

RESEARCH BRIEF

# DIGITAL HEALTH EXEMPLARS CROSS-COUNTRY SYNTHESIS

## INTRODUCTION

Digital tools are transforming almost everything we do. In the health sector, digital innovations, including AI tools, have the potential to address global challenges such as barriers to access, inefficient system management, and suboptimal care quality. When deployed appropriately, digital tools can accelerate progress toward more intentional and efficient primary health care systems to deliver critical care worldwide.

The Digital Health Exemplars research project aims to generate practical insights on how countries can use digital health technologies to improve primary health care systems. The project’s retrospective study identified five countries—Brazil, Finland, Ghana, India, and Rwanda—that have done this successfully relative to peers.

Learn more about  
Digital Health Exemplars



## Key findings and recommendations

Digital health Exemplar countries represent varying levels of digital ecosystem maturity, enabling policymakers to draw lessons and apply these insights across diverse contexts.

	KEY INSIGHTS	RECOMMENDATION
<b>HOW CAN COUNTRIES GAIN VALUE FROM DIGITAL HEALTH INTERVENTIONS?</b>	<ul style="list-style-type: none"> <li>Digital health interventions delivered value when tied to a clearly articulated health system need or service need.</li> <li>Efficiency gains in administrative tasks were the most consistent and measurable benefit, allowing more time for clinical tasks.</li> <li>Time savings did not automatically translate into cost savings; this depended on system management and financing.</li> <li>In more mature digital health systems, care utilization and quality improved alongside patient engagement.</li> </ul>	<b>Align digital interventions to specific problems in the health system</b>
<b>HOW CAN COUNTRIES ESTABLISH STRONG ENABLING ECOSYSTEMS FOR DIGITAL HEALTH?</b>	<ul style="list-style-type: none"> <li>Sustainable scale depends on system readiness; moving too fast risks digitizing broken processes.</li> <li>Exemplar countries invested in a common, readiness-based progression across enablers—first establishing foundational elements before scaling and moving toward integration and sustainability.</li> <li>As ecosystems mature, digital use cases deliver the most value when complexity matches context.</li> <li>AI depends on the same foundational elements as digital systems, with emphasis on data availability, infrastructure, and governance.</li> </ul>	<b>Invest in building up the ecosystem, making staged improvements across infrastructure, governance, workforce, and financing</b>
<b>HOW CAN COUNTRIES MOVE FROM SILOED DIGITAL SOLUTIONS TO FULL HEALTH SYSTEM DIGITIZATION?</b>	<ul style="list-style-type: none"> <li>End-to-end health system digitization offers long-term value but requires substantial readiness, investment, and cross-sector coordination.</li> <li>Exemplar countries moved from siloed to integrated digital solutions, using tailored policy and governance levers to promote interoperability.</li> </ul>	<b>Establish a long-term vision for full health system digitization, balanced with a readiness-based approach</b>

## Research partners

The content of this research brief reflects the work of the retrospective research arm of the Digital Health Exemplars project, including the following partners:



Figure 1: Outcomes identified across digital health interventions

Outcome types <sup>1</sup>	Efficiency	Care Utilization and Quality	Direct Patient Engagement
Core findings	Measurable time savings found across use cases but the limited conversion of those savings into reduced costs highlights the complexity of implementing interventions for cost efficiencies	The interventions studied had <b>positive impacts on care quality</b> , supporting the retention and progression of individuals through the health care system	The interventions studied largely showed <b>positive impact by driving direct patient engagement</b> with the appropriate service modality and service type
Associated maturity level	Emerging		Leader

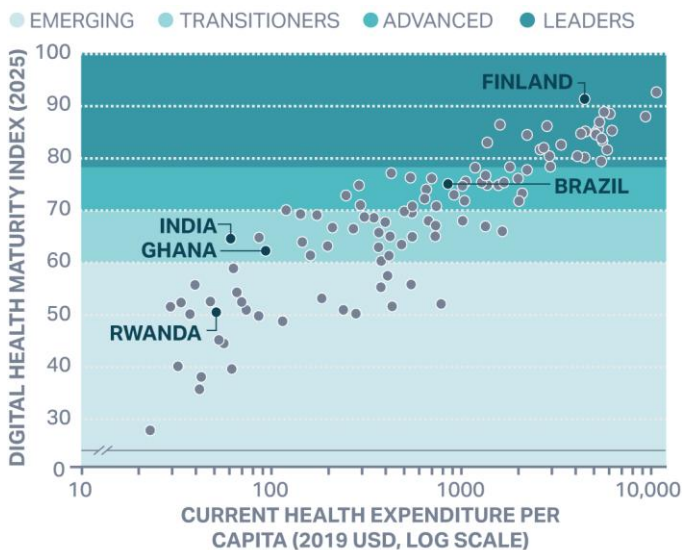
Another outcome type observed, **Data Quality**, had secondary effects for each of the above outcomes

1. Not all digital health interventions were evaluated for every outcome type. Outcomes studied reflect intervention purpose and feasibility of data collection and analytical methods.

### How were Digital Health Exemplar countries chosen?

The Digital Health Exemplars (DHE) project collaborated with normative agencies, implementing agencies, the private sector, and ministries of health to identify positive outliers in digital health and primary health care (PHC) performance. DHE started by cross-mapping countries across digital health maturity and PHC performance relative to spending. Countries with relatively strong performance were then grouped into four digital health maturity types: emerging, transitioners, advanced, and leaders.

Figure 2: Digital Health Exemplars country selection



Digital Health Exemplar country selection was grounded in a digital health maturity index that is made up of indicators selected for their relevance to the following seven ecosystem enablers:

- Infrastructure
- Workforce
- Legislation
- Leadership and governance
- Strategy and investment
- Gender diversity
- Consumer readiness

Note: The typologies are classified based on the quartile distribution of the average composite score before the score cutoffs

Finally, DHE conducted a landscaping analysis to determine the strength and maturity of digital programs in shortlisted countries. The countries selected—Rwanda (emerging), Ghana (transitioner), India (transitioner), Brazil (advanced), and Finland (leader)—were at different stages of digital health maturity at the time of selection, making these research findings relevant to a wide range of country and health system contexts.

### Research overview

In each Exemplar country, researchers studied selected systems-facing, provider-facing, and patient-facing digital interventions owned by the government that had demonstrated early signs of impact and sustained use at scale. This research aimed to:

1. Assess the value and impact of digital health tools for patients, providers, and health systems.
2. Understand how countries delivered that impact by building and sustaining strong enabling environments for digital health transformation.
3. Map Exemplar countries' pathways to scale, from individual digital interventions to more comprehensive health system digitization.

### What value did digital health interventions bring to Exemplar countries' health systems?

Digital health interventions generated value when they were anchored to a clearly articulated need.

Across the interventions DHE studied, the most valuable digital tools reflected “intervention–context fit”—meaning they addressed a relevant problem in the health system, and the system had the capacity to implement it. In contrast, broad deployment without a specific use case often led to limited uptake and inefficient implementation.

- In response to long patient wait times, care delays, and inconsistent patient data across multiple patient records, approximately 10% of health facilities in India implemented Scan & Share, a QR-code based registration system that

shares patient data with a facility's health management information system and generates a digital token to streamline patient registration. Researchers observed Scan & Share's largest time savings in health centers, where the volume of patients and complexity of the workflow justified its implementation, compared to other settings.

**Across the digital health tools DHE studied, the most consistent and measurable benefit was efficiency gains, which provided more opportunity and space for clinical work.**

Overall, the digital tools studied reflected time savings in administrative processes such as stock management, immunization-related tasks, claims reimbursements, and reporting requirements. These benefits ultimately boosted PHC case management capacity and, in some cases, improved systems-level efficiency.

- In **Rwanda**, the E-Tracker electronic immunization registry and Kwivuza digital platform for claims management were associated with an 82% reduction in monthly hours spent on administrative tasks, freeing up staff time for clinical work and service delivery. Health workers who used E-Tracker spent significantly less time on tasks involving aggregate patient data (for example, the time they spent creating defaulter's lists dropped by 93%) and shifted their time toward tasks involving individual patients such as registering children. Likewise, the Kwivuza platform improved efficiency across core claims management activities, saving substantial staff labor on previously time-intensive and error-prone tasks such as claims preparation and submission (81% reduction) and claims review and adjustment (80% reduction).
- In **Ghana**, the Integrated Logistics Management Information System, GhiLMIS, improved timely order-supply rate by 140%. Time to receive stock orders also dropped by 70%.

**The degree to which efficiency gains translated into cost savings depended on health system management and financing.**

Efficiency gains in the form of time savings did not always translate into cost savings. To realize cost efficiencies, systems reorganized to adjust for some increases in facility-level digitization costs and shifts in personnel time. In the study cases, the cadres that saved the most time using digital tools were often those paid the least, which limited the cost savings.

- In **Rwanda**, E-Tracker reduced costs by just 15%, since its time savings were limited to lower-paid PHC nurses. In contrast, the Kwivuza platform had a 78% reduction in annual facility operating costs because it reduced the time spent on tasks performed by relatively highly paid insurance officers.

**In more mature digital health settings, increases in health care utilization and quality were observed alongside increased patient engagement.**

As countries advanced in digital health maturity, they began to build on their initial efficiency gains, adding further value by boosting health care utilization and quality, and increasing direct patient engagement.

- In **Brazil**, Telehealth Brazil Networks improved care quality by easing patient access to diagnosis and treatment. In 2019, it avoided an average of 67% of referrals using provider-to-provider teleconsultation. In turn, this reduced the amount of time patients spent waiting to get their health needs addressed.
- Also in **Brazil**, the availability of more granular and personalized health information via digital systems, such as the electronic health record platform (PEC) for primary health care, has increased service utilization for PHC visits; it has also improved targeted health promotion. For instance, the Impulso Mensageria program used PEC data to deliver targeted outreach via WhatsApp for cervical cancer screening, increasing screenings fourfold.

**However, digital health interventions are not a silver bullet for fixing health systems.**

E-Tracker, Kwivuza, Telehealth Brazil Networks, and the PEC electronic health record platform are built on functional non-digital systems such as national health insurance and PHC delivery systems, expanding their reach and boosting their success. However, digital interventions can have a limited—even negative—impact if they link to a broken service delivery model or financing flow, if they do not fit the context or meet a specific need, or if they do not match the maturity of their digital context.

The following section explores the elements required to build a supporting environment in which digital health interventions can deliver the most value to health systems, across maturity levels.

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## How did Exemplar countries establish strong enabling ecosystems for digital health?

**Sustained uptake of digital health solutions depends on broader system readiness.**

Digital health interventions cannot compensate for weak underlying enablers such as a facility's lack of internet connectivity or hardware, limited user digital literacy, insufficiently trained and compensated health workers, or inefficient clinical workflows. In many cases, investments in such enablers outside of the health sector can have a substantial impact on digital health transformation.

- **India's** progress toward digital health transformation is rooted in its strong digital public infrastructure. Early investments in unique ID numbers, digital payments, and digital governance established the foundation for the infrastructure needed to create electronic health records, patient-facing applications, and telemedicine systems. In 2021, those investments enabled the introduction of the Ayushman Bharat Digital Mission (ABDM), an integrated digital health infrastructure initiative.

Exemplar countries built and matured their enabling environments with some common sequencing across enablers.

Figure 3: Sequence of improvements made to the enabling environment



- To reduce fragmentation in digital governance across sectors, **Rwanda** established foundational readiness by introducing a national network of chief digital officers whose aim was to coordinate the digital health strategy under a single eHealth framework. Next, the country scaled its digital governance systems with the national 2021 Patient Data Privacy and Protection Policy along with a national AI strategy to establish national data governance for storage and ownership. Finally, policymakers integrated digitization by linking digital governance to national strategies for information, communication, and technology and education under the Vision 2050 plan, which coordinated strategies and budgets across sectors. In more recent digital reforms, Rwanda continues to address remaining digital health governance challenges.

As the enabling digital health ecosystem matures, countries can introduce increasingly complex interventions. AI, for example, requires similar foundational enablers, with some add-ons.

As digital ecosystems mature, the complexity of interventions can increase in parallel. In emerging or transitioning implementation contexts, the most feasible interventions are often simpler, stand-alone tools that address immediate operational gaps. In advanced or leader contexts, interventions can be highly interoperable and capable of handling individualized data, delivering direct benefits to patients and frontline providers.

While AI has the potential to accelerate the impact of digital health interventions across maturity levels, additional emphasis on strengthening data availability, infrastructure, and data governance will be needed to properly equip the enabling environment.

#### WHAT ABOUT AI?

*DHE research began before generative AI tools were broadly released, and the Exemplar countries are still discerning how best to leverage AI. Because AI interventions are often built on existing digital tools and require similar enabling ecosystems, the insights from this study can be applied to both AI and more traditional digital tools and applications.*

#### How did Exemplar countries move from siloed digital solutions to full health system digitization?

**End-to-end health system digitization offers long-term benefits but requires substantial foundational readiness.**

Worldwide, many countries are moving beyond one-off digital health interventions and aiming for full end-to-end health system digitization, including health information exchange and patient data portability. Although end-to-end digitization offers long-term benefits, such as better outcomes, higher efficiency, and improved patient experience, it is not universally appropriate because it requires a baseline of digital health readiness and substantial, ongoing investment.

**Interoperability is one way to achieve full health system digitization. It happens gradually, supported by cross-sectoral investment and coordination efforts, and adoption strategies tailored to different user groups.**

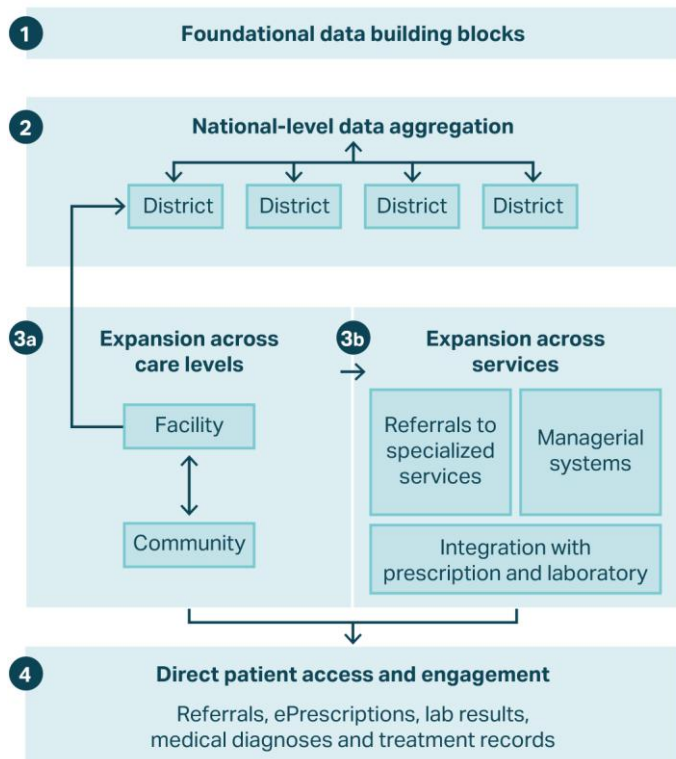
Exemplar countries phased their investments to advance health data interoperability—the capacity of different IT systems and applications to securely exchange data. They progressed through the following stages:

1. **Foundational data building blocks** such as national ID systems, birth registries, and digital banking. **Rwanda** established its foundational data building blocks with the development of its National Identification Number, a unique identifier, enabling access to health insurance, birth certificates, and other public services.
2. **National-level data aggregation** through health management information systems. **Ghana's** national data aggregation is done through its district health information system (DHIS2), which aggregates district-level data to support evidence-based planning for care.
3. **Expansion across health (a) care levels and (b) services.** **Brazil's** national health system provides PEC, a free electronic health record platform for PHC facilities. PEC integrates with Brazil's national health information exchange layer, enabling data sharing across health care levels and services. In **India**, ABDM supports the integration of health data by offering accreditation programs for electronic health records developed by private vendors, expanding continuity of data sharing across services such as ePrescriptions and lab results.

4. **Direct patient access to and engagement** with health information is enabled through patient-facing digital tools. **Finland** has reached this furthest stage of interoperability, with direct patient access and engagement through MyKanta, a patient-facing platform that details users' prescription data, lab results, medical procedures and diagnoses, imaging studies, and vaccine records.

**Figure 4: Stages of interoperability progression**

→ HEALTH INFORMATION EXCHANGE



To successfully adopt interoperability solutions, countries need to strike a balance between incentives and regulations, which can vary based on each country's context. Even in high-maturity settings, systemwide digitization requires substantial investment and time to see results; premature implementation can increase complexity without improving health system performance.

- For example, **Finland** paid high up-front costs to maintain the information exchange layer supporting MyKanta. The government spent €554 million on building and maintaining MyKanta between 2005 and 2024, representing an annual investment of approximately €29 million. The system supports its long-term sustainability via annual user fees from providers and pharmacies, amounting to approximately €25 million annually since 2016.
- **India** used a combination of regulations and incentives to drive the adoption of interoperability through the ABDM scheme. States received their funds in multiple installments contingent on performance and ABDM utilization, while private sector stakeholders were encouraged to innovate using a “sandbox” that allowed developers to test the interface of their solutions with the government system.

### About Digital Health Exemplars

The Digital Health Exemplars (DHE) research project, part of the Exemplars in Global Health program, aims to generate practical insights on how Exemplar countries used digital health technologies to improve primary health care (PHC) systems and contribute to better health outcomes. Insights from this work aim to inform global and national health research, policy, and practice to strengthen the PHC systems that serve billions of people around the world. The DHE project has a threefold approach, with workstreams to develop retrospective case studies on Exemplar countries, conduct deep dives into key digital health transformation themes, and support peer-to-peer learning to help translate evidence into practice.



www.exemplars.health

The Exemplars in Global Health (EGH) program is a global coalition of partners including researchers, academics, experts, funders, country stakeholders, and implementers. Our mission is to identify positive global health outliers, analyze what makes countries successful, and disseminate core lessons so they can be adapted in comparable settings. We aim to help country-level decision makers, global partners, and funders make strategic decisions, allocate resources, and craft evidence-based policies. EGH is part of the Gates Foundation's Global Development Division.