outputs related to strategic priorities that can be monitored and reported to demonstrate the continued value of investments and understand whether they meet users' needs.**
✓	**Test interventions with a small subset of districts and/or facilities to assess the effectiveness, replicability, and scalability of interventions.**
✓	**Make implementation of the digital health strategy a permanent agenda item of all meetings at all levels of the health system.**

MW

COUNTRY EXAMPLE

Operationalizing digital health strategies

In Malawi, the implementation team hosted a weeklong working session with partners to align project activities to the new national digital health strategy. This alignment session also collected information on funding streams and implementation timelines to allow team members to pause, review progress, and realign the next steps.

Cross-Cutting Considerations

Leadership & Governance	Engage stakeholders and other participants Establish clear, strong governance structures
Investment	Coordinate and align funders and investments with strategic plans
Policy	Develop or update policies and standards
Systems Architecture	Develop a systems architecture plan
Services & Applications	Assess and evaluate services and applications already in use

*Click on a **Key Factor** to jump to that section*

Investment

Investments include the monetary funds and other resources required to transform national data health systems. Countries engaging in digital transformation must grapple with the question of how to fund the necessary human resources, infrastructure, and equipment for the transition. Digitalization is a costly, multiyear investment that requires streamlining systems and maintaining them over time. A coherent strategy for aligning strategic, long-term, sustained investments that contribute to achieving digital health goals is critical for success.

Key Factors in Investment	
	01. Coordinate and align funders and investments with strategic plans using tools such as investment roadmaps.
	02. Realign investment priorities with shifting priorities and activities.

KEY FACTOR **01**

Coordinate and align funders and investments with strategic plans using tools such as investment roadmaps.

An investment roadmap, in conjunction with the strategic plan, specifies the resources necessary to achieve the digital health vision. The roadmap can be used to inform donors of priority needs and align their grants against those priorities to provide complementary funds for digital health investments. The roadmap should also consider sustainability plans that account for long-term funding of interventions.

KEY FACTOR 01

Action Steps

✓	**Include donors and funders in working groups and stakeholder discussions to keep them informed of implementation goals and activities and let them participate in setting the direction of activities.**
✓	**Encourage donors to adopt the Principles of Donor Alignment for Digital Health (https://digitalinvestmentprinciples.org/).**
✓	**Advocate for resource allocation across government sectors to support digital health and data systems in a complementary way.**
✓	**Plan for long-term, country-generated funding streams to reduce reliance on external funding.**
✓	**Include funding to maintain and support digital tools and data use activities in annual budgets.**
✓	**Institute a funding oversight mechanism that monitors and regularly reports on how funding is used. This mechanism can also help ensure that all investments comply with policies and standard operating procedures.**

TZ

COUNTRY EXAMPLE

Codeveloping an investment roadmap

The implementation team partnered with the Government of Tanzania to create the Digital Health Investment Roadmap (2017–2023) and later refresh it in 2021. The roadmap aligns digital health priorities for the country and gives 36 recommendations for investment as well as financing and cost guidelines. The roadmap helps to ensure that current and future digital health investments support Tanzania's strategic vision for digital health while prioritizing finite resources.

KEY FACTOR **02**

Realign investment priorities with shifting priorities and activities.

Changes in government leadership and unexpected issues like the COVID-19 pandemic can bring shifts in digital health priorities, and implementation activities need to shift along with them. Raising awareness of these changes and remaining flexible when they occur are key to overcoming challenges that may result.

KEY FACTOR 02

Action Step

Regularly engage funders to discuss reallocating funding to new priorities while still supporting overall digitalization goals.

BFA

COUNTRY EXAMPLE

Planning for financial flexibility

Countries must often shift their health priorities and budgets in the face of new information, evolving health trends, or unexpected roadblocks. In Burkina Faso, for example, a six-month data strike in 2019 led health workers to refuse to collect or share data with national-level officials within the MOH. This resulted in project delays and limited visibility into health data. Fortunately, partner and donor flexibility allowed the implementation team to postpone data collection efforts until a resolution had been reached. It also allowed the flexibility to redirect project funds to the COVID-19 response when the government identified this as a leading priority for digital health programming.

Cross-Cutting Considerations

Leadership & Governance	Engage stakeholders and other partners Establish clear, strong governance structures
Strategy	Develop a strategic plan
Policy	Develop or update policies and standards

*Click on a **Key Factor** to jump to that section*

Policy

Policy encompasses legislation and guidance for implementing digital health applications and HIS; standards and legal frameworks for data security, privacy, and sharing; and compliance and enforcement methods.

When policies and standards related to digital health and data use are clear, operationalized, and enforced, they help standardize and align digital health programs within the larger health system. Policies that aren't aligned well with the country's digital health strategy can hinder achieving digital health goals. Therefore, policies require regular review and revision as digital health work advances.

Key Factors in Policy	
	01. Use existing policies and standards as a foundation for developing a cohesive digital health policy.
	02. Implement a structured, consultative process to develop or update policies and standards.

KEY FACTOR **01**

Use existing policies and standards as a foundation for developing a cohesive digital health policy.

Existing policies can help determine the priority areas for investment and align these with the national strategic vision. Stakeholders have already vetted existing policies, so it will be easier to gain approval and drive implementation for activities based on them. Adapting existing policies and standards that health workers already know will make it easier for the workforce to learn and operationalize them. Existing data standards are also easier to adapt and expand to facilitate interoperability among systems. Keep in mind that existing policies will need to be updated to reflect new technologies, tools, and regulations.

KEY FACTOR 01 Action Steps	
✓	**Plan for time and resources to consolidate documents into a single digital health policy for the country.**
✓	**Standardize data definitions on standards and policies that are already in use as much as possible.**

BFA

COUNTRY EXAMPLE

Building on existing policies and standards

Existing policies and standards offer a foundation for digital health implementers to build upon. The MOH in Burkina Faso defined a ten-year strategic plan for its National Health Information System (NHIS). The implementation team evaluated this plan and the NHIS based on the user perspective. The evaluation identified components of the NHIS Strategic Plan that were achieved and areas of opportunity to strengthen. Information gleaned from the evaluation provided a comprehensive situational analysis on which to build the next five-year NHIS Strategic Plan and context to guide the development of other key strategies. The Government of Burkina Faso is using the evaluation results to draft key strategies for the next five years, including the NHIS 2021–2025 Strategic Plan, Digital Health Strategy, Health Sector Development Plan, and National Economic and Social Development Strategy.

KEY FACTOR **02**

Implement a structured, consultative process to develop or update policies and standards.

Key stakeholders can help the country strategically develop or revise policies, standards, and guidelines using an iterative approach, which implementers can then use to prioritize and guide implementation work. Plan to revise policies regularly, at each milestone in the digital transformation process, as well as to align with any new advancements in technology, strategic goals, and/or legal requirements. Commit to enforcing policies and operationalizing standards, and anticipate challenges that may come as a result, such as the need to retire old systems or retrain health workers.

KEY FACTOR 02

Action Steps

✓	**Review strategic plans and goals to determine what policies are needed, such as electronic medical record standards, governance protocols, ICT policies, interoperability standards, and user manuals.**
✓	**Identify gaps that need to be addressed when revising policies, such as complying with laws on data privacy or aligning with new digital health priorities.**
✓	**Develop policies that empower health workers to act on data by providing clear guidelines on appropriate access and use of digital health systems.**
✓	**Review and improve security standards, privacy policies, and confidentiality of data in coordination with system upgrades.**
✓	**Identify the specific authorities to ensure enforcement of and compliance with policies and standards in different areas of the health system depending on the oversight area or location.**
✓	**When operationalizing policies, consider regional differences and how those might affect the standardization of policies at the national level.**
✓	**Develop a clear, concrete dissemination plan for new policies and standards specifically aimed at all authorities who oversee policy enforcement and compliance.**
✓	**Develop an M&E plan to track the uptake of policies.**
✓	**Appoint a central authority to oversee digital health policies nationally, distribute and promote updates, and monitor implementation across the health sector.**
✓	**Throughout the efforts to advance data use, continue to increase the visibility of policies to familiarize health workers with them and gain endorsement by managers.**

TZ

COUNTRY EXAMPLE

Governing digital transformation

In Tanzania, a National Digital Health Steering Committee (NDHSC), chaired by the permanent secretary of the MOH, serves as the country's primary governance body overseeing implementation of Tanzania's National Digital Health Strategy. The NDHSC is cochaired and staffed by government officials across the health system and accompanied by a Digital Health Technical Committee and other governing bodies at lower levels to translate new guidance, policies, and standards for health facilities and frontline health workers into regional contexts.

Cross-Cutting Considerations

Leadership & Governance	Engage stakeholders and other partners Establish strong, clear governance structures
Strategy	Use initial assessments and evaluations as an evidence base Develop a strategic plan Establish oversight and accountability for the strategic plan
Investment	Coordinate and align funders and investments with strategic plans
Systems Architecture	Develop a systems architecture plan Connect or phase out existing systems
Services & Applications	Assess and evaluate services and applications already in use

*Click on a **Key Factor** to jump to that section*

Systems Architecture

A strong enterprise architecture organizes and connects digital health systems within the current ICT infrastructure so that they may be better scaled and sustained as the health system grows. When digital health systems are disconnected, underdeveloped, and underused, it is impossible to develop an ecosystem in which data are routinely used to make decisions. Using standards, optimizing interoperability, and improving the enterprise architecture enable digital health systems to "speak to one another" and increase the flow of data to improve data quality, access, and use. As such, developments in systems architecture are at the heart of digital health transformation efforts.

Key Factors in Systems Architecture	
	01. Use a holistic, strategic process to develop a systems architecture plan.
	02. Engage stakeholders at the lower levels of the health system in planning systems.
	03. Plan to connect or phase out existing systems.

KEY FACTOR **01**

Use a holistic, strategic process to develop a systems architecture plan.

Strategic plans for developing and implementing systems architecture should align to a country's broader digital health goals rather than be developed in isolation to meet the needs of a particular facility or group. Explicitly shifting from a "project" mindset to a "global" mindset of infrastructure development can facilitate a holistic view for planning a more integrated and interoperable systems architecture. The evidence base created from an initial assessment of existing digital health systems can guide discussions about systems interoperability and rationalization. The enterprise architecture can also be used as a tool for defining standards and policies for digital health systems.

KEY FACTOR 01

Action Steps

Base plans on how the health sector currently operates, including what HIS exist, how they interface, and where there may be gaps in services.
Define and configure an interoperability layer for digital health systems, which includes articulating the system's overarching architecture and core component gaps and developing a plan to establish the interoperability structure.
Define and configure metadata, including indicators and data elements, to ensure that data are provided to users consistently and accurately.
Adopt a practical approach to planning and implementation.
Build on what has already been done.
Use user-centered and human-centered design approaches.
Help partners select existing platforms and approaches.
Define services and applications that support sustainability.
Invest in not just artifacts and hardware but also human resources and capacity building.
Develop a roadmap based on the systems architecture plan to guide implementation and set expectations for the time needed with stakeholders.
Monitor and report intermediate outcomes to demonstrate the impact of digital health investments and progress toward larger goals.

TZ

COUNTRY EXAMPLE

Developing a blueprint for the health system

In Tanzania, the implementation team partnered with the government to develop a health enterprise architecture, which serves as a conceptual blueprint for the structure and operation of the country's national digital health system. The enterprise architecture provides an overview of how the country's health sector currently operates, including what HIS exist, how they interface with one another, and where there may be gaps in services.

KEY FACTOR 02

Engage stakeholders at the lower levels of the health system in planning systems.

Systems interoperability depends on standards that enable systems to communicate with one another and exchange data. Close cooperation with data users at the district and facility levels is needed to align their data requirements with national standards, resulting in a more efficient systems architecture. An added benefit is that more engagement at the lower levels leads to more local ownership of digital health systems.

KEY FACTOR 02
Action Steps

✓	**Educate stakeholders on the value of standards and integrating systems.**
✓	**Train key stakeholders in enterprise architecture processes (such as the TOGAF Standard; see https://www.opengroup.org/togaf) to build in-country expertise and enable them to participate directly in systems-architecture planning.**
✓	**Work with local data users to determine their data requirements and align those with national standards.**
✓	**Advocate for district priorities when planning systems and build on what is already working locally.**

MW

COUNTRY EXAMPLE

Aligning national policies to local contexts

In Malawi, the implementation team partnered with the MOH to align national standards to district requirements. This enabled a more efficient systems architecture and created local ownership of the digital tools.

KEY FACTOR 03

Plan to connect or phase out existing systems.

The more systems for managing data that a country has, especially if they are fragmented or siloed, the greater the challenge it is to connect them. Facilities often have their own systems, each using different data standards. Keep in mind that this includes paper-based systems. Evaluating which systems are most used and functional provides a strong foundation on which to base interoperability and systems rationalization. Also consider retiring or phasing out older systems if they do not support new policies and standards.

KEY FACTOR 03
Action Steps

✓	**Institute a searchable system for registering, inventorying, and documenting digital health systems developed by different stakeholders that details the technology used, the focus area, and the geographic coverage of each system.**
✓	**Establish criteria and a consistent process for how and when to retire old, obsolete, or paper-based systems.**
✓	**As systems are being improved, also devote time to improving supporting documentation (e.g., systems requirements specifications, user acceptance testing reports, system technical manuals, user manuals, and standard operating procedures).**

ETH

COUNTRY EXAMPLE

Tracking and connecting systems

To help track and manage Ethiopia's disparate systems, the team supported the development of the Digital Health Projects Inventory System: a searchable, web-based system that enables the registration of different digital health implementations and improves coordination.

Cross-Cutting Considerations

Data Use Ecosystem	Ensure that data are collected, shared, and monitored across systems
Leadership & Governance	Engage stakeholders and other partners
Strategy	Use initial assessments and evaluations as an evidence base for decision-making Develop a strategic plan
Policy	Use existing policies and standards to develop a digital health policy Create or update policies and standards
Services & Applications	Assess and evaluate services and applications already in use

*Click on a **Key Factor** to jump to that section*

Services and Applications

Services and applications include data platforms and digital interventions deployed to improve data access and use. Countries may have already installed various tools depending on the needs and priorities defined for the health sector, and those tools may differ significantly in how much they are used and how well they integrate with other digital health systems. The assessment of the existing digital health landscape may highlight services and applications that can be improved, expanded, and connected to the overall systems architecture, saving the time of having to start from scratch. Accessing technical support from implementers, upgrading applications on an ongoing basis, and building the capacity of workers to use them help ensure the long-term usability of services and applications.

Key Factors
in Services and Applications

01.	Assess and evaluate services and applications already in use before implementing new tools.
02.	Develop services and applications with a user-centered design approach.
03.	Establish a governing body to approve new services and applications.

KEY FACTOR **01**

Assess and evaluate services and applications already in use before implementing new tools.

To avoid duplicative or unnecessary systems, knowing what tools are already in use is necessary. Furthermore, this evaluation step helps to identify the specific needs of data users so that the appropriate tools to meet those needs can be implemented. The initial assessment of the digital health landscape should provide an inventory of the services and applications in use.

KEY FACTOR 01
Action Steps

✓	**Implement an application registration system or inventory to determine which services and applications are in use, their functionality for users, and their costs to implement.**
✓	**Develop a data dictionary to help understand the applications in implementation and where efficiencies can be made. The data dictionary can also be used to develop data standards.**

BFA

COUNTRY EXAMPLE

Harmonizing data collection systems

In Burkina Faso, the implementation team is developing an inventory of all paper and digital health applications to better track, coordinate, and synchronize the various tools available to the health workforce. This will help to avoid duplicative tools. The government is also conducting a metadata analysis and creating a data dictionary to define core data elements. Together, these activities will help to find efficiencies and synergies in Burkina Faso's existing digital health systems.

KEY FACTOR **02**

Develop services and applications with a user-centered design approach.

Designing with the user fosters the development of services and applications rooted in an understanding of users' characteristics, needs, and challenges, which increases the uptake of new tools. Consider the user perspective when planning digital health interventions, including language, communication, and cultural considerations. Implementing stable, functional, and appropriate services and applications will also build users' confidence in them.

KEY FACTOR 02
Action Steps

✓	**Engage users via working groups and one-on-one meetings to make sure digital health and data tools consider and address their concerns.**
✓	**Support stakeholders to work together, under government leadership, to design specifications and incorporate these into existing tools as much as possible, rather than creating new standalone applications.**
✓	**Solicit recommendations and guidance from technical working groups and other groups at the local, national, and regional levels to coordinate development partnerships and facilitate improvements of services and applications.**
✓	**Mobilize technical expertise from partners to contribute to planning, implementing, and monitoring priority interventions.**

ETH

COUNTRY EXAMPLE

Providing learning labs for user-centered design

In Ethiopia, the government and implementing partners created the Digital Health Innovation Learning Center (DHILC) to build health workforce capacity. The DHILC offers space for practitioners to seek technical and professional support to help overcome health system implementation challenges while utilizing user-centered design principles. For example, it will feature a software development testing environment for new digital tools in which developers can validate new requirements, try out use cases in a health facility setting, and seek user feedback.

KEY FACTOR **03**

Establish a governing body to approve new services and applications.

To streamline systems and coordinate development efforts, a governing body is needed that will review proposed services and applications and approve interventions that align with the overall digital health strategic plan. This body can also serve a knowledge management function by documenting interventions for the global evidence base.

KEY FACTOR 03

Action Step

Establish a clear, transparent process for introducing digital tools for health systems that includes criteria for approving the implementation of new services and applications based on the digital health strategic plan.

TZ

COUNTRY EXAMPLE

Centralizing digital oversight

In Tanzania, the government will soon implement the Center of Digital Health (CDH), which will support and oversee all digital health initiatives in the country (similar to Malawi's new Digital Health Division; see Leadership and Governance). It will also seek to make future partnerships and digital systems more coordinated and impactful and serve as a knowledge management function, helping to document Tanzania's digital leadership and advance the global evidence base. The CDH offers a mechanism for monitoring the implementation of policies and standards across the health sector and reviewing and approving new digital tools and systems to avoid duplication.

Cross-Cutting Considerations

Data Use Ecosystem	Ensure that data are collected, shared, and monitored across systems
Workforce	Train users how to use services and applications
Leadership & Governance	Engage stakeholders and other partners Establish clear, strong governance structures
Strategy	Use initial assessments and evaluations as an evidence base for decision-making Take a user-centered approach Develop a strategic plan
Systems Architecture	Develop a systems architecture plan Engage stakeholders in planning systems
Infrastructure	Plan for how to improve infrastructure

*Click on a **Key Factor** to jump to that section*

Infrastructure

Physical infrastructure and system maintenance is a broad area that includes servers, computers, tablets, backup paper, and HIS supplies, as well as energy, electricity, and internet connectivity. Infrastructure improvements are an important aspect of digital health strategies; because these improvements can require a lot of resources and time to implement, it is often necessary to seek out sustainable solutions that work around challenges and supplement country infrastructure needs on an "as-needed basis."

Key Factor in Infrastructure	
	01. Plan for how to improve infrastructure.

KEY FACTOR **01**

Plan for how to improve infrastructure.

The most common infrastructure issues are with reliable electricity and internet connectivity. In addition, staff may not have access to smartphones or computing devices that can support new interventions. Partner and government investments may need to be leveraged to obtain funding for much-needed infrastructure improvements, such as connectivity or hardware. Coordinating across funders can help address the need for large initial investments. However, infrastructure improvements often fall outside the purview of teams implementing digital health improvements. It is therefore important to design interventions and systems that will work within the limitations of the existing infrastructure while at the same time planning for improvements in the long term.

KEY FACTOR 01

Action Steps

✓	**Institute a data or digital health innovation center at the national level to provide a central way of assessing and advocating for infrastructure improvements and help build government capacity.**
✓	**Work with internet providers, cloud-hosting services, and other private partners to develop solutions for hosting data, monitoring systems, and improving connectivity.**
✓	**Develop services and applications with both offline and online capabilities to mitigate issues with internet connectivity.**
✓	**Consider flexible interventions such as web-based tools that can be accessed over public internet connections and apps for mobile phones that can upload data when a connection is available.**
✓	**Plan for new staff required to maintain and configure new equipment and systems as well as computing devices or smartphones and training for health workers.**

ETH

COUNTRY EXAMPLE

Building technological and physical infrastructure

In Ethiopia, the implementation team partnered with the government to explore hosting alternatives for Ethiopia's DHIS2. Since the DHIS2 systems needed consistent connectivity at all levels, the implementation team advocated for using cloud-hosting services as part of the effort to enhance data use. Building the capacity of the MOH for cloud service optimization, real-time monitoring of performance, continuous data backup, and disaster recovery was crucial.

Cross-Cutting Considerations

Workforce	Train users how to use services and applications
Investment	Coordinate and align funders and investments with strategic plans
Systems Architecture	Develop a systems architecture plan
Services & Applications	Assess and evaluate services and applications already in use

*Click on a **Key Factor** to jump to that section*

Methodology

Under DUAL and with the support of the Bill & Melinda Gates Foundation, PATH and Cooper/Smith partnered to advocate for including country learnings on digital tools and approaches within global policies, future interventions, and funding mechanisms.

Partners included Cooper/Smith (Malawi, Burkina Faso), PATH (Tanzania), JSI Research and Training Institute (Ethiopia), and the University of Cape Town (South Africa).

DUAL analyzed key resources to identify common themes across existing models and frameworks related to data use, digital health, and HIS. Thirty-six documents were reviewed to determine the critical factors for digital transformation, which were then used to inform the process of collecting evidence and experiences from the five focal countries.

Data were collected and analyzed in two phases: (1) a literature review of Data Use Partnership (DUP) documents and (2) primary data collection through key informant interviews and other methods. The table lists the number of documents collected from each of the five focal countries during Phase 1 and the number of interviews conducted in each country during Phase 2 that were coded and analyzed.

COUNTRY	DOCUMENTS	INTERVIEWS
South Africa	8	7
Tanzania	17	6
Malawi	18	7
Ethiopia	21	10
Burkina Faso	8	3

During Phase 1, DUAL reviewed 72 documents, including implementation materials, country strategies, and M&E reports. The collected documents were coded based on the previously identified critical factors for digital transformation, and the results were synthesized and presented to stakeholders and partners in each country. Gaps were identified that could direct areas of focus for Phase 2.

Phase 2 consisted of primary data collection through key informant interviews, online surveys, and a series of webinars and virtual discussions with representatives of the country audiences. DUAL conducted 33 interviews with country officials, implementers, and local government staff to gather further evidence on the model elements as well as information on overall experiences with digital health implementations. Interview transcripts were coded as in Phase 1. In some cases, key informants were individuals who either were part of the country's DUP or worked closely to support the DUP. Therefore, there may have been some bias in their experiences and insights.

This has been taken into consideration by engaging in sense-making discussions with country stakeholders and cross-country discussions to ensure that specific views are not overrepresented.

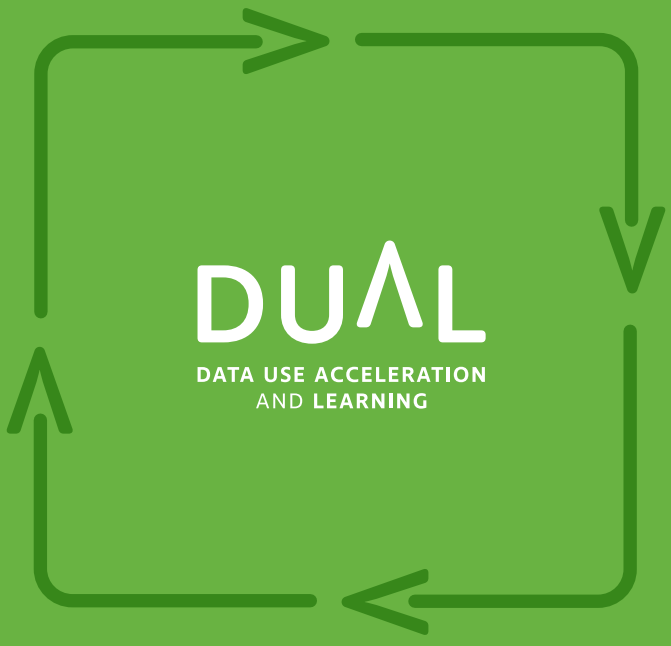
With all Phase 1 and 2 data coded, an in-country analysis was first conducted to surface findings and insights related to factors that enable or hinder data use acceleration and learning in each country and country-specific achievements, challenges, recommendations, and lessons learned. These findings were then shared with country implementation teams for feedback and validation. After finalizing the in-country reports, DUAL conducted a cross-country discussion with 22 attendees from the five countries to explore relevant themes and validate country experiences. A synthesis of all in-country reports and additional data analysis from both phases, along with the notes from the cross-country discussion, were analyzed to identify the critical cross-country factors for digital transformation.

DUAL then conducted virtual workshops convening country officials, policymakers, donors, and implementers to discuss and validate the cross-country findings. Workshop participants developed the initial version of the DUAL model presented in this document.

It should be noted that because each country is at a different stage of developing its digital health implementations, countries will have demonstrated greater or lesser progress compared with one another. This study is intended to better understand how countries use the DUAL model elements to achieve their goals for improving data use, rather than to measure their progress toward achieving those goals. Those countries that have been implementing digital health and data use interventions longer may therefore be represented more than others in the findings.

What's Next

Data and digital health tools and information systems can improve health service delivery and ultimately health equity, but not if done without considering the broader goals, vision, and data ecosystem of the country's health system. The DUAL model for digitally transforming health systems to advance data use is based on countries' actual experiences and emphasizes a holistic approach made up of ten core elements that considers not only tools, systems, and infrastructure but also strengthening governance, building the capacity of the health workforce to use these systems, systematically managing the transition to digital health systems, and cultivating a culture of data use throughout the health sector. DUAL envisions a future in which all stakeholders in digital health, both globally and nationally, work together to advance and accelerate digital transformation in alignment with current best practices and each country's health strategy and digital maturity, thereby improving the health of people around the world.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AND LEARNING