



THE GOLDEN
OPPORTUNITY OF
**DIGITAL
HEALTH**
FOR LATIN AMERICA AND
THE CARIBBEAN

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ACKNOWLEDGEMENTS

The authors would like to thank Narumi Akita, Neili Bermúdez, Amancaya Conde, Marcelo D'Agostino, Daniel Doane, Pablo Ibarrarán, Donghyun Kang, Myrna Martí, Elisa Martínez, Sergio Miguens, Luis Morales, Ariel Northwestern, Daniel Otzoy, Mihwa Park, Santiago Paz, Soledad Planes, Cristina Pombo, Fernando Portilla, Ferdinando Regalia, William Savedoff and Blair Witzel for their input to this publication.

In memory of our dear co author Georgina Raygada. Thank you for your talent, dedication and passion for the transformation of health systems in our region. Part of you will always be in the pages of this book.



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TABLE OF CONTENTS



Preface *An unsustainable status quo*

Introduction

- I. *If not now, when?*
- II. *Welcome to... the future?*
- III. *Not a luxury: A necessity!*

The IDB's vision, support, and collaboration

- IV. *In good company*
- V. *Strength in unity*

The Core Premises of DT

- VI. *Health care is what we need to transform*
- VII. *Truth be told*

The potential of DT in LAC

- VIII. *The quality agenda*
- IX. *The efficiency agenda*
- X. *The equity and inclusion agenda*

From planning to results

- XI. *First, define the future state*
- XII. *Where are we now?*
- XIII. *How do we get there?*
- XIV. *Governance*
- XV. *People and culture*
- XVI. *Informed health policy and practice*
- XVII. *Infrastructure*
- XVIII. *Infostructure*
- XIX. *Applications and digital services for the sector*
- XX. *Me, the patient*

Conclusion

Epilogue *One day, in the future state...*

References



Preface: an unsustainable *status quo*

What would happen if other sectors routinely operated the same way the healthcare sector does?

"If banking were like health care, automated teller machine (ATM) transactions would take not seconds but perhaps days or longer as a result of unavailable or misplaced records.

If home building were like health care, carpenters, electricians, and plumbers each would work with different blueprints, with very little coordination.

If shopping were like health care, product prices would not be posted, and the price charged would vary widely within the same store, depending on the source of payment.

If automobile manufacturing were like health care, warranties for cars that require manufacturers to pay for defects would not exist. As a result, few factories would seek to monitor and improve production line performance and product quality.

If airline travel were like health care, each pilot would be free to design his or her own pre-flight safety check, or not to perform one at all."

The COVID-19 pandemic proved how central the population's health is to economies and social welfare. At the same time, it exposed enduring structural problems in healthcare systems. In Latin America and the Caribbean (LAC), it brought to light serious flaws in basic aspects such as quality, outcomes, costs, and equity. In today's environment, countries face the challenge of managing their increasingly complex healthcare systems while coping with an unprecedented economic crisis. As these constraints converge, the *status quo* becomes unsustainable.

The digital transformation (DT) of the health sector refers to how technologies change the sector's rules of engagement, ways of working and interacting, and mindset. DT presents an opportunity to leverage technology's transformative power to address fundamental flaws and move the region's healthcare systems toward a new reality. Drawing on its comprehensive and technical understanding of the fundamental issues for successfully adopting technology in this sector, as well as a powerful network of stakeholders within and outside of the region, the IDB Group—which consists of the [Inter-American Development Bank](#) (IDB), [IDB Invest](#), and [IDB LAB](#)—has the ability to help countries reconfigure their health systems to make them stronger. This publication covers each aspect of the digital transformation process; shares specific evidence, practices, and recommendations; identifies the stakeholders that can—and should—be involved; and outlines the practical elements each country needs to make progress on this crucial issue.



¹ Committee on the Learning Health Care System in America; Institute of Medicine, *Best Care at Lower Cost: The Path to Continuously Learning*, (Washington DC: National Academies Press, 2013).



INTRODUCTION

I. If not now, when?

In 2015, Bill Gates opened his TED Talk by saying: “If anything kills over 10 million people in the next few decades, it’s most likely to be a highly infectious virus rather than a war. Not missiles, but microbes.”²

Many people were informed of or had at least heard of the exponential risk of a global health crisis. However, the scale of the COVID-19 pandemic took a poorly prepared world by surprise.

In December 2019, humanity faced something that seemed like a scene from a movie, a shock impossible to sum up in a few short paragraphs. This tragic alteration in the very fabric of reality spared no one.

In LAC, the cost has been staggering. In 2020 alone, the region had 28% of all confirmed COVID deaths and 18.6% of cumulative cases,³ despite only being home to 8.4% of the world’s population. These statistics show how little prepared the region was for this type of event. Even these numbers are considered to be underestimates⁴ made by overwhelmed health systems with no way of accurately gauging the real toll.

Other data also speaks to the devastating impact on LAC. In 2020, the region’s Gross Domestic Product (GDP) dropped 7.4%,⁵ total employment fell 14%,⁶ and the total number of people in poverty rose to 209 million, or 22 million more people than the previous year.⁷ LAC countries took measures



Why invest in digital Health in LAC?

30% of avoidable deaths in LAC are due to lack of access to health services, while the remaining 70% are due to low quality.

² Bill Gates, “The next outbreak? We’re not ready,” recorded in March 2015, TED video, 8:24, https://www.ted.com/talks/bill_gates_the_next_outbreak_we_re_not_ready?language=en.

³ Calculations by the Inter-American Development Bank (IDB) based on data from the Johns Hopkins Coronavirus Resource Center.

⁴ The Economist, “Tracking covid-19 excess deaths across countries,” The Economist Group Limited, <https://www.economist.com/graphic-detail/coronavirus-excess-deaths-tracker>.

⁵ IDB, “Opportunities for stronger and sustainable post pandemic growth: 2021 Latin America and the Caribbean , <https://flagships.iadb.org/en/MacroReport2021/Opportunities-for-Stronger-and-Sustainable-Postpandemic-Growth>.

⁶ IDB COVID-19 Labor Market Observatory IDB, “Evolución del empleo 2020,” IDB, <https://observatoriolaboral.iadb.org/es/empleo/>.

⁷ Economic Commission for Latin America and the Caribbean (ECLAC), *Panorama Social de América Latina*, (Santiago: ECLAC, 2020), 13.



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that cost 4.6% of the region's GDP to support their populations, ratcheting up the regional deficit by nine percentage points. All told, the ramifications of this event rank it as LAC's worst economic, social, and productive crisis in 120 years.⁸

Health systems now face an [enormous](#) challenge. In upcoming years, LAC countries will need to combine efforts to combat the pandemic with measures to reactivate other health services, including those interrupted by the crisis, prepare for future emergencies, and tackle the rising costs of healthcare⁹.

However, the crisis also prompted constructive changes in the region. Countries designed and implemented innovative [social programs](#) to meet the new challenges, and digital behaviors expanded in all social and economic spheres.

These trends converge to present a historic opportunity—and responsibility—to address structural problems in health systems and change them on a fundamental level, harnessing the

transformative power of technology. To achieve this change, it is critical to prioritize the DT of the sector to usher health institutions, workers, patients, and the entire ecosystem into the digital age.

As Leon C. Megginson paraphrased Charles Darwin's theory of evolution "it is not the strongest of the species that survives, nor the most intelligent that survives. It is the one that is most adaptable to change."¹⁰ Now it is up to the region to decide how, and if, it will continue adapting. It must choose whether, as a new normal crystallizes, it will take the opportunity to build back national health systems better.

If not now... When will it be more pressing to have data to better inform diagnoses and reduce medical errors? When would be a better time to empower patients, encouraging self-care and cutting costs for all involved, or to give vulnerable and remote groups better access to health? And how long can countries afford to wait to prepare their health systems for future epidemics?

⁸ ECLAC, *Preliminary Overview of the Economies of Latin America and the Caribbean 2020*, (Santiago: ECLAC, 2021), 11.

⁹ The real per-capita cost of healthcare is expected to rise 1.5% per year in the region from 2015 to 2040. See 2021 Health Sector Framework Document, 17.

¹⁰ Megginson, 'Lessons from Europe for American Business', *Southwestern Social Science Quarterly* (1963) 44(1): 3-13, at p. 4.



Welcome to... the future?

The digital imperative is not new. For years it has been standard to do bank transactions online, pay utility bills on smart phones, and check in for flights on airline websites. However, before the pandemic, most people picked out their fruit at the supermarket, tried on shoes before buying them, and attended all their medical appointments in person. Lockdowns and mobility restrictions showed that doing things in person is not as indispensable as we thought. This changed everything: for the digitally savvy and the uninitiated, for those who were ready and those who weren't. The circumstances catapulted everyday digital behavior to levels it was thought were still years in the future.

The government sector experienced a similar shift. For years, LAC countries' agendas have included adopting digital tools for areas critical to development like education, labor markets, and health. This prompted the development of sector-specific action plans, like the [Action plan for strengthening health information systems \(IS4H\) 2019-2023 of the Pan-American Health Organization \(PAHO\)](#). Some countries made [significant strides in the area of health](#), like implementing EHR Systems for patients in [Uruguay](#) and [Costa Rica](#) or using artificial intelligence expand telemedicine services to remote areas of [Brazil](#). When the pandemic struck, several countries [fast-tracked legislation](#) to make it easier to prescribe medicine or provide medical services remotely. Others expedited measures like electronic triage systems in emergency departments. At the beginning of the health crisis, between March and July 2020, almost half the population (45%) in 18 LAC countries did not receive the medical care they needed.¹¹ It has yet to be seen how much the measures

taken were able to mitigate the drop in health care and how quickly the region can handle the backlog that formed during the pandemic, as well as new challenges like the [growing mental health crisis](#) (worldwide, the pandemic triggered an estimated 28% increase in cases of clinical depression and 76% increase in cases of anxiety disorder).¹²

The lessons from this health crisis unequivocally underscore the urgency of technology-based processes to transform health systems. Additionally, several studies on potential scenarios for the next few years show that the pandemic-driven migration to digital tools will only continue to gain momentum during the recovery stage¹³ and that both public and private institutions have to improve their capacities in this area if they are to achieve their objectives.¹⁴ The path forward is not a mystery. This

¹¹ Calculations by the IDB based on data from Argentina, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Jamaica, Mexico, Nicaragua, Panama, Peru, Trinidad and Tobago, Uruguay, and Venezuela. This set of surveys was conducted to assess changes in service levels prior to and immediately following the outbreak of the COVID-19 pandemic. This data should not be used for general estimates of health service levels. More information at: <http://ghdx.healthdata.org/series/covid-19-health-services-disruption-survey-2020>.

¹² Daniel F. Santomauro et al., "Global prevalence and burden of depressive and anxiety disorders in 204 countries and territories in 2020 due to the COVID-19 pandemic", *The Lancet* 398, no. 10312 (November 2021): 1700-1712. [https://doi.org/10.1016/S0140-6736\(21\)02143-7](https://doi.org/10.1016/S0140-6736(21)02143-7).

¹³ Aamer Baig et. al., "The COVID-19 recovery will be digital: A plan for the first 90 days." *McKinsey Digital*, (May 2020). <https://www.mckinsey.com/business-functions/mckinsey-digital/our-insights/the-covid-19-recovery-will-be-digital-a-plan-for-the-first-90-days>.

¹⁴ Accenture, "Outmaneuver uncertainty: Navigating the human and business impact of Covid-19," *Now next*, (July 2020). <https://www.accenture.com/us-en/about/company/coronavirus-business-economic-impact>.



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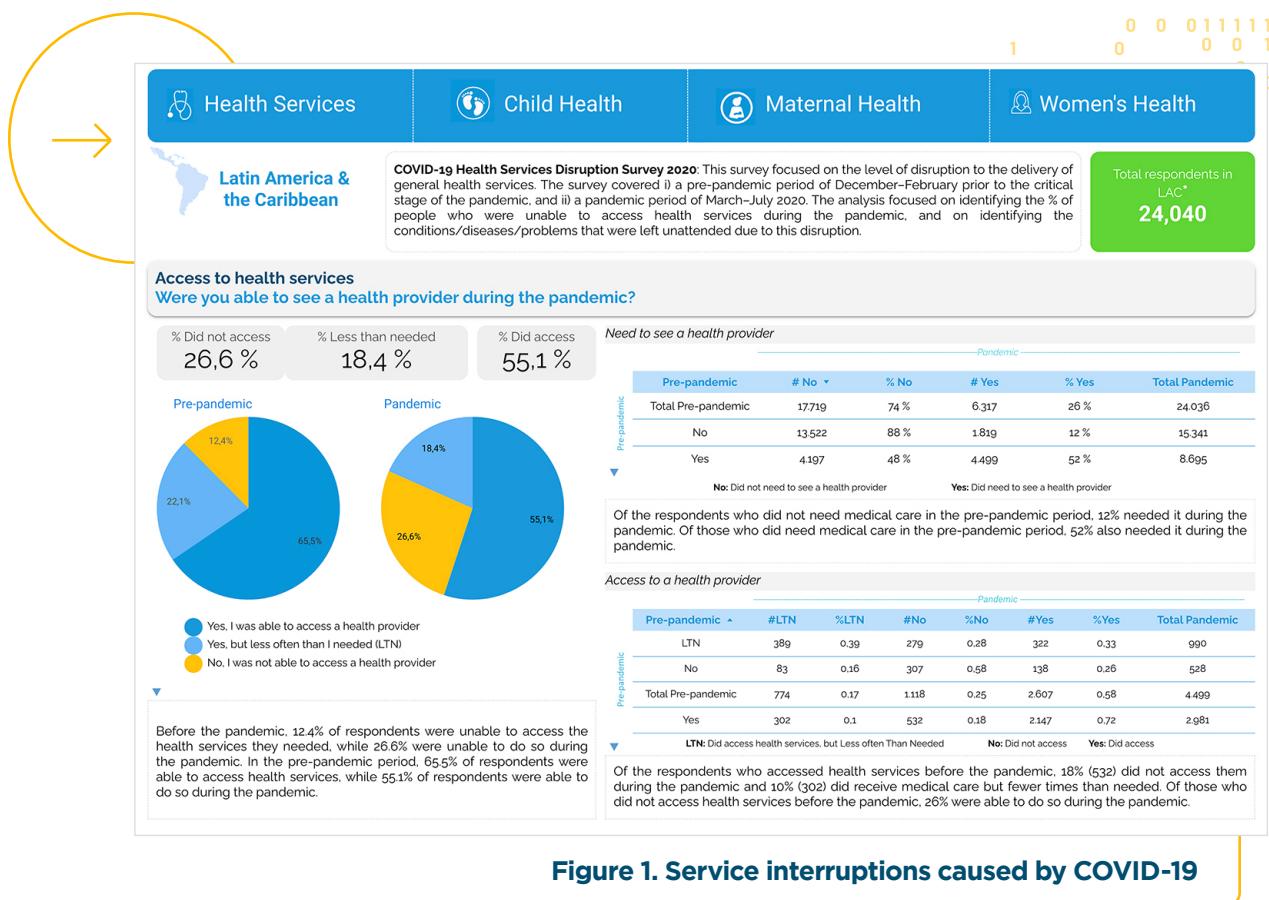


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publication will explore exemplary implementations and experiences in the region that show its potential future in digital health.

DT processes are thus crucially important in LAC's current socioeconomic climate, in which

countries not only have to do more in the area of health care, but they also have to do it more efficiently and with better quality, all while curbing rising expenses. This call to action is even more urgent in relation to the most vulnerable groups. The time to act is now, not 10 years from now.



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III.

Not a luxury: A necessity!

In October 2020, the Government of the United Kingdom reported that nearly 16,000 new coronavirus cases had been left out of the national count¹⁵ because of a mistake in transferring a very large Excel file—the type of error that a novice bookkeeper might make. The failure to include these cases in contact tracing efforts was linked to more than 125,000 additional cases and over 1,500 deaths¹⁶ in the world's sixth largest economy.

This event illustrates three key points about digital transformation. First, information technologies can have a direct, life-or-death impact on public health. Second, slapdash, ad hoc implementations without an intentional and long-term vision and without all necessary elements and stakeholders cause serious harm. Finally, cutting corners on the public investment needed to properly implement these processes (with the right tools) ends up costing dearly, as does a poorly informed investment without strategic planning.

There is unanimous, global consensus at the highest political level about the importance of digital transformation.

Information technologies are part of 10 of 17 Sustainable Development Goals (SDG) in the 2030 agenda. In health, the commitment to the SDGs and 2030 agenda was confirmed in 2018 by more than 100 presidents and senior officials at the global conference in Astana, led by the World Health Organization (WHO) and UNICEF. In 2021, 49 countries and territories ratified the [Roadmap for the Digital Transformation of the Health Sector in the Region of the Americas](#), and PAHO outlined [8 principles](#) to govern these processes.



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In May 2018, all WHO Member States passed a resolution on digital health. Its vision is “The vision of the global strategy is to improve health for everyone, everywhere by accelerating the development and adoption of appropriate, accessible, affordable, scalable and sustainable person centric digital health solutions to prevent, detect and respond to epidemics and pandemics, developing infrastructure and applications that enable countries to use health data to promote health and well-being, and to achieve the health-related Sustainable Development Goals and the triple billion targets of WHO’s Thirteenth General Programme of Work, 2019–2023.”¹⁷

Yet LAC still lags behind. In the field of health, [only 11 countries in the region have laws that define and validate electronic health record systems, and only 14 of the 26 countries](#) analyzed have a digital health strategy.¹⁸ Furthermore, LAC health information systems are isolated, fragmented, underfunded, and underused.

¹⁵ Pan Pylas, “G. Bretaña: Detectan 16.000 casos de COVID-19 no reportados,” AP News, October 5, 2020, <https://apnews.com/article/noticias-98d2228e659973af7e38001c04944565>.

¹⁶ Thiemo Fetzer and Thomas Graebe, “Does contact tracing work? Quasi-experimental evidence from an Excel error in England,” (CAGE working paper, University of Warwick, 2020). <https://warwick.ac.uk/fac/soc/economics/research/centres/cage/manage/publications/wp.521.2020.pdf>.

¹⁷ World Health Organization (WHO), *Estrategia mundial sobre salud digital 2020–2025*, (Geneva: WHO, 2021).

¹⁸ IDB, “Mapa normativo de salud digital,” <https://socialdigital.iadb.org/en/sph/dashboard>.



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In light of these circumstances, countries have two main choices. The first is to move ahead as usual: adopting technological tools in fragmented implementations, without a comprehensive vision of how the technology can improve the sector's work, to patch up immediate issues. The second is to strategically incorporate technologies, processes, and skills specific to the needs of each country, integrating the vision and participation of all involved. The latter approach requires making a long-term political and economic commitment to redesigning health systems.

Given the current severe economic crisis, it is possible some countries will consider sticking to their traditional approach. However, the harsh [lessons of COVID-19](#) all urge a single course of action: [embark on a digital transformation](#) to create national health systems that are high quality, efficient, equitable, and

promote the continual well-being of their population. For the region, progress toward universal health coverage will require increased public expenditure in upcoming years because of population aging, rising prices, and the growing availability of technology.¹⁹ It will be more important than ever to have a clear idea of how health resources are being spent, which will be impossible without quality information systems. To check rising costs, investments in digitally transforming health care can be key because they enable resources to be allocated more efficiently.²⁰

This document covers each aspect of the digital health transformation process; shares evidence, practices, and specific recommendations; identifies the stakeholders that can—and should—participate; and lays out the practical elements each country needs in order to carry out this crucial process.



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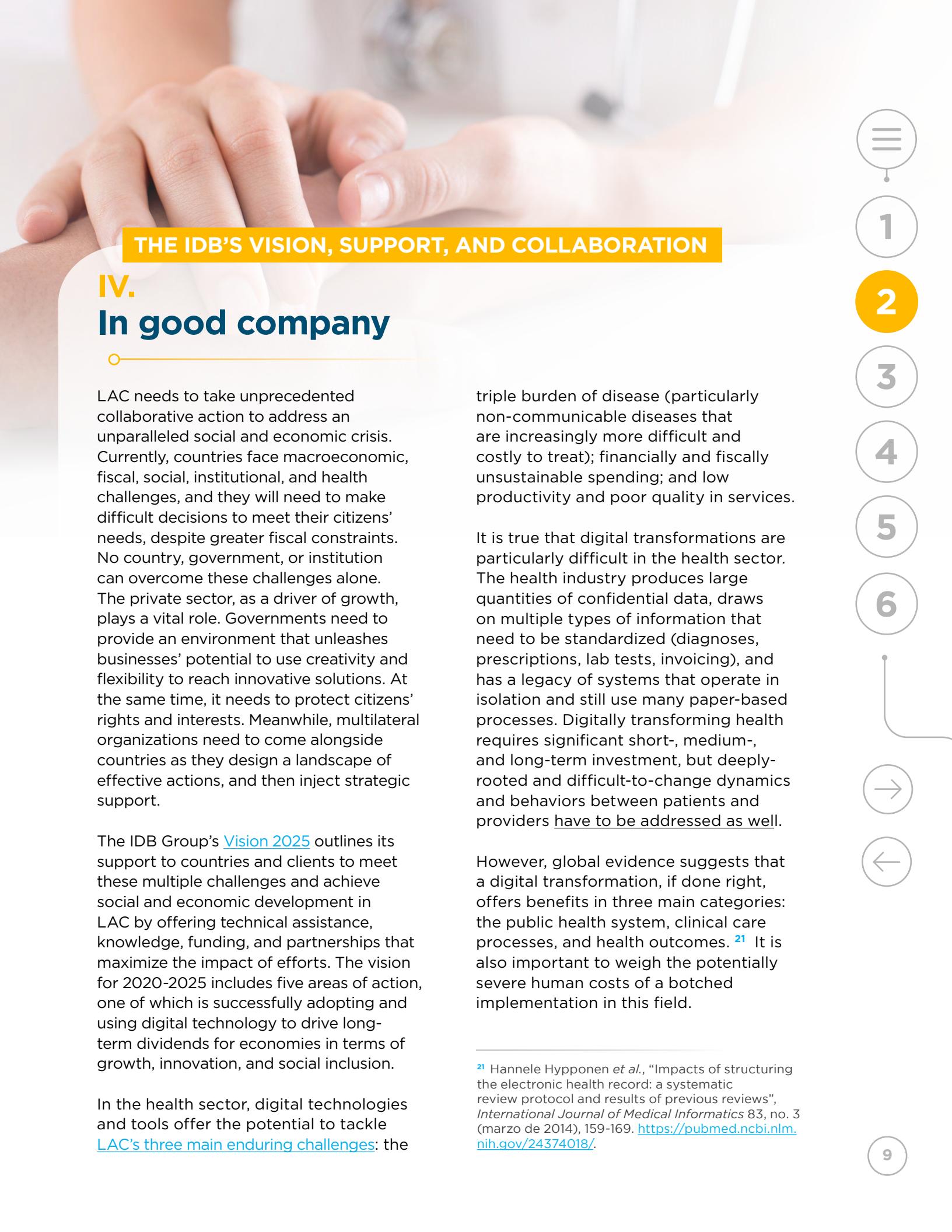
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¹⁹ William Savedoff *et. al.*, "Documento de Marco Sectorial de Salud," (Washington D.C., IDB, 2021), 6. <https://idbdocs.iadb.org/wsdocs/getdocument.aspx?docnum=EZSHARE-1348179246-3>.

²⁰ For example, exchanging health information led to a 59% drop in duplicated CAT scans. For ultrasounds, the reduction was 44%, and it was 67% for x-rays. (See: Eric Lammers *et. al.*, <https://www.jstor.org/stable/24465841>). A systematic review of information exchanges found that 60% of studies showed quality improvements and cost-effectiveness. (See Farahnaz Sadoughi *et. al.*, <https://www.sciencedirect.com/science/article/pii/S0169260718300907>).



THE IDB'S VISION, SUPPORT, AND COLLABORATION

IV. In good company

LAC needs to take unprecedented collaborative action to address an unparalleled social and economic crisis. Currently, countries face macroeconomic, fiscal, social, institutional, and health challenges, and they will need to make difficult decisions to meet their citizens' needs, despite greater fiscal constraints. No country, government, or institution can overcome these challenges alone. The private sector, as a driver of growth, plays a vital role. Governments need to provide an environment that unleashes businesses' potential to use creativity and flexibility to reach innovative solutions. At the same time, it needs to protect citizens' rights and interests. Meanwhile, multilateral organizations need to come alongside countries as they design a landscape of effective actions, and then inject strategic support.

The IDB Group's [Vision 2025](#) outlines its support to countries and clients to meet these multiple challenges and achieve social and economic development in LAC by offering technical assistance, knowledge, funding, and partnerships that maximize the impact of efforts. The vision for 2020-2025 includes five areas of action, one of which is successfully adopting and using digital technology to drive long-term dividends for economies in terms of growth, innovation, and social inclusion.

In the health sector, digital technologies and tools offer the potential to tackle [LAC's three main enduring challenges](#): the

triple burden of disease (particularly non-communicable diseases that are increasingly more difficult and costly to treat); financially and fiscally unsustainable spending; and low productivity and poor quality in services.

It is true that digital transformations are particularly difficult in the health sector. The health industry produces large quantities of confidential data, draws on multiple types of information that need to be standardized (diagnoses, prescriptions, lab tests, invoicing), and has a legacy of systems that operate in isolation and still use many paper-based processes. Digitally transforming health requires significant short-, medium-, and long-term investment, but deeply-rooted and difficult-to-change dynamics and behaviors between patients and providers have to be addressed as well.

However, global evidence suggests that a digital transformation, if done right, offers benefits in three main categories: the public health system, clinical care processes, and health outcomes.²¹ It is also important to weigh the potentially severe human costs of a botched implementation in this field.

²¹ Hannele Hypponen et al., "Impacts of structuring the electronic health record: a systematic review protocol and results of previous reviews", *International Journal of Medical Informatics* 83, no. 3 (marzo de 2014), 159-169. <https://pubmed.ncbi.nlm.nih.gov/24374018/>.



The IDB has the structure, knowledge, and commitment to help countries effectively implement digital transformation of the health sector. In addition to its vast experience in LAC, the IDB has comprehensive and technical knowledge on issues key to successfully adopting technologies in the health sector in an ethical and responsible manner. It also has a powerful network of actors within the region and beyond. Since 2018, the IDB Group has been building knowledge and tools related to launching DT in health care. In 2018, IDB endorsed the [Principles for Digital Development](#), and in 2019 it published the report [The Health and Social Protection Division's Approach to Digital Transformation: Directives and Recommendations](#), with guidance for its technical and financial support to countries on strategic and foundational matters, Global Goods, and sharing regional knowledge on digital health. The bank also set up the [Social Digital](#) platform, a digital resource center on leveraging technology to improve social services in LAC.

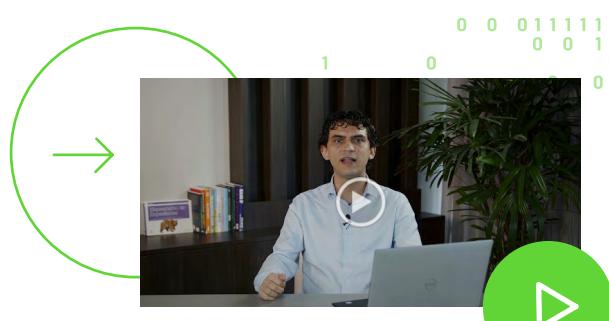


Learn about an Uruguayan's experience with EHR



The main objectives of the IDB Social Sector's work on digital transformation are to improve the efficiency of the sector, improve the quality of social services, and reduce inequality through digital services.

The IDB's experience supporting the work of ministries of health and ministries of technology—and coordinating their efforts—at a national and sector level is enhanced by [IDB Invest's](#) experience supporting the public-private partnerships needed for this process, as well as [IDB LAB's](#) experience promoting the creativity and innovation of entrepreneurs to solve some of the most complex problems.



In São Paulo, the “Portal Telemedicina” promotes efficient management and quality care.

Whatever the state of [digital transformation in each country](#), as well as the fiscal challenges, government plans and national budget, and technological expertise of each, the IDB Group offers resources to chart a good path for DT, from the current state of affairs to a strong health system that is sustainable and cost effective. This publication is a guide for the journey.



Learn about the experience of Jamaica for the control of chronic diseases.

V. **Strength in unity**

A key takeaway from the pandemic is that when a community works together, it can achieve amazing things. The scientific community came together (and continues to collaborate) to develop vaccines in 11 months, a process that in the past has taken 4 to 20 years.

In the same way, organizations, local communities, and governments can magnify the efficacy and impact of their digital transformation process by pooling resources, knowledge, and areas of focus. Collaboration allows stakeholders to share resources and experiences to benefit each initiative and also strengthen the global community.

The IDB fosters collaboration in four specific areas of DT: alignment with regional and global movements and partners; using and contributing to existing knowledge platforms and repositories; supporting and contributing to networks and communities of practice in the region to further joint learning; and collaborating with the private sector.

In the first area, the IDB has ramped up its collaboration with the PAHO to bolster its contributions to countries and raise the standards required in LAC. This collaboration includes harmonizing support and learning programs to avoid redundant efforts and inconsistent messaging, developing strategic plans and roadmaps for countries, and analyzing investment synergies. Likewise, the IDB helped develop the two regional PAHO policies

“Coming together is a **beginning**, staying together is **progress**, and working together is **success**. ”

Henry Ford

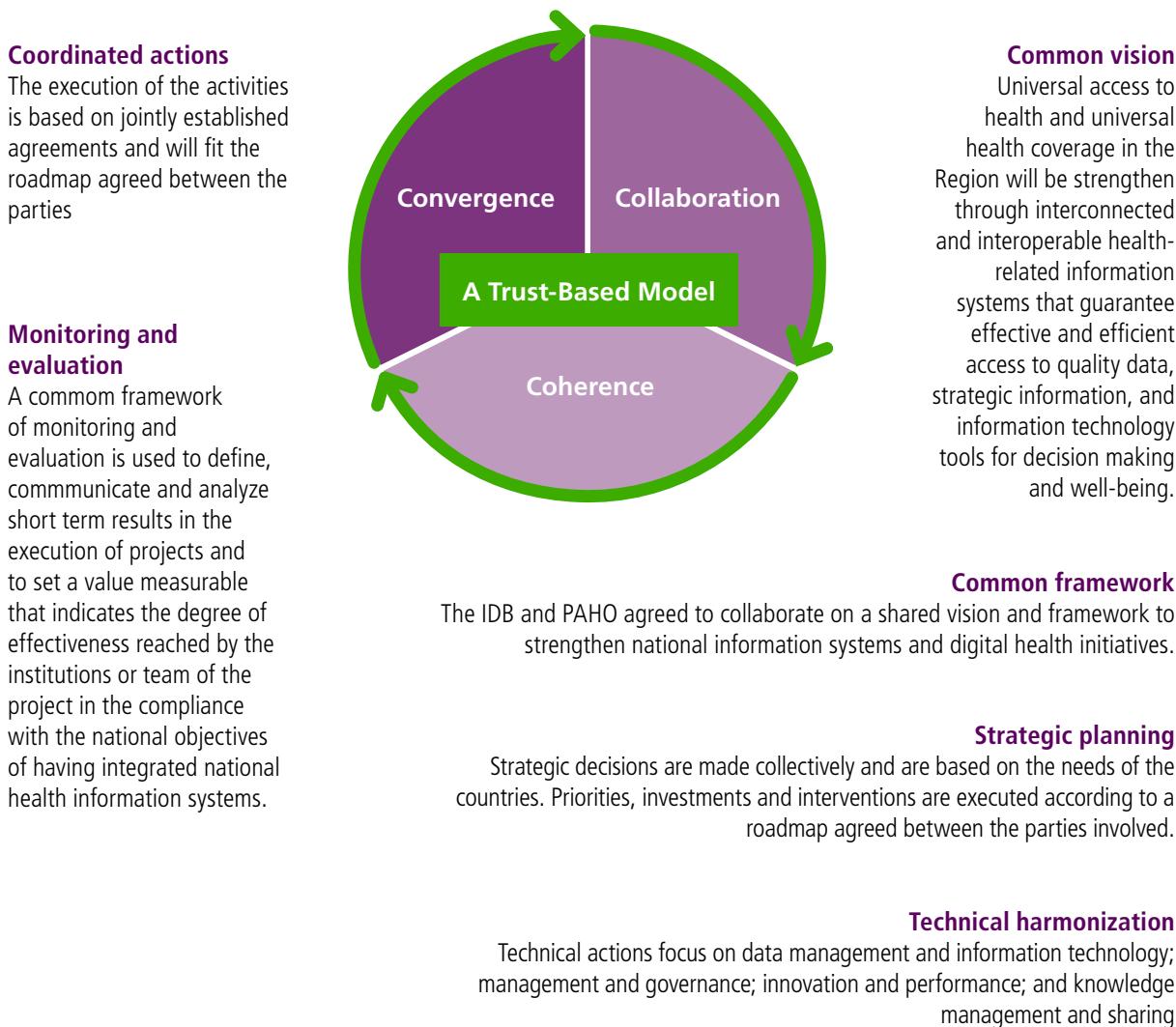
for advancing digital health, including [the Roadmap for the Digital Transformation of the Health Sector in the Region of the Americas](#). Finally, in its projects, the IDB applies standards for interoperability, cybersecurity, and privacy promoted by the WHO, PAHO, the International Telecommunication Union, and the International Organization for Standardization (ISO).



The Digital Development Principles

In 2018, IDB endorsed the Digital Development Principles: 9 guidelines for the successful implementation of digital development projects

Figure 2. PAHO & the IDB's Trust-Based model



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²² Pan-American Health Organization (PAHO), *Sistemas de información para la salud. Proceso de aplicación en la subregión del Caribe: enseñanzas obtenidas y examen posterior a la acción, 2016-2019*, (Washington DC: PAHO, 2021), 54.

The IDB's second area of collaboration centers on using and contributing to existing repositories and platforms for exchanging knowledge, and on compiling resources like open-source code; articles; and frameworks for donors, clinicians, and technology specialists developed by different organizations. Examples of these repositories include the IDB's [Social Digital](#) and [Code for Development](#) repositories.

In the third area, IDB supports communities of practice, centers of excellence, and networks on digital health formed to create learning spaces in the region and beyond. The [Hospital Italiano de Buenos Aires](#) is one such center of excellence, and the [Asia eHealth Information Network](#) is an example of a groundbreaking network. Another important experience in the region is the [Digital Health Cooperation Network of the Americas](#) (RACSEL). Its founding members include the ministries of health of Chile, Colombia, Costa Rica, Peru, and Uruguay. RACSEL was created in 2014 with IDB's support to advance cross-border digital health. IDB also promotes Regional Public

Goods for digital health. For example, it worked with the Caribbean Public Health Agency ([CARPHA](#)) to support [safe tourism](#), and with the National Center on Health Information Systems ([CENS](#)) and RACSEL to create [LACPASS](#) for ensuring COVID-19 certificates meet international standards.

Finally, the IDB Group actively collaborates with the private sector to further a shared vision and course of action for investing in and implementing innovations in digital health, the sector's productivity, and ICT capacity building for workers.



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The IDB and [IDB LAB](#) joined forces with Capital Salud and 1DOC3 on a health assistance program designed to reduce access barriers for vulnerable people in the Colombian cities of Armenia and Bogotá. The collaboration yielded a scalable and adaptable solution for environments where the demand for medical services greatly exceeds available physical resources (facilities) and professional resources (doctors).

RACSEL: Governments working together to improve digital health

Henry Ford's conviction that "if everyone is moving forward together, then success takes care of itself" still resonates today. Ford did not invent the automobile or even the assembly line, but he is responsible for transforming the automobile industry by aligning resources, harmonizing strategies, and channeling the contributions of all involved. We still feel the impact today. To successfully transform LAC's health



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systems, the private sector, government, and civil society (especially citizens and professional associations) all have to work together, and international development partners must do their part too, among other factors explored in this document. Strength lies in unity.

A video player interface featuring a thumbnail image of a man in a suit, identified as Alexandre Bagolle, followed by a green play button. A large green arrow points from the top left towards the video thumbnail. The video thumbnail has a digital binary code overlay (0 0 0 1 1 1 1 0 0 0 1 1 0 1 0 1).

Alexandre Bagolle. Specialist in Social Protection and Health. Division of Social Protection and Health

How can we promote the regional digital health ecosystem in LAC?

In a connected region, citizens can freely move between countries, always with easy access to their health data in a secure and confidential way

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THE CORE PREMISES OF DT

VI.

Health care is what we need to transform

Before embarking on a DT, all involved need to understand what it is—and what it isn't—and be familiar with the process' basic premises. This is easier said than done: a simple Google search for the term "digital transformation" yields more than 100 million hits (in 0.55 seconds) and a flood of complex technical terms.

The objective of DT is to get the right information to the right people at the right time so they can take action. That is what makes it indispensable to the health sector, where it can mean the difference between life and death.

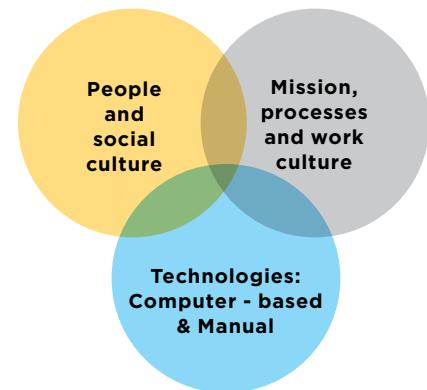
To understand DT, it is important to differentiate three easily confused concepts:

- **Digitalization** is the process of transferring information in analog (tangible, physical) format to digital format using digital tools (like a scanner or cell phone) so it can be processed, stored, and shared on digital circuits, computers, and networks (like a server or online cloud).
- **Information technology (IT)** is the set of tools needed for digitization (including hardware and software).
- **Digital transformation (DT)** is how technology changes the rules of engagement, ways of working and interacting, and mindset of

an organization or sector. Digital transformation has three equally important components: people, processes, and technology.²³

Figure 3. Three key elements for digital transformation.

Source: Dowling (1985, 2018)



Two everyday examples illustrate these concepts. The first is Amazon. The company digitally transformed commerce by allowing consumers to buy products on their cell phones and have them delivered to their door in 24 hours. Amazon uses digitalized information and IT tools, but what revolutionized customers' shopping experience is how

²³ Alan F Dowling Jr., "Health care information systems architecture of the near future", *Journal of the Society of Health Systems* 1, no. 2 (November 1989): 77-97, <https://pubmed.ncbi.nlm.nih.gov/2519109/>.

Amazon does business with retailers, as well as its logistics. Similarly, the airline industry used technological tools to digitalize flight and passenger information, but the transformation lay in how travelers interact with airlines, how airports operate, and how airlines interact with each other.

Pablo Orefice, Senior Consultant, IDB.
Social Protection and Health Division

What does human-centered design imply for digital health?

The adoption of digital health services depends on the level of trust of users of the system

In the health sector, for example, IT alone will not improve efficiency or administration or reduce hazardous conditions or medical errors. Although technology makes these changes possible, a DT will not succeed unless healthcare processes are redesigned.

Each country must therefore make its digital decisions based on its national health needs and objectives. This ensures that the tools added resolve the most urgent healthcare and public health problems. To do otherwise would mean starting from the solution instead of the problem and adding to the cost of ineffective processes.

So, “how do we upgrade the information technology systems of the country’s health sector?” is the wrong question.

The questions should be: can the DT help achieve the health sector’s objectives? If so, how?



We can only successfully tackle the how, when, and where of the process by viewing the DT as a tool to achieve the sector’s aims.

Counting what counts

Well-designed digital transformations change systems because they affect flawed core service delivery processes and information flows. When coupled with value-based care, digital transformation can change the system’s objectives, replacing fee-for-service models with payments tied to outcomes reached by providing evidence-based care. Designing information systems to measure what counts is essential to achieving the true potential of DT in health.



VII. Truth be told

There is no denying that digitally transforming health is a complex, multifaceted, long, and costly process. Many reports and articles in the international press have spotlighted this difficulty. In 2019, a Boston Consulting Group article stated that as many as 70% of digital transformation projects fail to deliver the expected benefits.²⁴ Another study on large companies in the United States found that only 9% of digital projects are a complete success, while 53% went over budget, 68% were completed late, and only 42% of planned characteristics were functional.²⁵

It is understandable that the risk of failure, in a sector as sensitive as health care, could keep governments and institutions from fully embracing a digital transformation. In LAC, the challenges span many areas, including gaps in access to equipment and Internet connections, fiscal constraints, limited digital skills, and resistance from health professionals.

However, these challenges do not necessarily doom DT to failure. Instead, the efficacy of DT initiatives is often thwarted by the lack of a comprehensive strategy and sustained commitment from their leaders. The truth is that digital transformation adds value by allowing countries to address, at different stages, the sector's major challenges as they bolster their health systems. To do so, they need an intentional, holistic, and long term approach that follows the [Principles for Digital Development \(PDD\)s](#) and the [8 Principles for Digital Transformation of Public Health](#), as well as action in all key areas. The rest of this publication explores each practical aspect of this approach

and identifies the specific areas in LAC where digital transformation has enormous potential.

But first, it is important to dispel a few misconceptions that often detract from the success of these initiatives.

More than shiny objects

Terms like “electronic health record systems,” “interoperability engine,” “telehealth,” or “electronic prescription” can give the impression that digital transformation revolves around buying hardware or software. Paradoxically, the most important part of a DT is not digital, per se.

The assumption that buying the “latest” tool or most “cutting-edge” technology will be what transforms the health system is a recipe for failure. A DT is not about keeping processes as they are and launching an “application.” Rather, a successful DT consists of a portfolio of projects and investments in six key dimensions: governance, people and culture, informed health policy, infrastructure, infostructure, and system applications.

²⁴ Patrick Forth et al., “Flipping the Odds of Digital Transformation Success”, BCG, October 29, 2020. <https://www.bcg.com/publications/2020/increasing-odds-of-success-in-digital-transformation>.

²⁵ The Standish Group International, *The Chaos Report*, (s.l.: s.n., 1995), 2.



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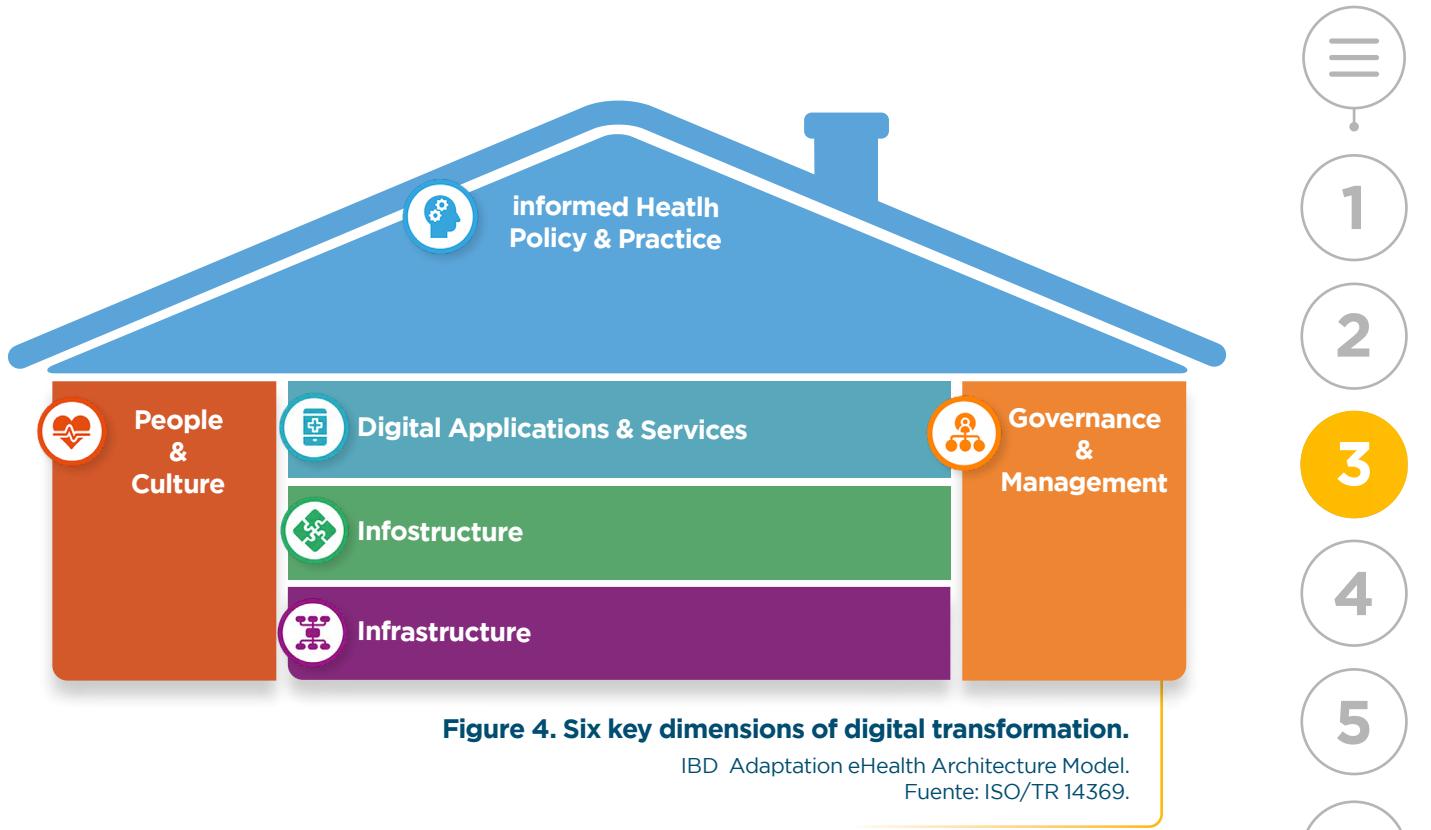
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No straddling the fence

The arithmetic of digital health is simple: a 50% investment does not equate to a 50% outcome. Countries have to go all in. To design and implement a DT well, countries have to realize that its price tag far exceeds that of an information system. The average investment required is estimated to be 3 to 5% of the national health budget.²⁶ In LAC, DT in health are often derailed by a failure to allocate the necessary resources.

If the goal is to achieve long-term solutions, it is crucial to first, increase investments; second, make effective, sustainable, and equitable investments; and, third, implement investments in a coordinated way. Technology can indeed be transformative when implemented properly, provided investments are done right.

Start today, plan for tomorrow

A successful digital transformation also requires a political commitment to launch a participatory and sustained joint creation process involving all relevant health system stakeholders.²⁷ This commitment yields immediate benefits, but to reach its full potential, it must transcend any one government, sector, or administration, for three reasons. First, a radical and authentic transformation of a health system takes more than three, five, or six years. Second, digital transformations by nature require a

²⁶ International Standards Organization (ISO), "Health informatics – Capacity based eHealth architecture roadmap – Part 2 Architectural components and maturity model," (Standard, ISO/TR 14639-2, 2014), <https://www.iso.org/standard/54903.html>.

²⁷ Government, private sector, academia, financial entities and insurers, citizens, and professional associations and unions, among others.

longer timeline to reach maturity, hence the need for state policies that provide cross-administration continuity. However, with leadership and determination, it is possible to reach key short-term milestones that help the digital transformation gain momentum. Finally, the starting point for a DT must be a vision for the future state of the health system cast by all key government and non-government stakeholders of the ecosystem—with an emphasis on citizens—followed by comprehensive and vigorous action by the whole sector. Otherwise, the process will be plagued by constantly shifting directions, plans, teams, funding allocations, and performance indicators that, at best, will incur enormous losses of investment and, at worst, will result in a staggering loss of life and a population with deteriorating health.

Despite the risks and obstacles, misconceptions, and resistance to digital transformation, multiple international experiences demonstrate the singular value of this process in improving the quality and efficiency of public services and in preparing for future crises.

As the region builds back better post-coronavirus, LAC has a historic opportunity to prioritize a redesign of public health to transform the lives of patients, resolve social problems, and achieve a more equitable system. Not just because it can, but because it should.

The next section explores the potential of this process in the region.



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THE POTENTIAL OF DT IN LAC

VIII. The quality agenda

Afraid of flying?

Quality health care is effective, safe, and person-centric. This means services are timely (without long wait times or harmful delays); equitable (regardless of gender, ethnicity, geographic location, and socioeconomic status); integrated (offering the full range of services a person needs throughout their lifetime); and efficient (maximizing the benefit of available resources and avoiding waste).²⁸

Poor quality medical care, on the other hand, means incorrect diagnoses, improper or unnecessary treatments, medication errors, lack of screening and preventative actions, unsafe clinical facilities, and providers without proper training. Every year, between 5.7 and 8.4 million deaths are attributed to poor-quality care in low and medium income countries, or up to 15% of deaths in those countries.²⁹

To put in another way, the risk of dying due to medical error during a hospital stay (1 in 300 people, according to the WHO) vastly outweighs the risk of dying in a plane crash (1 in 3 million people).³⁰ And although no country is immune to this problem (some estimates claim that if medical error were included in the official ranking, it would be the third leading

cause of death in the US),^{31,32} lower income countries—which are home to 80% of the world’s population—have the highest rates of death due to “adverse events.”³³ In LAC, only 30% of preventable deaths are caused by lack of access to medical attention. The other 70% are the result of poor quality.³⁴

²⁸ OMS, “Quality of Care”, Health Topics, https://www.who.int/health-topics/quality-of-care#tab=tab_1.

²⁹ Ibid.

³⁰ Liam Donaldson et al., ed., *Textbook of Patient Safety and Clinical Risk Management*, (Cham: Springer, 2021), 5.

³¹ The BMJ, “Medical error—the third leading cause of death in the US”, <https://www.bmjjournals.org/content/353/bmj.i2139.full>.

³² Estimating the rate of deaths due to medical error is not simple. While rough estimates have been used to justify improvements in the quality of hospital care, they are not free from criticism, as seen in: <https://www.mcgill.ca/oss/article/critical-thinking-health/medical-error-not-third-leading-cause-death>.

³³ Dean T Jamison et al., “Global health 2035: A world converging within a generation.” *The Lancet*, 398, no. 9908. (December 2013): 1898-1955. [https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(13\)62105-4/fulltext](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(13)62105-4/fulltext).

³⁴ Ibid. see [Health sector framework document](#), 2021, 17.



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What do quality data have to do with medical care?

"We need to increase the automation of data collection so that they are of higher quality"

Also part of healthcare quality is preventing diseases through early detection and guidance, as well as education to promote behavioral changes both within and outside of clinics. A closer look at the probability of dying from a non-communicable disease would likely recalibrate some people's fear of flying. In the US, 1 in 6 people die of heart disease, and 1 in 7 of cancer.³⁵ In 2019 alone, it was estimated that 2.5 million deaths in the Americas—35% of all deaths—were preventable.³⁶ In terms of data, current initiatives to measure quality are fragmented and focus more on inputs than outputs. They are not designed based on the population's health needs.³⁷ Since decision-makers in the region do not have timely information that provides a snapshot of the health system as a whole, they are flying blind.

The value of DT

The first response to this situation is usually: How and in what areas can DT help? Before answering this question, we need to first consider a more important one: Who does this process

benefit? The answer is not just citizens, but also professionals and providers, institutions, and the health system in general. This is what makes DT such an integral part of reaching the “Quintuple Aim” of health care: **i)** improving the patient experience; **ii)** improving the population's health; **iii)** reducing costs; **iv)** improving the work life of medical providers and professionals; and **v)** promoting equity and inclusion.³⁸ The DT helps this ecosystem of stakeholders by giving them timely access to precise information.

Estonia: Key learnings from the digital transformation of its health system

"We have seen that patients are the main beneficiaries"

³⁵ NSC, “Odds of dying”, Preventable deaths, NSC Injury facts, <https://injuryfacts.nsc.org/all-injuries/preventable-death-overview/odds-of-dying/>.

³⁶ OPS, “Mortalidad prematura potencialmente evitable (MPPE)”, Salud en Las Américas, OPS, <https://hia.paho.org/es/mortalidad-evitable>.

³⁷ Dean T Jamison et al., “Global Health”.

³⁸ Thomas Bodenheimer y Christine Sinsky, “From triple to quadruple aim: care of the patient requires care of the provider”, *Annals of family medicine* 12, no. 6 (November 2014): 573-6. <https://www.annfammed.org/content/12/6/573>.



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Tangible Digital Benefits

The network of DT solutions is vast and will only be effective with a strategy tailored to each country's needs and resources.

Also, there is mixed evidence on ineffective implementations and uses of IT tools in specific contexts.

Fewer medical errors and better decisions:

- Computerized clinical decision support systems (CDSS) can be used to remind or alert health professionals about **drug interactions, allergies, and treatments that are counter-indicated for a patient**.
- If physicians and other professionals have easy access to images, indicators, updated protocols, and healthcare standards, they can make **informed and correct decisions**.
- Computerized provider order entry (CPOE) records, stores, and provides access to prescriptions and test results to keep procedures from being done twice.
- Electronic prescriptions help **reduce errors caused by illegible handwritten information**.

The examples and information below are specific cases where introducing technology has facilitated progress toward quality.

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What does the evidence say?

1 → A review of 47 studies associates EHR systems with a lower number of medical errors (risk ratio [RR] = 0.46); shorter documentation times (-24%), and fewer adverse drug reactions (RR = 0.66). Some effects were not significant for systems without CDSS.³⁹

2 → A meta-analysis of 37 articles found that electronic prescription strategies reduced medication errors (RR=0.24), dosage errors (RR=0.17), and adverse drug events (ADE) (RR=0.52). It did not find effects on death rates, hypoglycemia, and/or hospital stay. Existing studies were found to be heterogeneous and some are of poor quality, but the findings of the most recent studies are more solidly positive.⁴⁰

3 → A meta-analysis of 129 studies on clinical decision support systems found moderate but significant care quality improvements of 5.8% (in indicators like following protocols, test orders, and prescriptions). Findings varied widely between studies.⁴¹

³⁹ Paolo Campanella et al., "The impact of electronic health records on healthcare quality: a systematic review and meta-analysis", *European Journal of Public Health* 26, no. 1. (June 2015): 60-64. <https://academic.oup.com/eurpub/article/26/1/60/2467302>.

⁴⁰ Nadia Roumelioti et al., "Effect of Electronic Prescribing Strategies on Medication Error and Harm in Hospital: a Systematic Review and Meta-analysis", *Journal of General Internal Medicine* 34 (August 2019): 2210-2223 <https://link.springer.com/article/10.1007%2Fs11606-019-05236-8>.

⁴¹ Lorenzo Moja et al., "Effectiveness of Computerized Decision Support Systems Linked to Electronic Health Records: A Systematic Review and Meta-analysis", *American Journal of Public Health* 104, no. 12 (October 2016): e12-e22. <https://ajph.aphapublications.org/doi/10.2105/AJPH.2014.302164>.

Patient empowerment (information, self-care, and access):

- Personal health records (PHR) and nationwide EHR give patients **transparency and swift access to their medical information**. EHR systems can be used to send text messages (SMS) with appointment reminders support communication for management of chronic conditions, or provide personalized recommendations.
- Telemedicine allows patients in remote areas or with mobility limitations to access doctors or specialists anywhere in the world, also saving them the time and cost of travel.
- Healthcare using mobile devices (mHealth) holds promise for **treating chronic conditions** like heart disease and its risk factor, hypertension (high blood pressure). It has also shown good results in **promoting the behavioral changes required to reduce the risk of developing or exacerbating hypertension** (like regular physical activity).
- mHealth can help **increase mobile adherence** (mAdherence), with high levels of satisfaction among low-income groups, the elderly, and vulnerable people; reduce the burden of travel or transfers to health facilities; and facilitate better chronic disease management.

What does the evidence say?

1 A systematic review of 34 articles shows that text messaging interventions have improved patients' drug adherence rate (85% of studies). Of the patients included in the review, those who had adherence problems or those for whom the text messages were most helpful had HIV, asthma, diabetes, schizophrenia, and heart disease (73.5%).⁴²

2 In 2016, a meta-analysis found that mobile phone text messaging almost doubled the likelihood of drug adherence. This is a 50% improvement in adherence rates (based on a baseline reference rate for patients with chronic diseases in developing countries) to 67.8%, or a 17.8% improvement, in absolute terms⁴³

3 A systematic review of nine studies analyzing the impact of mobile health on chronic disease outcomes in low- and medium-income countries found that mobile health was cost-effective and had positive impacts on care processes, clinical outcomes, and health-related quality of life.⁴⁴

4 A systematic review and meta-analysis of 51 studies found that digital health interventions correlated with a relative risk reduction of almost 40% in heart disease outcomes, outperforming other prevalent, guidance-based preventative measures like statins or aspirin. No effects on blood pressure were found.⁴⁵

5 A meta-analysis found that digital health interventions seem to effectively reduce HbA1c levels in patients with poorly controlled type II diabetes.⁴⁶

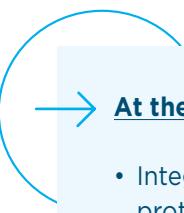
⁴² Roghayeh Ershad Sarabi et al., "The Effectiveness of Mobile Phone Text Messaging in Improving Medication Adherence for Patients with Chronic Diseases: A Systematic Review", *Iranian Red Crescent medical journal* 18, no. 5 (April 2016), <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4939231/>.

⁴³ Thakkar Jay et al., "Mobile Telephone Text Messaging for Medication Adherence in Chronic Disease: A Meta-analysis", *JAMA Intern Med.* 176, no. 3 (March 2016): 340–349, <https://jamanetwork.com/journals/jamainternalmedicine/fullarticle/2484905>.

⁴⁴ Andrea Beratarrechea, "The impact of mobile health interventions on chronic disease outcomes in developing countries: a systematic review", *Telemedicine journal and e-health: the official journal of the American Telemedicine Association*, 20, no. 11 (December 2013): 75–82. <https://www.liebertpub.com/doi/10.1089/tmj.2012.0328#>.

⁴⁵ Ray Widmer et al., "Digital health interventions for the prevention of cardiovascular disease: a systematic review and meta-analysis", *Mayo Clinic proceedings* 90, no. 4 (April 2015): 469–480. [https://www.mayoclinicproceedings.org/article/S0025-6196\(15\)00073-7/fulltext](https://www.mayoclinicproceedings.org/article/S0025-6196(15)00073-7/fulltext).

⁴⁶ Mihiretu M. Kebede et al., "Effectiveness of Digital Interventions for Improving Glycemic Control in Persons with Poorly Controlled Type 2 Diabetes: A Systematic Review, Meta-analysis, and Meta-regression Analysis", *Diabetes Technology & Therapeutics* 20, no. 11 (October 2018). <https://www.liebertpub.com/doi/abs/10.1089/dia.2018.0216>.



At the organizational level:

- Integrating systems (both legacy and new), programming languages, communication protocols, data models, or interfaces can support coordinated health care within the public sector and between the public and private sectors.
- Panel management and patient records help **segment populations by risk**, create **care plans for specific subpopulations**, and provide **business intelligence** for managing teams and organizations
- Telementoring projects can **enhance the knowledge of primary care providers in marginalized communities** so they can provide specialized care for complex chronic diseases.
- By making it easier to collect systematic and standardized data, EHR can improve public health **monitoring and reporting capacities**.

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What does the evidence say?

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A systematic review of 32 studies on health information exchange (HIE) systems found markedly improved outcomes for the quality and cost-effectiveness of care. Sixteen studies (64%) reported positive improvements in the quality of care for patients.⁴⁷



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⁴⁷ Farahnaz Sadoughi, et al., "The impact of health information exchange on healthcare quality and cost-effectiveness: A systematic literature review", *Computer Methods and Programs in Biomedicine* 161 (July de 2018), 209-232, <https://www.sciencedirect.com/science/article/abs/pii/S0169260718300907?via%3Dihub>.

IX.

The efficiency agenda

Efficiency is essential to improving health systems, making them sustainable, and equipping them to face future emergencies. It is also crucial to progress towards universal health coverage in LAC.⁴⁸

Efficiency measures whether the way health resources are being used achieves the best quality/price ratio,⁴⁹ which is the relationship between costs (labor, capital, or equipment), intermediate products (number of patients treated, wait times, etc.), and final health outcomes (lives saved, for quality-adjusted life years [QALY], etc.).⁵⁰

What would you do with four more years of life?

A study compared the efficiency of 22 LAC countries with that of other middle-income and OECD countries in key public health aspects like life expectancy, mortality rate for children under age 5, access to services, and immunization rates, among others. It found much room for improvement: all LAC countries fall into the lower half of the ranking, and 12 are in the lowest 25%.⁵¹



Even more startling are the projections that people in LAC could live an average of 4 years longer if the region's countries caught up to their more efficient peers.⁵² In Bolivia, Guyana, Suriname and Trinidad

and Tobago, this average is as much as 7 years longer. Such is the power of increasing the efficiency of health systems. In addition to the cost in life years, poor quality costs low- and middle-income countries \$1.4 to \$1.6 trillion per year in lost productivity.⁵³

In the current context of a devastating health crisis and what has been called the greatest economic contraction in the history of LAC,⁵⁴ what could be a higher priority for countries than investing in tools that help use scarce resources more efficiently?

The value of DT

To do more for public health with the same budget, especially in a health crisis, the people who decide where to invest public funds, directors of health institutions, and those in charge of the enormously complex task of providing medical care all have to make effective and well-informed decisions.

⁴⁸ Camilo Cid et. al., "La eficiencia en la agenda de la estrategia de acceso y cobertura universales en salud en las Américas," *Salud Pública de México* 58, no. 5 (Sept./Oct. 2016): 496-503, <https://saludpublica.mx/index.php/spm/article/view/8182>.

⁴⁹ A Williams, "Priority setting in public and private health care. A guide through the ideological jungle," *Journal of Health Economics* 7 (June 1988): 173-83, <https://www.sciencedirect.com/science/article/abs/pii/016762968890015X?via%3Dihub>.

⁵⁰ Gavin Mooney et al., *Choices for health care: a practical introduction to the economics of health care provision* (London: Macmillan, 1986).

⁵¹ Diana Pinto et al., *Better Spending for Better Lives: How Latin America and the Caribbean Can Do More With Less*, (Washington D. C.: IDB, 2018). <https://publications.iadb.org/publications/english/document/Better-Spending-for-Better-Lives-How-Latin-America-and-the-Caribbean-Can-Do-More-with-Less.pdf>.

52 Ibid.

⁵³ WHO, "Servicios sanitarios de calidad," WHO news room/fact sheets, August 11, 2020. <https://www.who.int/es/news-room/fact-sheets/detail/quality-health-services>.

⁵⁴ ECLAC, *Measuring the impact of COVID-19 with a view to reactivation*, (Santiago: ECLAC, 2020), 1. <https://www.cepal.org/en/publications/45477-measuring-impact-covid-19-view-reactivation>.



On any given day at work, a physician has to juggle caring for patients, administrative tasks, exchanging information with colleagues, and staying up to date on new

developments in their field to provide evidence-based care. The last task alone entails each doctor reading 5,000 articles per day, since a new article is published in a specialized journal approximately every 26 seconds.⁵⁵ Even if doctors could stay up-to-date on their reading, by the time something is published, it is often outdated given the time to publish. There is so much information that an estimated 17 years to translate healthcare data to research findings that would then inform clinical decisions⁵⁶. Given this almost surreal state of affairs, physicians must use technology in order to make full use of their time and protect their own physical and mental wellbeing. Similarly, DT processes can considerably enhance the immediate and long-term performance of each stakeholder and area of the health ecosystem.

⁵⁵ M Linzer et. al., “Role of a medical journal club in residency training”, *J Med Educ* 61, no. 6 (June 1986): 471-3. https://journals.lww.com/academicmedicine/abstract/1986/06000/role_of_a_medical_journal_club_in_residency.7.aspx.

⁵⁶ Amy Harris Nordo et al., “Use of EHRs data for clinical research: Historical progress and current applications”, *Learning health systems* 3, no.1 (January 2016). <https://onlinelibrary.wiley.com/doi/10.1002/lrh2.10076>.



Tangible digital benefits

The network of DT solutions is vast and will only be effective with a strategy tailored to each country's needs and resources.

Also, there is mixed evidence on ineffective implementations and uses of IT tools in specific contexts.

In health care:

- Data management systems **reduce the amount of time health providers spend on administrative tasks, finding test results, and searching for information so they can make decisions.**
- EHR systems allow different stakeholders from diverse contexts to access patient information **so less time and money are wasted on redundant diagnoses.**⁵⁷

⁵⁷ Nir Menachemi et. al., "Benefits and drawbacks of electronic health record systems," *Risk Manag Healthc Policy* 4, 47-55 (May 2011), <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3270933/>.

⁵⁸ Amy Cheung et. al., "The Organizational and Clinical Impact of Integrating Bedside Equipment to an Information System: A Systematic Literature Review of Patient Data Management Systems (PDMS)", *International Journal of Medical Informatics* 84, no.3 (marzo de 2015), <https://www.sciencedirect.com/science/article/abs/pii/S1386505614002470?via%3Dihub>.

⁵⁹ Researchers have published numerous articles on how physicians are burnt out by how much time EHR-S documentation requires, but this problem seems to be specific to the requirements of the US system. https://www.researchgate.net/publication/325020995_Psychiatrist_Burnout_in_the_Electronic_Health_Record_Era_Are_We_Ignoring_the_Real_Cause

⁶⁰ Campanella et. al., "The impact of", 60-64

⁶¹ See Lise Poissant et. al., (May 2005): "The impact of electronic health records on time efficiency of physicians and nurses: a systematic review," and Esther C Moore, et. al., (May 2020) "A systematic review of the impact of health information technology on nurses' time."

⁶² Kolsun Deldar et. al., "Teleconsultation and Clinical Decision Making: A Systematic Review," *Acta Inform Med* 24, no.4 (July 2016), <https://www.bibliomed.org/mnsfulltext/6/6-1468676794.pdf?1643692347>.

The examples and information below are specific cases where introducing technology has led to greater efficiency.

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What does the evidence say?

1 → A review of 18 studies from Austria, Belgium, Canada, Germany, Israel, Italy, the Netherlands, Finland, and the United States concludes that patient data management systems reduce time spent on filling out patients' medical records and increase time spent on patient care.^{58 59} A systematic evidence review also found that using EHR systems led to a 22% drop in time spent on documentation.⁶⁰ However, there are studies that find mixed results for time spent by medical and nursing staff.⁶¹

2 → Physicians who use telemedicine achieve quicker diagnoses, faster and better patient management, more accurate triage, higher confidence, and fewer unnecessary procedures. However, the same study expresses a need for better standards for exchanges and the need to improve the quality of studies.⁶²



For the patient:

- Tools like telemedicine and EHR systems make it possible to move information instead of people, giving patients access to health care. This **saves them significant amounts of productive time and cuts down the high costs associated with moving patients.**
 - CDSS can notify users of **more affordable drug alternatives or of conditions that insurance companies will cover.**



For organizations:

- DT gives members of a care network the ability to store and use the same information generated in many places. This prevents entering the same data multiple times, so **professionals spend less time on data entry and have fewer chances of making mistakes in doing so.**⁶⁴
 - Digital tools facilitate task shifting and improve quality by **providing decision-making support at the point of care** and **adapting procedures designed for medical workers with limited training**, like community health workers.⁶⁵

What does the evidence say?



Two systematic reviews found that telemedicine technology for diabetic retinopathy and otolaryngology has the potential to cut costs significantly, especially for low-income patients and rural patients with high transportation costs.⁶³

- When integrated with computerized provider order entry (CPOE) systems, clinical decision support systems (CDSS) can **suggest more affordable drug alternatives and reduce redundant testing.**
 - Electronic referral systems can **improve communication between primary care and specialists.** However, they have a positive but limited impact on reducing wait times. Economic evaluations are needed to analyze these referral systems clinical and economic value for health care.



⁶³ Daniel Avidor et al., "Cost-effectiveness of diabetic retinopathy screening programs using telemedicine: a systematic review." *Cost Eff Resour Alloc.* 18 no.16 (April 2020), <https://resource-allocation.biomedcentral.com/articles/10.1186/s12962-020-00211-1>.

⁶⁴ John Glaser, "Interoperability: The Key to Breaking Down Information Silos in Health Care", *Healthc Financ Manage* 65, no. 11, (November 2011): 44-6, 48, 50, <https://pubmed.ncbi.nlm.nih.gov/22128594/>.

⁶⁵ Alan Labrique et al., "mHealth innovations as health system strengthening tools: 12 common applications and a visual framework" *Global health, science and practice* 1, no.2 (August 2013): 160-71, <https://www.ghspjournal.org/content/1/2/160>.



- Telehealth can bring costs down by **eliminating trips funded by the health system and by reducing the need**

for costly procedures or specialized monitoring by providing competent care in a more efficient manner.

What does the evidence say?

1 →

A study reviewing existing evidence on telehealth found cost savings (between \$32 and \$3523) and equal or greater QALY. The study also found that there has been little analysis of the economic impact of telementoring. However, in the long run it is likely to lead to inadvertent cost savings by improving the skills of general practitioners and associated staff.⁶⁶

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A review of 27 studies on clinical decision support systems found that most (22) resulted in cost savings by reducing unnecessary testing and antibiotic prescription. The results are promising, but the authors recommend improving the quality of the studies, since they did not necessarily cover all cost categories.⁶⁷

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A review of 23 studies on using EHR in emergency rooms found more efficient use of medical staff's time, less testing and imaging, and fewer unnecessary hospitalizations.⁶⁸

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The case of telehealth is less clear and depends on the specialty and scale of the services being provided. A study that reviewed existing evidence on telehealth costs compared to in-person care found cases of cost savings in monitoring cardiovascular diseases, congenital heart diseases, detecting diabetic retinopathy and glaucoma, among others (savings of between \$32 and \$3523 per appointment). It also found cost increases in several other specialties, but in both cases, it found improvements in the clinical effectiveness of the interventions.⁶⁹

⁶⁶ Centaine L Snoswell et al., "Determining if Telehealth Can Reduce Health System Costs: Scoping Review", *Journal of medical Internet research*, 22, no. 10, (August 2020), <https://www.jmir.org/2020/10/e17298/>.

⁶⁷ Daniel Lewkowicz et al., "Economic impact of clinical decision support interventions based on electronic health records", *BMC Health Serv Res* 20, no. 871 (September 2020), <https://bmchealthservres.biomedcentral.com/articles/10.1186/s12913-020-05688-3>.

⁶⁸ Eftekhari, Saeede et al., "Do Health Information Exchanges Deter Repetition of Medical Services?", *ACM Transactions on Management Information Systems* 8, no. 1 (April 2017) <https://dl.acm.org/doi/abs/10.1145/3057272?download=true>.

⁶⁹ Snoswell et. al., "Determining if".

⁶⁹ Centaine L Snoswell et al., "Determining if Tele - health Can Reduce Health System Costs: Scoping Review", *Journal of medical Internet research*, 22, no. 10, (October 2020), <https://www.jmir.org/2020/10/e17298>.

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For governments:

- Interoperability processes and data management systems can optimize how the many service providers and funders throughout the country enter the data comprising the health system. This **can help governments make better decisions about health**.
- A health system that is integrated, at least on an informational level, can:
 - Reduce health care costs associated with redundant diagnostic testing, unnecessary hospitalizations, and preventable readmissions, among other aspects.
 - Make better use of resources and management to know how, when, and where those resources are used.
 - Effectively monitor notifiable diseases, seasonal diseases, communities' disease burden, and other aspects.
 - Keep an accurate record of the population's diseases.
 - Aid public health research.
 - Strengthen disaster response.
- Improvements related to information in EHR can **help make studies requiring large sample sizes more efficient**, since their data can be compiled more quickly and inexpensively.⁷⁰ However, it is critical to ensure ethical use of the data, privacy, and information security.

What does the evidence say?

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A systematic literature review of 25 studies on health information exchange (HIE) systems found positive outcomes for the quality and cost-effectiveness of health care. Fifteen of the HIE studies (60%) demonstrated positive economic effects.⁷¹

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In Canada, connected health in the outpatient context reduced the duplication of lab testing and diagnostic imaging testing, saving the system C\$72.7 million and C\$6.7 million, respectively.⁷²

⁷⁰ Nir Menachemi y Taleah H Collum. "Benefits and drawbacks of electronic health record systems". Risk Manag Healthc Policy 4. 47-55 (May 2011), <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3270933/>.

⁷¹ Farahnaz Sadoughi, et al., "The impact of health information exchange on healthcare quality and cost-effectiveness: A systematic literature review", *Computer Methods and Programs in Bio-medicine* 161 (July 2018), 209-232, <https://www.sciencedirect.com/science/article/abs/pii/S0169260718300907?via%3Dhub>.

⁷² Gartner, "Connected Health Information in Canada: A Benefits Evaluation Study," (April 2018): <https://www.infoway-inforoute.ca/en/component/edocman/3510-connected-health-information-in-canada-a-benefits-evaluation-study-document/view-document?Itemid=0>



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Digital and sustainable health

Can digital tools like EHR systems and telehealth have a positive environmental impact?

A study by Kaiser Permanente found that although EHR systems generated⁷³ 250 tons of electronic waste, they saved 1000 tons of paper and 68 tons of x-rays, resulting in a net positive effect.

Likewise, a report⁷⁴ indicated that using ICT could cut emissions by 0.205 Gt of CO2 globally as a result of reducing trips and decreasing use of physical medical facilities. It also indicates that telehealth has the potential to save 1.7 billion liters of fuel used for transfers and more than US\$66 billion by freeing up space, with 271.4 million square meters made available for other uses by 2030.



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⁷³ Marianne C Turley et al., "Use Of Electronic Health Records Can Improve the Health Care Industry's Environmental Footprint", *Health affairs* 30, no. 5 (May 2011), <https://www.healthaffairs.org/doi/10.1377/hlthaff.2010.1215>.

⁷⁴ GeSI, *SMARTer2030 ICT Solutions for 21st Century Challenges*, (Belgium: Gesi, 2015), 32.

X.

The Equity & Inclusion Agenda

LAC is one of the most unequal regions in the world. It has sharp income disparities, and gender, race, and ethnicity are strong determinants of who accesses healthcare, education, and employment in the region.⁷⁵ Under these circumstances, there is a highly relevant debate on whether growing use of technology can reduce inequality and close social gaps or instead exacerbate and deepen them.

How can we encourage the former and avoid the latter?

It is first necessary to understand the two major areas of the equity agenda as it relates to DT in the region. On the one hand, countries must address the severe digital divide, which includes lack of access to digital tools (like internet connections or smart phones) and lack of knowledge or skills needed to use those tools. This issue is also related to structural aspects of the health system. For example, in fragmented systems, the system subcomponents with more resources will be the first to be transformed, widening existing quality gaps.

On the other hand, countries need to make sure they develop and use data-based technology in a way that promotes inclusion and respects the population's diversity in terms of gender, age, race, nationality, ethnicity, sexual orientation, disability, and socioeconomic level. This requires eradicating data poverty,⁷⁶ which limits the ability of people, groups, or populations to benefit from a discovery or innovation because of a lack of fully representative data. Additionally, when this data is fed into algorithmic decision-making systems

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“Every system is perfectly designed to get the results it gets.”

Dr. Paul Batalden

and artificial intelligence systems, the resulting actions can be exclusive, inefficient, or even damaging to certain people and groups.



How can a tablet support health monitoring in remote areas?

⁷⁵ Matías Busso y Julián Messina, ed., *The inequality crisis: Latin America and the Caribbean at the Crossroads*, (Washington D. C.: BID, 2020), <https://publications.iadb.org/publications/english/document/The-Inequality-Crisis-Latin-America-and-the-Caribbean-at-the-Crossroads.pdf>.

⁷⁶ Hussein Ibrahim et al., “Health data poverty: an assailable barrier to equitable digital health care”, *Lancet Digit Health* 3, no. 4, (March 2021), <https://pubmed.ncbi.nlm.nih.gov/33678589/>.



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It is essential to include women

in the design of digital health transformation and ensure they play a leadership role in defining their needs in health systems.

Meet the digital health champions

The digital divide in LAC

While LAC's digital ecosystem (infrastructure, technology use, and public policies) enjoys an intermediate level of development,⁷⁷ 50% of the population (300 million people) does not have a computer at home or a fixed broadband connection, and only 9.9% of households have a high-quality fiber-optic connection.⁷⁸ Meanwhile, only 4 out of every 10 rural Latin Americans has internet access options, compared to 71% of the urban population.⁷⁹

As for technological skills, an estimated 30% of people do not regularly use the internet; a large percentage of the adult population has little to no experience with computers (ranging from 25.2% in Chile to 43.6% in Peru);⁸⁰ and only 1/3 of workers use computers, smart phones, or other ICT tools in their job once a week or more.⁸¹ These challenges are compounded by the fact that certain groups are severely excluded from accessing and using technology. Examples include [women](#), people with disabilities, or older people. Other factors that fuel inequality, like limited schooling, poverty, ethnic origin, and race, further aggravate this exclusion.



⁷⁷ TELECOM ADVISORY SERVICES LLC et al., *El estado de la digitalización de América Latina frente a la pandemia del COVID-19*, (Caracas: CAF, 2020), https://scioteca.caf.com/bitstream/handle/123456789/1540/El_estado_de_la_digitalizacion_de_America_Latina_frente_a_la_pandemia_del_COVID-19.pdf?sequence=1&isAllowed=y.

⁷⁸ OCDE/BID, *Políticas de banda ancha para América Latina y el Caribe: Un manual para la economía digital*, (Paris: OECD Publishing, 2016), <https://doi.org/10.1787/9789264259027-es>.

⁷⁹ BID et al. *Conectividad rural en América Latina y el Caribe. Un puente al desarrollo sostenible en tiempos de pandemia*, (Costa Rica: IICA, 2020), <https://repositorio.iica.int/handle/11324/12896?locale-attribute=es>.

⁸⁰ ECLAC, *Universalizar el acceso a las tecnologías digitales para enfrentar los efectos del COVID-19*, (Santiago: UN ECLAC, 2020), <https://www.cepal.org/es/publicaciones/45938-universalizar-acceso-tecnologias-digitales-enfrentar-efectos-covid-19>

⁸¹ International Labour Organization (ILO), *El teletrabajo durante la pandemia de COVID-19 y después de ella*, (Geneva: ILO 2020), https://www.ilo.org/wcms5/groups/public/-/-ed_protect/-/protrav/-/travail/documents/publication/wcms_758007.pdf.

The digital divide and data poverty impact all levels of the health sector. They limit people's access to tools and services for preventing diseases and providing care. They restrict healthcare providers' ability to efficiently offer services to the entire population. They also hamper equitable participation in the workforce, as well as fair and informed decision-making and resource allocation that benefits everyone. These inequalities are also perpetuated by a growing reliance on algorithms for decision-making that can be based on biased data, or data with limited or biased information on certain population groups.⁸² Unless digital technologies are intentionally deployed in an equitable and inclusive way, these imbalances will only grow.

Initiatives like [fAIr LAC](#) have already made important progress on identifying how to address these challenges and on developing tools to make the most of artificial intelligence, while avoiding negative equity impacts.

What does artificial intelligence mean for the health sector?

"Knowing the origin of the data used is crucial in order not to increase health disparities"



The potential of DT

Well-designed DT change systems because they [affect key processes](#) that are flawed. They can prompt new behavior in patients and providers to enhance self-care and the quality of care. They can facilitate tasks shifting, helping medical workers with limited training to make decisions and adapt procedures at the point of care by relying on digital tools. They can improve the flow of information and promote more access to data, increase its transparency, and improve feedback for data. Most importantly,

⁸² See Felipe González, et al., (2020) for an overview of the causes and consequences of this type of biases <https://publications.iadb.org/publications/english/document/Responsible-use-of-AI-for-public-policy-Data-science-toolkit.pdf>.

when DT of health care are coupled with an equity and inclusion agenda, they can reconfigure the system's objectives to tackle inequality at its core and extend benefits to the entire population.

In addition to simultaneously driving an expansion of infrastructure, enabling regulations, and ICT skills, DT processes can help maximize the use of healthcare systems' existing digital resources and skills. For example, while over 84% of people in LAC have a smart phone with internet access, only 69% use them.⁸³ DT tools and processes can enhance the efficiency of SMS as a way of getting the right healthcare information to the right person at the right time.

The digital component also allows systems to provide more and better service to people unfamiliar with ICT by using, for example, an intermediary (like a social worker) who can use telehealth and telemedicine to connect a doctor or specialist in the city with a patient in a remote area.

It is imperative to design and implement long-term digital transformations of healthcare that involve intentional and profound steps in the areas of people (including education and training), processes (including governance and regulations), and technology (infrastructure and infostructure) to address the current situation of inequality and exclusion.

Countries' role

Promoting digital equality and inclusion in health requires public and private stakeholders, academia, civil society, and multilateral organizations to take a collective and collaborative approach that prioritizes the necessary

commitment and investment, knowledge exchange, and, whenever possible, shared objectives and standards for their activities.

The solutions will vary from country to country based on the needs, resources, and healthcare system, but all countries should address the core issues outlined in the call to inclusive digital health. Inclusivity is one of the PAHO's [8 guiding principles](#) of the digital transformation of the health sector, and this principle includes a call to seven key actions:

- Include gender criteria, the intercultural perspective, and the principles of equity and solidarity in actions related to the digital health inclusivity agenda.
- Use reference data as a starting point to formulate and evaluate interventions, determining which people and groups have some degree of vulnerability and their relationship with the virtual world.
- Take multisectoral action to formulate and implement digital inclusion policies and strategies, such as awareness campaigns and training programs (authorities, providers, and the general population).

⁸³ Luis Felipe López-Calva, "Estás en Mute: Porque el acceso a Internet no es suficiente para la digitalización inclusiva de América Latina y el Caribe", *Blog del Director, UNDP*, March 18, 2021, https://www.latinamerica.undp.org/content/rblac/es/home/presscenter/director-s-graph-for-thought/_you-are-on-mute-because-internet-access-is-not-enough-for-the-.html (retrieved August 8, 2021).

- Empower individuals and their communities (children, youth, seniors, women, people with disabilities, and indigenous peoples) through initiatives that promote digital health.
- Analyze beliefs, concerns, and motivations regarding health decision-making that may affect the achievement of digital health for all, taking into account the most vulnerable people.
- Promote the inclusion of people-centered digital health, ensuring that the population knows their rights and responsibilities regarding the security, privacy, and reliability of health data.

- Enable a virtual resilience system so that health systems continue to offer coverage if physical care is impossible, with special attention to the most vulnerable populations.

“Leaving no one behind” is a mantra in DT, especially in the area of health, but LAC’s reality demands much more than this. Countries need to capitalize on this unique opportunity to redesign health systems in a way that empowers those most affected by its implementation and puts those who need it the most first.



FROM PLANNING TO RESULTS

XI.

First, define the future state

Without exception, a digital transformation in health care has to start with a clear vision of what the country's future health system should look like; in other words, the ideal state. This vision is based on questions like: What important challenges does the health system of the future address and what problems does it solve? How does it further the population's wellbeing and health? How does it perform in emergencies? How is it equipped to continue to evolve?

It seems logical and simple enough: define the destination before setting out. The complicated part, which is commonly overlooked but key to the success of a DT in health, is that this vision has to be based on a consensus between all actors in the system. This is particularly challenging in fragmented health systems like those of LAC, where each party operates in isolation and has its own vision for how the future should be, why it should be that way, and how to get there. This difficulty is commonly exacerbated by communication gaps between the different actors. For example, there is often a lack of communication between the people using the digital tools (medical staff and patients) and those procuring them (IT staff). A prominent physician with broad experience in both medicine and IT summed up the problem well: "For decades, doctors had no idea what they wanted, which is exactly what software developers gave them."⁸⁴ Another



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If you don't know where you are going, any road will get you there.

Lewis Carol
Alice in Wonderland



Guide: Building the Future State of Digital Health and its Critical Success Factors in Countries

⁸⁴ Fred Trotter y David Uhlman, *Hacking Healthcare: A Guide to Standards, Workflows, and Meaningful Use*, (s.l.: O'Reilly Media, Inc., 2011).

common and equally important hurdle is a sudden, radical, or repeated change in this vision. This often happens, for example, in administration changes, when past objectives and processes are usually reconsidered.

Fortunately, different industries⁸⁵ and the WHO⁸⁶ have extensively used methods for addressing this type of problem and helping countries define their ideal future state.

The key to this process is broad, transparent, and ongoing engagement from the different players in a country's digital ecosystem—not just those in the field of health and technology—to reach an agreement about the ideal health system and then define how technology will support it.

A common starting point is reaching an agreement on at least the health system's main desired characteristics. In LAC today, quality, efficiency, and equity should be at the center of the conversation. Addressing aspects like delivering health care, funding, and the role of citizens can also help build a unified vision. Another important requirement for these discussions is to initially focus on objectives instead of dwelling on obstacles. The vision for an ideal future state should be just that: ideal. In other words, it should be based on goals rather than limitations. This stage of the health system DT is about defining what it is and not how it will come about. Therefore, questions for

this participatory process of cocreation include: How do you imagine healthcare services in a better future? What would happen in that ideal scenario?



Learn about three key recommendations to start the process towards electronic health records.

"Each country has different needs and it is the responsibility of national leaders to envision a successful future state, [understand] what the success factors are to achieve it and focus on that rather than things that are fashionable but not essential."

The IDB has experience implementing this method in different LAC countries and in successfully fostering effective discussion and agreements between stakeholders. This process has four essential ingredients:

1. Genuine support from top authorities.

Without this support, the process will lose credibility and will not have the participation, dedication, and engagement it needs.

2. Broad engagement from the ecosystem.

A common mistake is to only convene the small group of actors directly responsible for these matters. The result is a perspective skewed towards IT, legal concerns, or medical considerations, undermining the

⁸⁵ See *Creating your Ideal and Future State Value Stream Map en Lean Manufacturing Tools*: <https://leanmanufacturingtools.org/598/creating-your-ideal-and-future-state-value-stream-map/>.

⁸⁶ See Digital Implementation Investment Guide (DIIG): Integrating Digital Interventions into Health Programmes: <https://www.who.int/publications/item/9789240010567>.

process' legitimacy in the eyes of all the other actors.

3. Constructive dialogue and ability to compromise. This factor will depend on the tone set at the beginning of the dialogue and on how motivated participants are to make progress toward DT. They have to take a step back from the mentality of everyday problems and immediate challenges to cast an unfettered vision for an ideal future. One common exercise is to ask what a front-page headline 10 years from now should say about the country's digital health achievements.

4. Validation and giving feedback to participants. The exercise should end by confirming the shared vision and formally articulating, in writing, the desire of all participants to move towards it.

The quote, "the best way to predict the future is to create it," is attributed to both Abraham Lincoln and Peter Drucker, an acclaimed consultant, professor, and writer considered by many to be the greatest management philosopher of the 20th century. Regardless of who said it, this quote conveys the powerful lesson that the best way to create the future one desires is to actively shape events as they unfold.

Like any process, health system transformations need a goal, a vision that encapsulates hopes, ideals, and the desire to grow and improve, and that gives a sense of purpose. This step in the process of transforming the region's health system starts with imagining what is possible.



XII.

Where are we now?

Once there is a vision for the ideal health system and before creating an action plan, the current state of the system must first be clear. Diagnostic testing plays a key role in health care and treating diseases; the same is true for a country's DT processes. No one would start a medical treatment without understanding the details of their condition. No doctor would prescribe a course of action without looking at the patient's test results. This also holds for a DT, where the leaders of the process are both patients and doctors. Without a correct diagnosis, they run the risk of acting blindly and perpetuating the system's chronic maladies, despite the high cost of the measure they take.

How do we diagnose the system's health?

Recently, the IDB, along with other institutions like the PAHO, [developed a series of tools](#) to help countries identify their current situation in relation to their vision for the future state of health care and each component of that goal.

First, there are two central characteristics of a more effective process: the diagnosis should be holistic and systemic. DT projects often fail because they focus on "transforming" just one aspect of the system. For example, they center on assessing computer or software gaps, without considering the current digital skills of patients or human resources or the present state of health care processes or governance.

So what goes into a proper diagnosis? It should evaluate the [six key dimensions](#) of DT: governance, people and culture, informed health policy and practice, infrastructure, infostructure, and

“A correct diagnosis is three-fourths the remedy.”

Mahatma Gandhi

applications and digital services of the sector. While the tools recommended below sometimes serve more than one function, they have been categorized according to their primary evaluative purpose.



What are the critical factors that increase our odds of success of digital transformation?

"A portfolio of projects in each of the 6 dimensions aligned with the goals and objectives of the national digital health agenda supports a holistic and sustainable transformation process"

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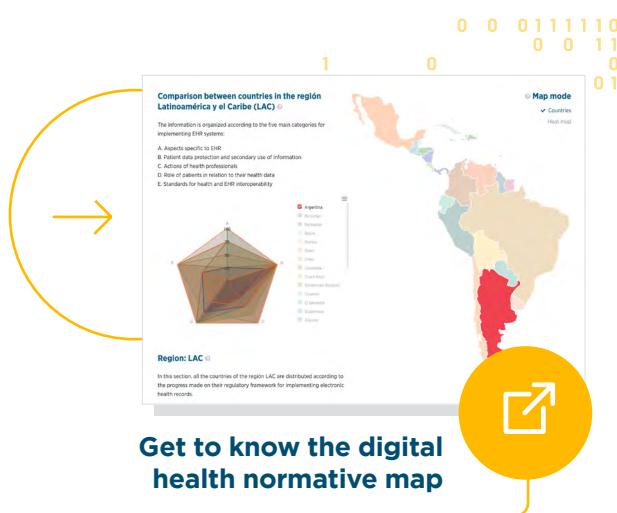
Governance and management

What is it?

The governance structure is the mechanisms, processes, and institutions whereby all stakeholders and participants in the national health system align their interests, exercise their rights, meet their obligations, resolve their differences, and oversee its operation. Governance is the framework allowing all participants to coordinate their work.

How is it assessed?

The [digital health regulatory map](#) is the key tool. Other valuable resources for specific implementation areas are maturity models, including the [Digital Electronic Health Records Maturity Model](#) and the [information Systems For Health Maturity Model \(IS4H-MM\)](#).



People and culture

What is it?

This dimension encompasses all actions related to communication and adoption of the DT strategy by citizens. It also includes all steps required of healthcare human resources, who have to acquire

digital and change management capacities in their daily activities. Key aspects like empowering the sector and citizens to achieve country's vision and strategy, as well as participation and commitment from all members of the ecosystem also fall under this dimension.

How is it assessed?

There are standardized [surveys like the one developed](#) by the Regional Center for Studies for Developing the Information Society (CETIC) and the [Telemedicine Maturity Model](#) developed by the PAHO and IDB that contain the questions needed to construct validated indicators on healthcare staff and patients and their relationship to digital tools. The National Health Service's (NHS) [digital community of interest](#) also has useful resources.

Informed health policy and practice

What is it?

This dimension involves using information to govern the health system and to track and monitor the country's public health.

How is it assessed?

The maturity models listed in the people and culture dimension can also be used to measure this dimension, since they collect information about generating and using digitalized information to make public health decisions. Additionally, there are two models proposed by HIMSS: one on supply chain ([CISOM](#)) and the other on the capacity in your organization for the use of analytics ([AMAM](#)).

Digital infrastructure

What is it?

The required technology, in terms of Internet access, storage, processing, devices, etc.

How is it assessed?

Specialized survey tools, like the one developed by [CETIC.BR](#) have been used in Brazil since 2013 and in [Uruguay](#) since 2014. Another diagnostic tool is [INFRAM](#), developed by HIMSS, which evaluates and maps the technological infrastructure capabilities required to achieve the clinical and operational objectives of an organization.

A screenshot of the IDB's National Electronic Health Record Maturity Model Toolkit website. The page features a blue header with the IDB logo and the title 'National Electronic Health Record Maturity Model Toolkit'. Below the header, there is a navigation menu with links like 'SPM', 'Resources SPM', 'Topics', and 'National Electronic Health Record Maturity Model Toolkit'. The main content area contains text about the toolkit, a 'Modules' section listing five modules, and an 'Additional Information' section. A large yellow call-to-action button at the bottom right encourages users to 'Check out IDB's National Electronic Health Record Maturity Model'.

Infostructure⁸⁷

What is it?

Infostructure is the technological components needed to develop the digital health system's syntactic and semantic interoperability processes, like medical information repositories; patient, product, and place directories; use of medical terms; components related to controlling the informed consent of patients; mechanisms to protect

the privacy and security of access to the platform; and rules for sharing the different types of electronic medical documents.

How is it assessed?

Through specific interoperability maturity models, like [IDB's](#) tool for the social sector or the one developed by MEASURE to calculate the [maturity of the health sector's interoperability](#). For assessing data protection, options include using ethical hacking or the [cybersecurity self-assessment tool developed by the IDB](#).

Applications and Digital Services of the Sector

What is it?

The software applications that need to be developed, integrated, upgraded, maintained, and launched to improve health care. The main tools in this sector include EHR, telemedicine applications, or artificial intelligence software.

A screenshot of the COVID-19 AND TELEMEDICINE toolkit. The page has a red header with the title 'COVID-19 AND TELEMEDICINE' and a subtext 'Tool for assessing the maturity level of health institutions to implement telemedicine services'. Below the header, there is a photo of a healthcare professional wearing a mask and using a computer. A large yellow call-to-action button at the bottom right encourages users to 'Check out COVID-19 AND TELEMEDICINE'.

⁸⁷ See https://www.campus.fundec.org.ar/admin/archivos/EI%20concepto%20de%20infoestructura_cornella.pdf.



How is it assessed?

The telemedicine maturity model developed by the IDB and the PAHO, as well as the IDB's National Electronic Health Record Maturity Model and Scorecard for Electronic Health Record Systems are good starting points.

In medicine, a fast and accurate diagnosis can mean the difference between life and death. Similarly, the difference between a successful and failed DT lies in constant, reliable, and accurate assessment of health systems using tools specifically created for that purpose.



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XIII.

How do we get there?

There are various examples from human history of technological projects that transformed our societies—electricity, the telegraph, the personal computer, the internet, cell phones, etc. As diverse as these advances were, they repeatedly featured four basic elements: a vision for what was to be accomplished,⁸⁸ a starting point (an understanding of how things functioned before the change),⁸⁹ a set of capacities (or the conditions and resources needed to make it a reality),⁹⁰ and a plan for how to achieve those capacities. Digitally transforming health is no different.

Once there is a vision for the ideal state of the health system—a state which will bring value to all system stakeholders and to the country as a whole—and an understanding of the current situation as the starting point, the next step is to build a path and obtain the capacities and resources needed to get from one point to the other.

Welcome home

To define the path itself and inform objectives as the transformation unfolds, a well-defined approach is key. With this in mind, the IDB developed an exercise for creating digital health roadmaps. For practical purposes, it uses the metaphor of a “digital house.”⁹¹ The digital house shows the actions and products needed to build a solid DT with good foundations that bring together the different aspects and perspectives of the approach. The digital house is built from the six

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A journey of
a thousand miles begin
with a single step.”

Lao Tsé

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key dimensions described above: governance, people and culture, informed health policy and practice, infrastructure, infostructure, and applications and digital services for the sector.

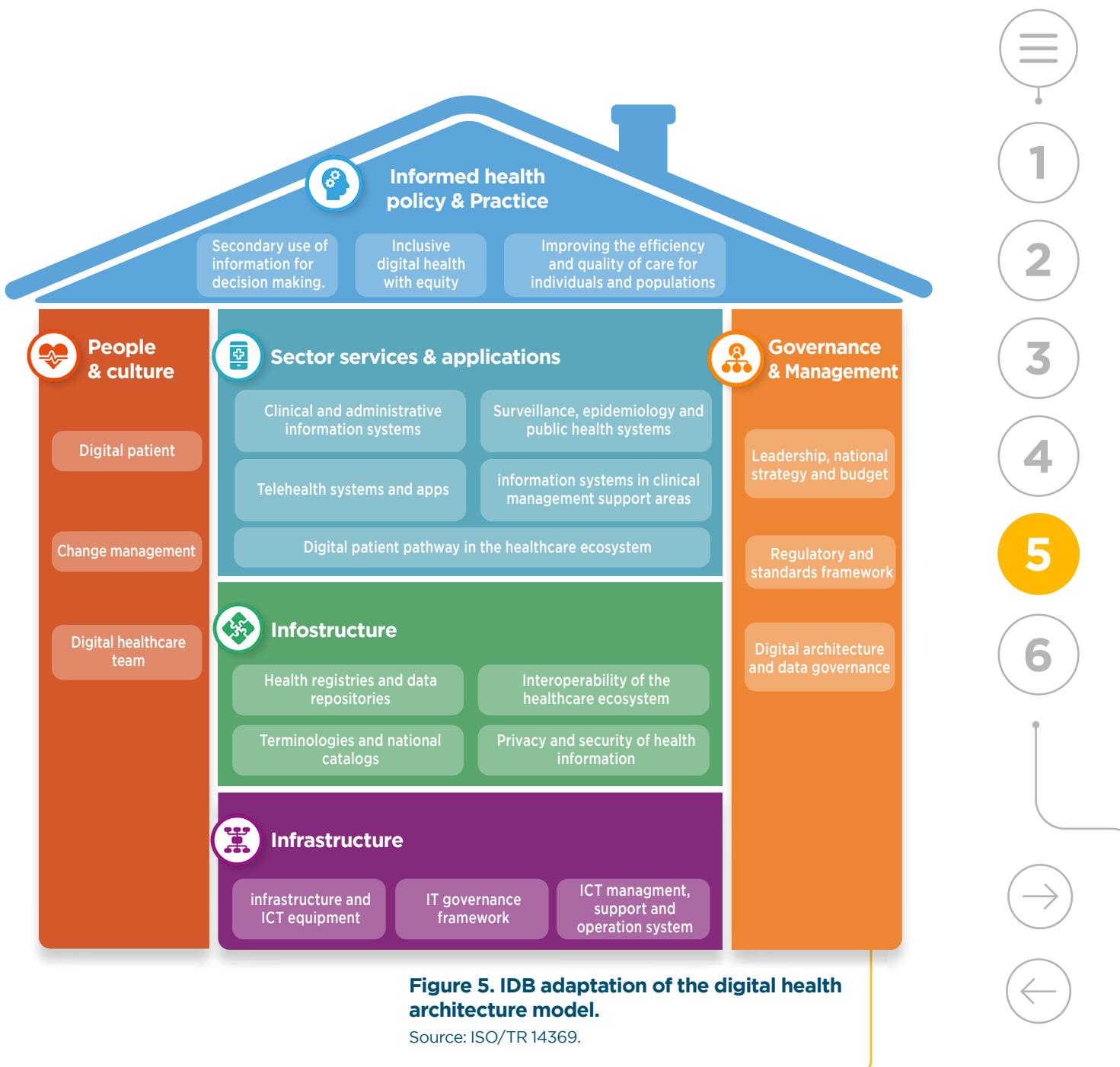
It also includes of the 8 key principles for digital transformation of the health sector, which cover topics like universal Internet access, including and mainstreaming human rights, cooperating on artificial intelligence, information security, interoperability, and the sustainability of systems, among others.

⁸⁸ Instant remote communication, decentralized information accessible to all, etc.

⁸⁹ Gas lamps or whale oil, land lines, communication by mail, etc.

⁹⁰ Installing antennae, cables, developing a standardized language, etc.

⁹¹ The roadmap’s actions and products are in line with ISO/TR standard 14639-2: 2014.



To build the house, the first step is to identify factors critical to success. What has to happen, and what do we need to have during the processes of bringing about the desired future? For example, if the house has a kitchen, the water, electricity, and drains need to be installed before the furniture.

Likewise, if we want to be able to exchange medical information between health providers, we first have to have standardized terminology and Internet access so medical information can be shared and understood by the health information systems and the healthcare teams themselves.



Figure 6. Construction of the necessary elements for the agreed vision of the future.

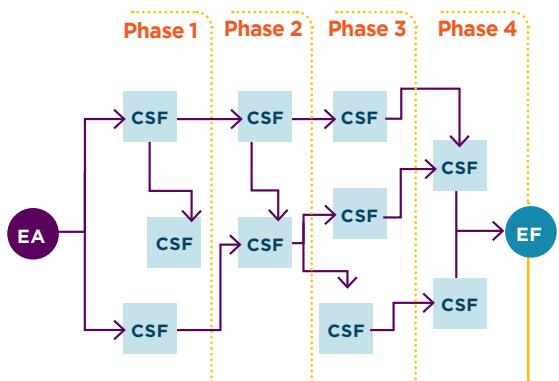


Figure 7. Identification of the dependencies between the factors necessary to achieve a vision of the future.

Here again it is crucial that the broad group of actors and stakeholders that created the vision for the future of the country's health system participate in defining these essential factors. Additionally, the interrelationships between each critical element need to be understood and addressed. To return to the kitchen example, we first have

to install the plumbing and electricity before putting in the tiling and furniture.

This house-building exercise will establish the interrelationships between actions, the timeline for implementing the DT, and the process of deploying it. The next step in the exercise is to divide the course of action into phases to start budgeting and sourcing funds for the different tasks.

This exercise shows which gains can be achieved rapidly and which tasks need to be tackled right away but will take time to bear fruit. The final product should include the portfolio of projects needed to digitally transform health, with the time it will take to implement each and the interrelationships between them. Many of these projects may be outside of the sector, but the exercise, if done well, helps identify each one and keep those responsible informed about how their actions will affect the delivery of quality and efficient healthcare services.

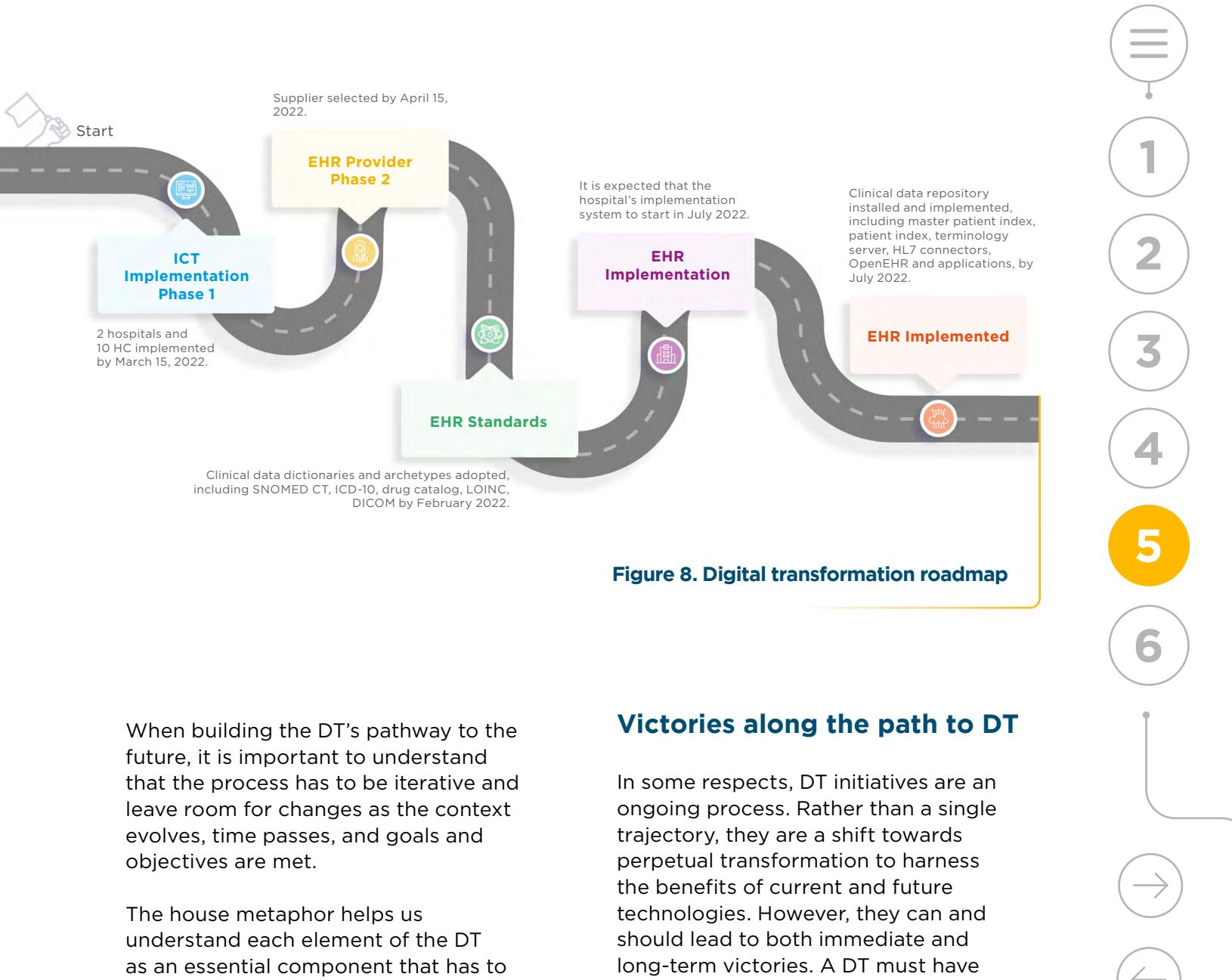


Figure 8. Digital transformation roadmap

When building the DT's pathway to the future, it is important to understand that the process has to be iterative and leave room for changes as the context evolves, time passes, and goals and objectives are met.

The house metaphor helps us understand each element of the DT as an essential component that has to be taken into account. This exercise makes it more difficult to, for example, skip over or minimize aspects related to people, like user-centric design and change management. It also puts healthcare processes at the center of the discussion to avoid giving projects a purely technological focus.

The next chapter explores each dimension in detail, but first we have to make sure there are early and substantial victories along the way.

Victories along the path to DT

In some respects, DT initiatives are an ongoing process. Rather than a single trajectory, they are a shift towards perpetual transformation to harness the benefits of current and future technologies. However, they can and should lead to both immediate and long-term victories. A DT must have holistic vision, which takes time to bring about and implement, but it also can and should yield significant short-term accomplishments and results.

On the path to a new digital ecosystem, initial steps can be just as important and significant as the end

⁹² See <https://centrodeconocimiento.agesic.gub.uy/web/salud.uy/conectat%C3%B3n-2016>.

products or system launches. One example is Uruguay's Connectathon,⁹² an "interoperability marathon" that brought together the country's top officials, hospitals, healthcare centers, and software companies to demonstrate that it really is possible to share data using standards that protect patient privacy. Chile, as part of its general Digital Hospital strategy, made important strides on the rural digital hospital⁹³ to resolve a specific access problem and reduce wait times in the remotest parts of the country, supporting technicians and connecting them with physicians in Santiago's central offices to provide better care and address health issues remotely. Meanwhile, *Project ECHO* and the *Jamaica Moves* app have seen significant and specific progress in the project's first stages in Jamaica⁹⁴.

Learn about the experience of the connectathon in Uruguay

The speed at which products can be developed depends on several factors unique to each context. The experiences of many LAC countries, especially since the pandemic, have proven that a swift response that creates key functionalities is possible. The challenge, and responsibility, is to generate sustainable actions, in favorable context, that do not require heavy spending or complex rearrangements in the future. These actions therefore have to fit into an overall vision of the health system.

Two examples of initiatives that were quickly rolled out to citizens and that aligned with countries' DT roadmaps are the launch of the [Coronavirus UY](#) app for the health emergency in Uruguay and Argentina's [digital COVID-19 vaccination credential](#). It is thus possible to fully leverage synergies, infrastructure, and services that are already available to quickly offer new, high-quality services.

All DT will have milestones, spaces for communicating and publicizing progress, subsidiary products, and even substantial products over the short, medium, and long term. The key? As the saying goes, keep your eyes on the stars (or in this case, the vision for the future of the country's health system) and your feet on the ground. It is also crucial to measure and share progress, and failures, throughout the process, and switch directions when necessary.

⁹² See <https://www.minsal.cl/hospital-digital-rural-el-debut-de-la-iniciativa-que-llevara-atencion-de-salud-a-los-rincones-mas-alejados-de-chile/>.

⁹⁴ See <https://hssp.moh.gov.jm/wp-content/uploads/2020/02/HSSP-HEALTH-SYSTEMS-CURVES-FINAL.pdf>.





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How do we know we are on the right path?

We can't afford to wait until the end of the project to evaluate whether the chosen path was effective. We need to use measurement and continuous improvement techniques to ensure the intended benefits. To proactively design a favorable outcome, we have to explicitly identify how we will measure the success of the future state. Some techniques include:

- Supervising progress and continuously making the necessary adjustments to maximize the process' value.
- Demonstrating the advantages of continuing to invest resources in DT.
- Validating the expected technological performance (both process support and the technical platform).
- Determining whether systems should be kept, adapted, or done away with.
- Deciding when the transformation is "complete."
- Learning from the DT's process and impacts (especially unexpected ones).
- Staying constantly focused on improving digital health and its potential for the country.



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XIV. Governance

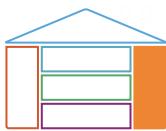
How do we organize the health system's stakeholders so each knows its role, functions, and responsibilities? How do we decide who should lead each issue related to digital health? The answer is by creating a good governance scheme.

Digital health governance involves the steps that political, administrative, and technical authorities take to manage all matters related to the health information system in all areas of the national health system.



Meanwhile, the governance structure is the mechanisms, processes, and institutions whereby all stakeholders and participants in the national health system align their interests, exercise their rights, meet their obligations, resolve their differences, and oversee the system's operation.⁹⁵

⁹⁵ Javier Carnicero y Patricia Serra, *Gobernanza de la salud digital: El arte de la transformación de los sistemas de salud* (Washington D. C.: BID, 2020). <https://publications.iadb.org/publications/english/document/Governance-for-Digital-Health-The-Art-of-Health-Systems-Transformation.pdf>.

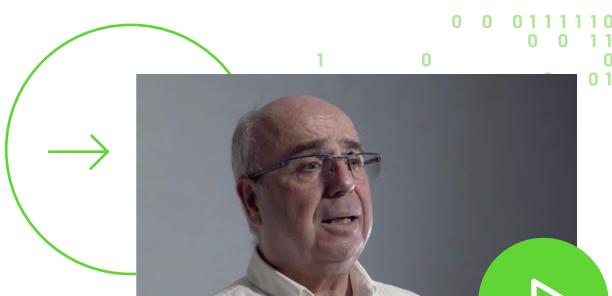


Who are the relevant stakeholders?

Each of the stakeholders in the public, private, and civil society spheres that are connected to health and the digital agenda are relevant. The chief stakeholders include (but are not limited to) the country's government; the directors of the digital health system—including system and information technology managers; hospitals, primary care centers, and other health care services; health professionals; citizens; academia; and patients.

What are their roles?

The **national government** must first have a digital strategy with a multi-year budget designed to usher all citizens and businesses into the digital age. It also should provide communications infrastructure, set goals for rolling out digital



Why is governance in digital health important especially in the context of health crises?

"The government must declare digital health as a national priority and provide precise, clear and public support for the digital health strategy [among others]."

administration, and ensure there is a pool of professionals with adequate training in related fields that businesses and government organizations can draw from. It is also the government's responsibility to promote and pass the laws needed to ensure legal certainty for all involved.

The ministry of health and directors of the health system, which are responsible for the overall health strategy, should create and implement the digital health strategy as a tool for achieving the country's health objectives. Their role includes setting objectives and goals and allocating the necessary financial and human resources.

Hospitals and primary care centers should make sure the DT brings value to patients and professionals. They also should implement clinical information systems and promote responsible use of information. It is therefore crucial for them to have a voice in decisions and to encourage professionals to participate in decision-making processes as well.

Health professionals should be involved in establishing requirements and semantic definitions based on their clinical information needs. They should also support technology uptake and propose innovations that help improve the DT.

Citizens and patients should be familiar with their health information, participate in designing the tools they will use, defend their rights, verify the DT's value, and advocate for necessary legislative changes.

The regulatory framework

Governance for digital health requires laws and standards that define the roles and responsibilities described above and that facilitate the use of technologies and digital practices in the sphere of health. There are different conceptual frameworks that lay out the type of regulations needed to advance digital health. For example, the IDB's [Regulatory framework for Digital Health in Latin America and the Caribbean](#), identifies five key areas for implementing EHRs:



1. Matters specific to EHR: what information EHRs should contain, and EHR's legal status.
2. Protecting patient data and secondary use of health information: which uses are permitted and which are prohibited.
3. Actions by health professionals: who can access EHR's information, what is its legal status, and the scope of its use.

- 4.** Role of patients in relation to their health data: whether patients can modify their data and whether they need to give consent for its use.
- 5.** Health and interoperability standards: the standards that should be followed so the information is understandable in all the different context where it is used.

The IDB's mapping exercise in the above report shows that only 10 LAC countries have regulatory frameworks that cover more than 75% of these areas. Meanwhile, seven countries address 50% to 75%, and the rest less than 50%. The IDB's [interactive platform](#) provides detailed information on the laws and regulations of the countries in the region. The platform can be used to draw comparisons between countries and access the texts of the different regulations.

In the daily routine

Beyond laws and regulations, governance encompasses and shapes the day-to-day culture and behavior of the ecosystem of people and institutions and the arrangements they need to make to digitally transform the sector. At this grassroots rather than legislative level, an example is the governance structure of the community developing

the open-source EHR system in the state of Bahia in Brazil. This [structure](#) defines roles and responsibilities for decision-making and developing AGUse, an open-source electronic health record system.



Two characteristics of the DT in health are particularly relevant to governance. First, the transformation involves many actors from different spheres that have traditionally worked in isolation. Second, it is an ongoing and long-term process. The success of any exploration depends on all participants moving forward together in harmony and in the same direction to reach the destination, and good governance is the key to achieving this.

XV. People and culture

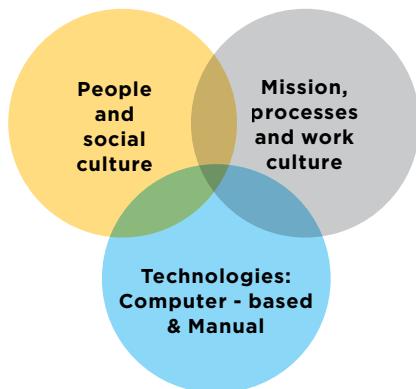
The importance of people has to remain clear while attending to each dimension of the digital house. Even if an information system is perfect, the process will fail if the people who have to use it reject it. In most fields, this rejection would mean a major loss of investment. In health systems, where people's lives are at stake, the cost would be staggering.

Studies show that globally, 35% of public sector technology projects can be considered failures, 50% partial failures, and only 15% successful.⁹⁶ This is largely because transforming a system is not about swapping one thing for another; it is about evolving towards a new reality. This is where the human factor and cultural factor plays a decisive role. Ignoring this factor is one of the main reasons why enterprises fail in the digital age. In fact, a third of decision-makers consulted in a global survey said that culture is the main obstacle to digital effectiveness, followed by people's lack of understanding of digital trends.⁹⁷

A DT's success depends on three ingredients, in equal measure: people, processes, and technology.⁹⁸

Figure 9. Three key elements for digital transformation

Source: Dowling (1985, 2018)



Indispensable

When designing and implementing this dimension of DT processes, the aim is to get health personnel and citizens to accept and use the technology by empowering them and involving them in developing and the digital strategy and putting it into practice. This aspect encompasses communication, capacity building, and organizational change management actions.

Despite their importance, people and organizational culture are too often included in DT processes as an afterthought and are frequently the first target of budget cuts.

Irresistible

New technology changes everyone's processes and ways of doing things. Without an intentional change management strategy, there will be



Learn about the key elements for successful change management in the health sector

⁹⁶ Richard Heeks, "Most eGovernment-for-Development Projects Fail: How Can Risks be Reduced?", *SSRN* 14, (March 2020): https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3540052.

⁹⁷ Goran, Julie, Laura LaBerge y Ramesh Srinivasan. "Culture for a digital age", *McKinsey Quarterly*, (July 20, 2017), <https://www.mckinsey.com/business-functions/mckinsey-digital/our-insights/culture-for-a-digital-age>.

⁹⁸ Dowling, Alan F. Jr. "Health care information systems architecture of the near future." *Journal of the Society of Health Systems*, Vol. 1, no. 2. (November 1989). <https://pubmed.ncbi.nlm.nih.gov/2519109/>.

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considerable resistance. Changes can make people feel insecure, like they are losing control, and afraid of the unknown. So, for a transition to be successful for individuals, groups, and organizations, it is essential to recognize resistance as a natural and inherently human reaction. This factor is even more important in the healthcare sector, with its broad and diverse network of stakeholders (each with their own interests) that cooperate or disagree to varying degrees⁹⁹ and that are constantly dealing with highly sensitive matters like sickness, death, and even humanness itself.



Evidence shows that projects with a well-implemented change management strategy are six times more likely to meet their objectives than those without one.¹⁰⁰ This means they are more likely to meet deadlines and stay within budget.

Fortunately, tools for implementing change management, especially in health care, have already been developed. For example, John P. Kotter's change management model emphasizes how important it is for all stakeholders to understand:

- Why they need to leave the current state and move towards the desired one.
- Why the future state is better for patients and professional practice.
- What changes in workflows (daily routines) will be necessary.
- What technologies and new skills will be required.
- How staff will learn these new skills and incorporate the new technology into their work routines.

The model gives eight steps for achieving this:

1. Create a sense of urgency based on the institution's purpose.
2. Build a coalition of professionals with different skills.
3. Draw up an information systems master plan.
4. Formalize the communication processes.
5. Train stakeholders on new tools and skills.
6. Rapidly obtain information on and an overview of the implementation's success.
7. Cement the change and set up a cycle of continuous improvement.
8. Evaluate results, review processes, document new standards and procedures, and audit.

⁹⁹ Jame W Begun et al. "Chapter 10. Health care organizations as complex adaptive systems". Advances in Health Care Organization Theory, 1st edition. Stephen S Mic y Mindy E Wytenbach, ed., Jossey-Bass, (febrero de 2003): 253-288, <https://experts.umn.edu/en/publications/health-care-organizations-as-complex-adaptive-systems>.

¹⁰⁰ See Prosci "Best Practices in Change Management" (2018), <https://www.prosci.com/resources/articles/change-management-best-practices>.



Figure 10. John Kotter's 8 steps for managing change in an organization

The Hospital Italiano de Buenos Aires estimates that up to 30% of a health information project's budget should be allocated to change management.

The IDB publication: [Irresistible: How to manage change in digital health](#) details a variety of traditional resources and tools and delves deeper into this crucial topic.

Communication and adoption by citizens

What is the best way to get citizens to adopt change? Public comment processes have been an effective tool. For example, the government of Peru used this type of process to [present its digital strategies to the general public](#) and get their point of view.

These processes require identifying which stakeholder(s) the population trusts. A survey of 10 countries in the region measuring people's level of trust in different institutions for adopting COVID-19 exposure notification apps found that people trust the WHO the most, followed by ministries of health.¹⁰¹



Figure 11. Citizen Participation Platform for the National Data Strategy in Peru

In over 15 years of digital transformations, we have learned that underestimating the barriers linked to the human factor is a common error. Understanding people's emotions and acting based on this understanding facilitates the change process and adoption of the technology, to the benefit of all involved. This dimension therefore deserves serious attention, funding, and planning from the outset.

¹⁰¹ Calculation based on data from the survey of applications on exposure alert implemented by the IDB.

XVI. Informed health policy and practice

What questions about the health system keep you awake at night?

Maybe: Who isn't receiving quality services? What drives system costs up? What treatments are the most effective for the population, and which ones should be discontinued? How do we get patients to attend their follow-up appointments? What works and what doesn't in national health care?

Whatever the question, the [right data](#) can both provide answers (and hopefully keep you from losing sleep) and help make more impactful decisions.

A DT's core contribution is providing the right information to the right people at the right time so they can take action. This includes each step of the process. Without the right information, policy designs and national health practices will be ineffective, or even catastrophic in crisis situations.

The IDB report [Detect, Prevent, Respond, and Recover Digitally: Evidence from Applying Digital Interventions in Past and Present Public Health Emergencies and Considerations for the Future](#) describes how information was the most frequent challenge during interventions in public health emergencies like Ebola, cholera, MERS, and COVID-19 outbreaks. The study identified 3 specific kinds of shortcomings: lack of quality and reliable data, communication barriers, and decisions based on insufficient information.

These challenges are not limited to pandemic situations. Information-related challenges persist, with serious consequences for the region. For



“If you do not know how to ask the right question, you discover nothing.”

William Edwards Deming

example, many national information systems still do not identify people by their name or identification number. Others lack interoperability, creating silos of duplicated data that is often poor quality. Also, the available data is frequently only used for reporting, not to make decisions about patient care, management processes, or information policies. This creates a vicious cycle of information that is poor quality because it isn't used and information that isn't used because it is poor quality.



The starting point for improvements

Designing informed health policy begins with asking questions about the problem to be solved and the needs of other key strategies like continuous quality improvement or results-based management. Without the right questions, the data collected cannot effectively inform decisions.

When the right questions about the challenges and needs are clear, the digital infrastructure and tools can be used to collect, process, exchange, and apply information to enhance the health system's efficiency and quality, and also make it learn. In other words, it can enable a system where knowledge generation practices are integrated into daily work to constantly improve care. Tools in this dimension include, for example, business intelligence dashboards; data repositories for statistics, analysis, and research; big data; and open-data tools.



Several LAC countries, including [Uruguay](#) and [Argentina](#) have created online knowledge centers for digital transformation that share content, experiences, and implementation guidelines for the national ecosystem. The PAHO portal [Knowledge Management and Access to Health Information in the Americas](#) offers technical information on policies, programs, and official documents; statistics and metrics from the scientific output of the main bibliographic databases; and trainings and workshops. Some countries have also created data analytics units to maximize the practical usefulness of the information collected. One example is the work done by the Information Management Area of the public health subsystem of the City of Buenos Aires on health information management.

To have a real impact on decision-making, these tools need to be aligned with a health analysis strategy for decision-making. Under the [PAHO's IS4H model](#), such strategy requires a systematic approach to assessing health needs and making essential information accessible, as well as advanced analytical techniques to support policy, management, and clinical decisions in real time.

Actions in other dimensions of the model for digitally transforming health, like people and culture and governance, are key to ensuring that health professionals have the skills and incentives they need to interpret and use data at all levels of the system, and that citizens have access to and are trained on using the data to improve their own health.

The following additional resources give more information and tools for achieving informed health policy and practice:

- [From Information To Intelligence: How To Adapt Institutions For Data Analysis In Government?](#) This publication describes different models for, and experiences of, public sector data analysis units.
- [Detect, Prevent, Respond, Recover Digitally: Evidence from Applying Digital Interventions to Past and Present for Future Public Health Emergencies](#). This document describes how technology was used to respond to past emergencies like Ebola, MERS, and SARS.
- The IDB's [National Maturity Model for EHR](#). This tool helps measure systems' maturity level in terms of using information from electronic health records to make decisions and perform other tasks.
- [The PAHO's Maturity Model for Information Systems for Health](#). This tool measures a country's level of maturity in managing digital health information.
- [Learning Health Systems: Pathways to progress](#). This WHO publication analyzes how we learn at the individual, team, and organizational level; why we need health systems that learn from themselves; and how to build a system that will do this.



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XVII. Infrastructure

Information and communication technology (ICT) infrastructure includes core IT technologies like networks, servers, software, and human resources, which are supported by the relevant standards, methods, directives, and frameworks. Countries most commonly address this dimension of the DT. It encompasses devices (computers, servers, personal digital assistants, tablets, smart phones) and people who administrate and operate the ICT.¹⁰²

In the health sector, this dimension includes medical technology like biomedical monitors, diagnostic imaging equipment, and other technologies.

ICT devices are connected via different network topologies.¹⁰³ These interconnections act as an organized whole and allow users to send, receive, and share data, voice, video, and messages, while also connecting them to the Internet.



The starting point for defining and structuring the digital health infrastructure has to be the country's health system model, as this will



determine the type of architecture and connectivity needed to support the ecosystem. Connectivity and architecture plans therefore must take into account and incorporate the specific characteristics of the health ecosystem, where multiple health promoters and providers and users constantly interact, generating an ever-larger quantity of data.

To be more specific, an information system's architecture shows its functions at the hardware and software level, as well as how it interrelates with other components, bodies and institutions, the health system, and users. Meanwhile, integrated health service delivery networks are often made up of different establishments (hospitals, primary care centers, specialty centers, and others) located in different geographical areas.

For example, each establishment generates health data from its different activities. Depending on the architecture used,¹⁰⁴ this data can be safeguarded in different ways. It can be centralized within the organization or distributed among different establishments, or even according to rules based on the data's characteristics like use, useful life, size, or geographic distribution.

¹⁰² There are IT governance frameworks for organizations, better known as COBIT, ISO 38500, Calder-Moir model, IT Governance Institute (ITGI) recommendations:

<https://repositorio.uide.edu.ec/bitstream/37000/4152/1/1163-Texto%20del%20art%C3%adulo-6196-1-10-20200507.pdf>.

¹⁰³ Types of network topologies and their characteristics: https://www.ecured.cu/Topolog%C3%A1A_de_red.

¹⁰⁴ TOGAF, a standard of The Open Group, is an enterprise architecture methodology and framework that are used by the world's leading organizations to improve business efficiency. <https://www.opengroup.org/togaf>.



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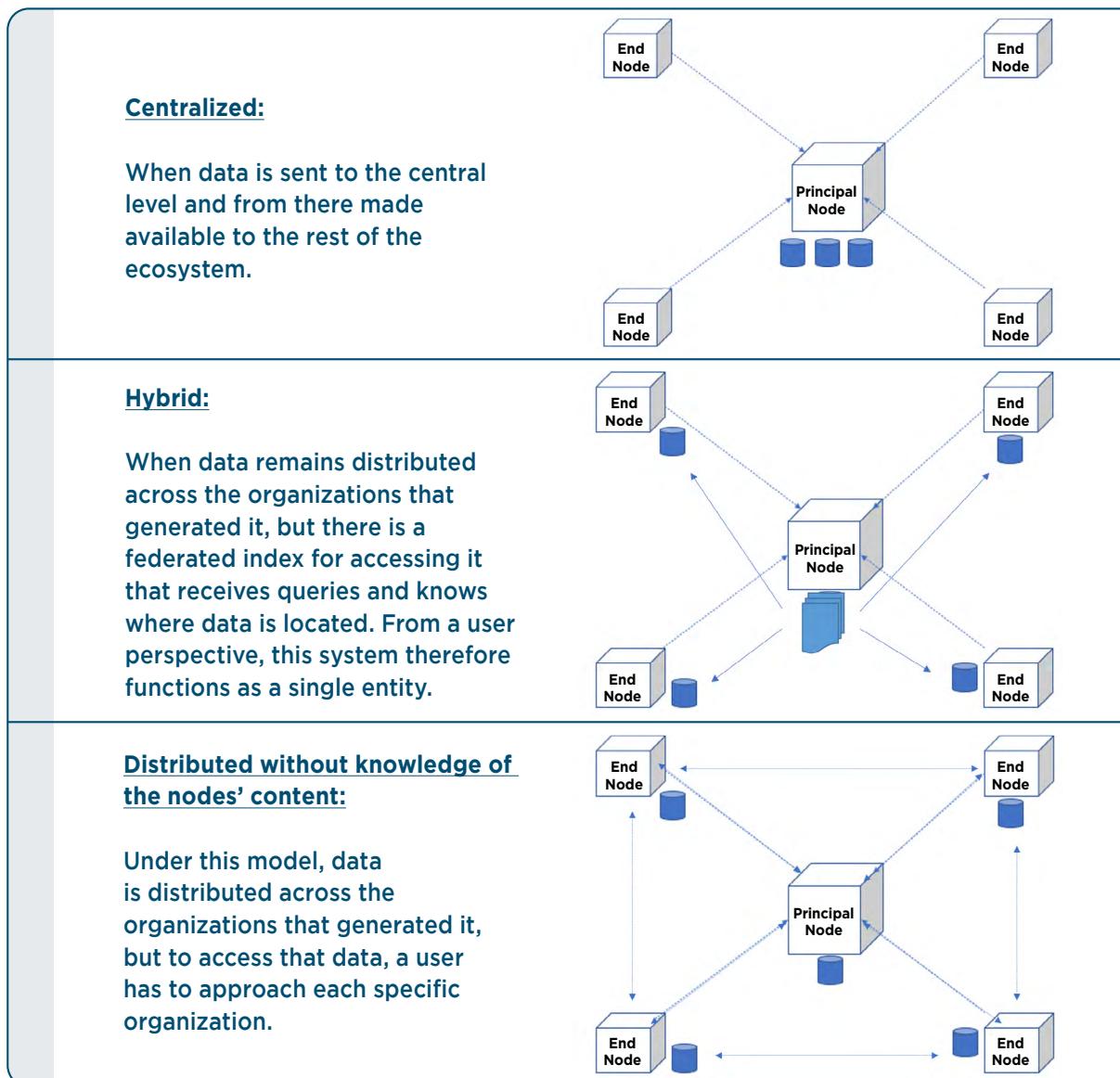
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Meanwhile, exchanging data—at the national or regional level or even within a single organization—presents different challenges that impact each government's information system

architecture. However, models for exchanging data in a healthcare ecosystem loosely fall into three general categories.

Figure 12. Three main possible scenarios of data exchange models within a healthcare ecosystem



Today, many health and government organizations evaluate and plan their architectures based on cloud computing, a technology that allows users to remotely

access software, store files, and process data online from anywhere and at any time, without having to connect to a PC or local server. There are currently 3 dominant models:

- SAAS:¹⁰⁵ Software as a Service
- IAAS:¹⁰⁶ Infrastructure as a Service
- PAAS:¹⁰⁷ Platform as a Service

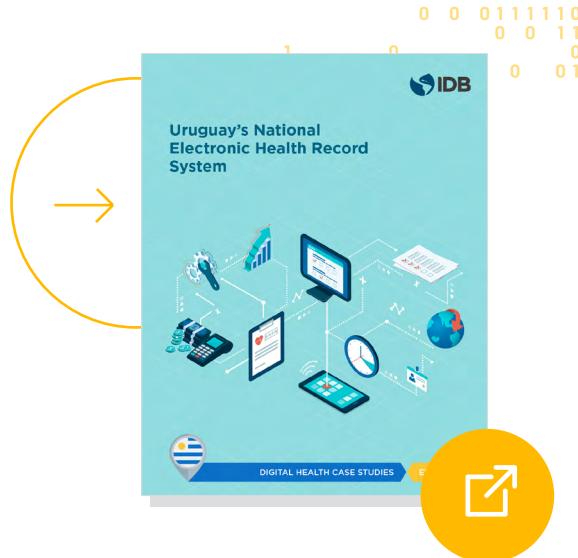
Past steps a country has taken to build its infrastructure are often a deciding factor for which architecture it will use because it is not easy to quickly switch to a different system architecture. In these cases, system designers need to identify infrastructure needs and gaps in the existing architecture to design systems based on the health service delivery model.

Each country should find its own health infrastructure solution to match its specific reality. Some, like Finland and Estonia, use centralized storage and systems. Others, like Israel, use completely decentralized storage and a hybrid architecture. Some do not even have infrastructure for exchanging information and data on a national level. In LAC, for example, Peru has a centralized database in its digital health architecture for its clinical content, while Uruguay has a hybrid model where each organization has its own systems and controls its own data.



The infrastructure for digital health should have a well-defined architecture in order to use resources efficiently. It also requires coordination between actors outside of the health sector, like ministries of innovation

or communications, to make sure basic investments are made where health services have the greatest needs. While this is a complex task, a proper governance scheme makes it easier.



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Digital health and the environment

Healthcare facilities can address the environmental impact of computers and electronics by purchasing environmentally friendly equipment that has fewer components, is less toxic, and has options for disposal at the end of its useful life. Using green [cloud computing and green software engineering practices](#) can benefit healthcare systems and the planet's health.



¹⁰⁵ Software as a service (or SaaS for short) provides users the ability to connect to cloud-based applications via the internet. It is also able to operate without the need for the support of client systems.

¹⁰⁶ Infrastructure as a Service (or IaaS) refers to online services used to address low-level infrastructure details such as physical computing resources, locations, security, backup and others.

¹⁰⁷ Applications such as databases, middleware, development tools, business intelligence services etc. can be launched on these platforms.

XVIII. Infostructure

This is not a typo. Rather, it is a [central dimension](#) of well-functioning digital health. In the field of health, infostructure^{108, 109} refers to developing and adopting information and communication technology (ICT) systems and components so patients, healthcare personnel, and other members of the health ecosystem can effectively communicate with each other and make informed decisions. While the infostructure is multifaceted, key components are interoperability,¹¹⁰ health standards,¹¹¹ and cybersecurity.



Interoperability makes it possible to share and understand a national health system's information. It involves two dimensions: the syntactical, which facilitates the information exchange itself; and the semantic, which allows the recipient of the information to correctly understand and process it and use it effectively.

Interoperability can tell you, for example, that the Pedro Pérez who visited a hospital in Bogotá today is the same person who went to an outpatient



center in Cauca a year ago. It also allows users to differentiate this Pedro Pérez from any other person, even if they have the same name, surname, or even date of birth.

Interoperability also ensures that the diagnosis, treatment, and prescription that Pedro Perez received today is recorded in a way that any other physician and information system at any other place or time can understand. This is especially relevant in the field of medicine, where diagnoses, equipment, medications, and treatments are often [given different names in different environments and by different actors](#).

Furthermore, a completely inter-operable national health system can yield major economic benefits, with net savings that can amount to 5% of all health spending, without counting indirect savings as a result of providing better medical care and the savings from the lawsuits that would be prevented.¹¹²

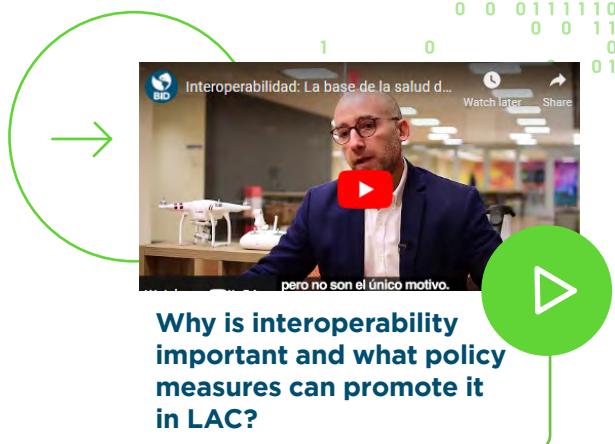
¹⁰⁸ World Health Organization and International Telecommunication Union, *Digital health platform handbook: building a digital information infrastructure (infostructure) for health*, (Geneva: ITU-WHO, 2020).

¹⁰⁹ ISO/TR 14639:2014 provides a guide to requirements and principles of best practice business principles for countries and their subordinate health authorities that plan and implement the use of ICT to support the delivery and development of healthcare. <https://www.iso.org/standard/54903.html>.

¹¹⁰ OPS, *Interoperabilidad en salud pública IS4H-KMCI*, (s.l.: OPS/OMS, 2019), https://www.paho.org/ish/images/toolkit/IS4H%20CC_InteroperabilidadenSP.pdf?ua=1.

¹¹¹ See Red Americana de Cooperación para la Salud Electrónica (RACSEL): Estándares de interoperabilidad en salud <https://socialdigital.iadb.org/en/sph/resources/toolkits/271/274>.

¹¹² Walker, Jan et al., "The value of health care information exchange and interoperability", *Health Affairs Millwood*, (January-June 2005), <https://www.healthaffairs.org/doi/10.1377/hlthaff.W5.10>.



The European Telecommunication Standards Institute (ETSI)¹¹³ proposes a system to classify the different levels of interoperability:

- **Technical interoperability.** This level generally refers to hardware or software components, with systems and platforms that allow systems to communicate with each other to exchange data but not its meaning.
- **Syntactic interoperability.** The messages, documents, and services consumed need to have well-defined syntax and coding to be interpreted by the software that receives them.
- **Semantic interoperability.** Additionally, the content can be written in different languages, like Japanese or English, and to understand the message's content, there has to be a vocabulary that both the sender and receiver know how to interpret.
- **Organizational interoperability.** Finally, there needs to be the option to generate actions through the exchanged content.

The IDB note [Interoperability for Beginners: the Foundation of Digital Health](#) gives detailed definitions, examples,

and references for each aspect of interoperability and explores the steps to achieving it, which are summed up below.

Five steps to achieving effective interoperability

1. **Establish an interoperability framework.** This framework is a set of policies, guidelines, standards, rules, and recommendations designed by a network of stakeholders to attain the highest level of interoperability.
2. **Promote the development and integration of information systems.** Adopt open solutions and provide tools or services to make implementation easier.
3. **Empower the patient.** Put patients in charge of their own information with tools that allow them to decide how their data is used.
4. **Address legal and regulatory issues.** Amend or pass laws on medical records.
5. **Develop human capital.** Properly train all system users on the technology and processes and inform them about their challenges and changes to them.

¹¹³ Hans Van der Veer y Anthony Wiles, *Achieving Technical Interoperability - the ETSI Approach* (Cedex: European Telecommunication Standards Institute, 2008). <http://goo.gl/RnJ2RB>.

Interoperability^{114, 115} and health standards¹¹⁶

It might seem utopian to envision a single national information system used by the operational and business units of all health establishments in the country. However, interoperability standards make this possible by ensuring that all information shared can be understood by everyone involved, regardless of the device or program used to access it. Using standards is important for interoperability, for scaling up systems, and, especially, for the quality of the information.

A traffic analogy helps illustrate the usefulness of standards: when a car's red lights come on, people all over the world know the car is braking, and when its white lights come on, they know it is going to back up. Whatever the car's brand or year, and wherever it is being driven, there is an agreement that applies to all manufacturers and drivers for communication and safety. That is a standard.

In the same way, the information systems that support healthcare processes also need standards^{117, 118} for each level of interoperability.

While standards have been classified in multiple ways, some of the most important are.^{119, 120}

1. Messaging standards: how do I structure a message so another system understands it?
2. Terminological standards: how do I codify the terms I use so others understand them?

3. Documentation standards: how do I structure a clinical document?

Semantic interoperability requires ordinary dictionaries or master tables. The following diagram of a care process shows which data needs to be standardized.

From a care perspective, interoperability increases a patient's safety, enhances the quality of care, and contributes to the continuity of care since it makes the patient's clinical data available during care.

¹¹⁴ "... The ability of two or more systems to exchange information and to use the information that has been exchanged..." Ref: IEEE Computer Society. Standards Coordinating Committee. *IEEE standard computer dictionary: a compilation of IEEE standard computer glossaries*, (New York: Institute of Electrical and Electronics Engineers, 1990), 610.

¹¹⁵ PAHO, *Interoperability in*.

¹¹⁶ See Digital Health Cooperation Network of the Americas (RACSEL): Interoperability standards and health. <https://socialdigital.iadb.org/en/sph/resources/toolkits/271/274>.

¹¹⁷ PAHO, *Revisión de estándares de interoperabilidad para la eSalud en Latinoamerica y el Caribe*, (Washington D.C.: PAHO, 2016), <https://iris.paho.org/handle/10665.2/28188>.

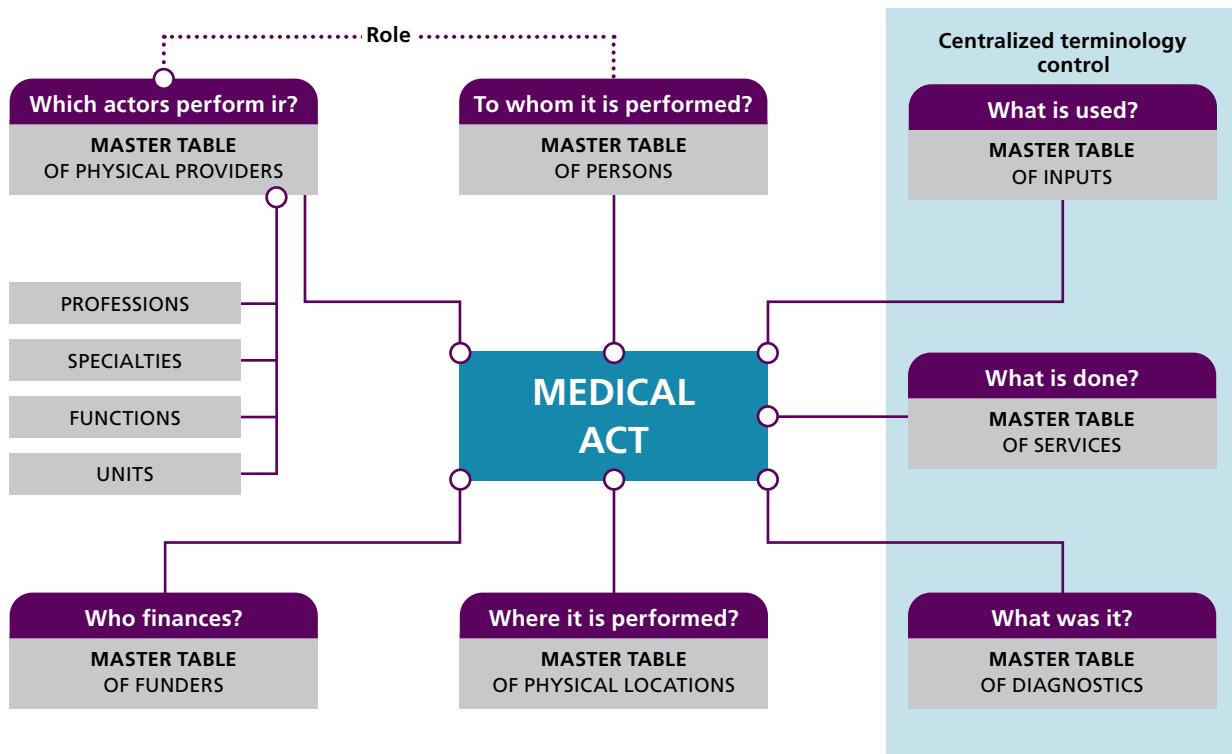
¹¹⁸ See IEEE-SA What are standards? Why are they important. <https://beyondstandards.ieee.org/generalSection1-news/what-are-standards-why-are-they-important/>.

¹¹⁹ Emilio Salvador Molé, "Introducción a Interoperabilidad y estándares en salud – Parte 2/2", *Informática en salud* (blog), February 17, <https://www.informaticaensalud.net/2019/02/introduccion-a-interoperabilidad-y-estandares-en-salud-parte-2-2/>.

¹²⁰ Funmi Adebesin et al., "A review of interoperability standards in eHealth and imperatives for their adoption in Africa", *South African Computer Journal*, 50 (July 2013): 55-72, <https://pdfs.semanticscholar.org/9f2e/cae4dbb143aad6afb8db0ee907348d04db4a.pdf>.

Figure 13. Anatomy of the medical act.

Source: Hospital Italiano de Buenos Aires.



121

Cybersecurity

The health sector was among the most frequently targeted by hackers in 2019. It is also the industry that has experienced the [most damaging attacks in recent years](#). The average cost of a cyber-attack on the health sector in terms of lost business and money spent on preventing, detecting, and recovering from the attacks is \$7.13 million. Meanwhile, the average cost of a cyber-attack for all other industries is \$3.86 million.¹²²

How do we start protecting health information?

There are four groups of tools that help improve systems' cybersecurity: frameworks, controls, guides, and the regulatory framework.

Frameworks equip organizations to carry out different information security activities in a systematized and controlled way. Controls are technical security or management measures taken to meet different information security objectives. Account management is one example. The regulatory framework includes compulsory regulations and optional standards that govern behavior and establish how organizations must act. Lastly, guides are practical

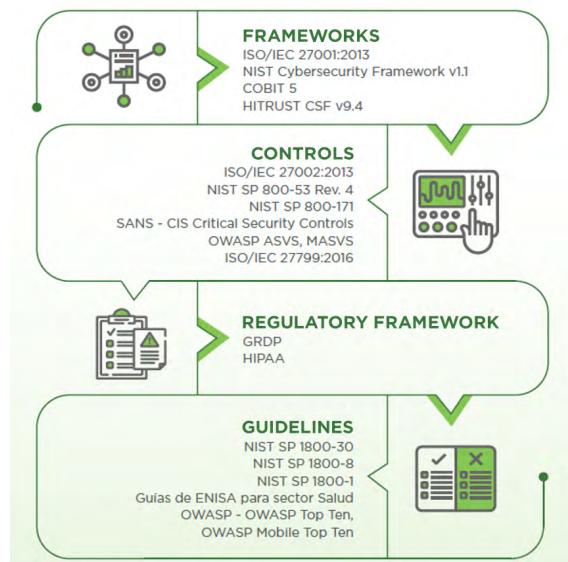
¹²¹ Daniel Luna et al., *Sistemas de Información para la Salud*, (Buenos Aires : Hospital Italiano de Buenos Aires, 2018).

¹²² Pablo Alzuri et al., *Protegiendo la salud digital: Una guía de ciberseguridad en el sector de la salud*, (Washington D. C.: BID, 2021), 6.



tools for addressing specific problems. For example, the guide [NIST SP 1800-8](#)¹²³ lays out how to administer assets, protect against threats, and mitigate vulnerabilities in wireless infusion pumps.

Figure 14. Summary of the main frameworks, controls, applicable regulations and guides..



7 key steps for cybersecurity:

1. Include cybersecurity as one of the organization's strategic management priorities. An example is setting the goal of achieving ISO/IEC 27001 certification for critical processes.
2. Define the organizational structure for cybersecurity. The organization needs to designate at least one information security officer and an information security committee.
3. Define the cybersecurity objectives and goals.
4. Assess the situation by performing a GAP analysis. The IDB has developed different tools to facilitate that assessment, including an industry best practice [self-assessment tool for the health sector](#), based on the NIST cybersecurity framework.⁴
5. Create a cybersecurity master plan. This plan should include the information security objectives, specific goals, and a portfolio of products/services.
6. Execute the master plan. The information security officer should monitor the plan's implementation, analyzing the management indicators and associated risks.
7. Evaluate the results and remaining risk. The results of implementing the plan should be evaluated periodically by analyzing their impact.

¹²³ Gavin O'Brien et al., "Securing Wireless Infusion Pumps in Healthcare Delivery Organizations", *NIST, 1800-8*, (agosto de 2018), <https://csrc.nist.gov/publications/detail/sp/1800-8/final>.

Those creating a national infostructure platform have to work collaboratively with the ecosystem, define a national interoperability framework, jointly design the core components for exchanging healthcare information, and establish a national framework of standards to be used, among other actions. This synergy, and spaces for sharing knowledge for a common objective, help the health system itself grow and are part of the effort to improve the quality of people's health care.



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XIX.

Applications and digital services for the sector

Improving mission-critical healthcare processes by digitally transforming the sector requires developing, integrating, updating, maintaining, and deploying a range of information domains or software applications that are key to those processes' functionality. A variety of IT components serve this purpose, such as EHR systems and applications for telemedicine, community health, epidemiological surveillance, self-diagnosis, or contact [exposure notifications](#). However, it is important to understand that no one software system can meet all needs, so the system's enterprise architecture is important. If we use the analogy of a house, applications and services would be the different rooms—with their own specific uses—, and the enterprise architecture would be the blueprints showing each room's function and how it connects with the rest of the house.

Paradoxically, the most important consideration with regards to these applications is not digital at all: no software solution will magically fix bad or nonexistent processes. Identifying and designing solutions to the pressing problems of a country's health system is a job that first has to be done in the analog world before the digital one. This task is closely tied to the [governance](#) of the health system and of digital health. Similarly, digital advances need to align with the country's overall health strategy at all times so technology does not become an end in itself.¹²⁴ This section will explore two of the main applications: EHR systems and telehealth applications.

For a digital healthcare system to work effectively, it needs other applications besides EHR systems and telehealth solutions. Also crucial are the human resource management system, the



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Nothing makes a bad business process worse than putting a bunch of tech around it.”

Phil Bertolini

pharmaceutical and dispatch system and other similar systems, the information system for integrating medical imaging, the national disease registry, public health monitoring systems, patient portals, and numerous others. Additionally, many health sector applications, can utilize services from other sectors, like identity documents or digital signatures. All of these applications should work in a synchronized way via the [organizational architecture](#).

The [IDB Digital Health Solutions platform](#) shares examples of initiatives and projects, many led by LAC governments, and also allows any person or entity to share solutions with the digital community.

¹²⁴ (CEPAL) et al., *Manual de salud electrónica para directivos de servicios y sistemas de salud. Volumen II: Aplicaciones de las TIC a la atención primaria de salud*, (s.l.: CEPAL, 2014), <https://www.cepal.org/es/publicaciones/37058-manual-salud-electronica-directivos-servicios-sistemas-salud-volumen-ii>.

EHR systems

There are currently different conceptions, terms, and definitions of what an [EHR system](#) is. This often creates confusion. It can be helpful to learn what this type of system can do in order to gain an understanding of what it is. The table below provides key examples of how it works.



Example functions of an EHR system	
Function	Example of how it works in a basic EHR system
Health information and data	
Functions related to recording information about the patient. For example: demographic data, problems, medications, clinical notes, medical history, and follow-up.	The authorized provider at a public healthcare institution enters information in the EHR system. The provider can see information about the patient in real time from providers from different public or private institutions. The information that the provider updates is also available in real time to other providers with electronic access to the information.
Entering/managing orders	
Functions related to entering and storing prescriptions, tests, and other services to enhance legibility, reduce duplicates, and handle orders faster.	The authorized provider at the public institution enters the information in the EHR system . The provider can see information about previous prescriptions from other providers at different institutions in real time. The provider puts in an order at the patient's pharmacy, and, in real time, the pharmacy confirms whether the medication is available so the patient can come pick it up.
Managing results	
The ability of providers to evaluate and use information on old and new patients from different sources to improve medical care processes and strategies, like imaging and laboratory diagnoses.	The authorized provider at the health center requests a lab test and an x-ray. In the patient's EHR, the provider can see information about prior tests. They see that the patient recently had one of these tests done, so it does not need to be done again. The provider reviews it in the EHR system and refers the patient to a specialist at a different medical institution. The specialist can see all prior results.

<p>Ability to use reminders, messages, alerts, and computerized decision-making support systems to improve compliance with clinical practices and ensure regular checks and other preventive practices. Some examples can be: warnings about drug interactions or contraindications, highlighting out-of-range levels in tests, and real-time reminders about interventions according to guidelines or explorations.</p>	<p>The supplier enters a prescription in the EHR system. The provider receives, in real time, an alert from the clinical decision-making support tool that a prescription written by a different provider from another institution is contraindicated for use with the one just prescribed. The patient is prescribed a different medication.</p>
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Source: United States Institute of Medicine (2003); table structure from DesRoches, Campbell, Rao et al. (2008) at <https://socialdigital.iadb.org/en/sph/resources/research-publications/5006>.

A key step in determining whether an application is right for the system being developed is comparing and reviewing evidence about its effectiveness. For EHR systems, it is important to bear in mind that the current literature often focuses on success factors linked to specific applications not necessarily found in all EHR systems: for example, computerized clinical decision support systems (CDSS) or computerized provider order entry (CPOE). For this reason, the IDB developed a [tool for measuring and comparing the features](#) of EHR systems based on international standards.

Another [essential step](#) in developing an [EHR system](#) is deciding whether the systems should be purchased, built from scratch, or adapted from an existing solution. The [IDB Guide to Open Source Electronic Health Records](#) provides detailed information about [this software](#) and the benefits of using it for healthcare, with special emphasis on EHR.

Meanwhile, the report [Electronic Health Record Systems: Definitions, Evidence, and Practical Recommendations for Latin](#)

[America and the Caribbean](#) covers the fundamentals and technical details of implementing EHR systems. [Among the topics it covers](#), it gives the following recommendations to LAC countries as they consider investing in an [EHR system](#):

1. Understand your current state: what systems are implemented in the country, what standards are followed, and what functions do they serve, etc.
2. Formally adopt a clear definition of an [EHR system](#).
3. Create the business case for [EHR systems](#) for your context.
4. Study and share your results.
5. Do not digitalize bad processes.
6. Design with the user.
7. Build an inter-disciplinary team.
8. Intentionally plan the transformation as part of the strategy.



Telehealth

Telehealth encompasses a wide range of technologies that [healthcare service](#) provider institutions use to serve populations that in most cases are geographically distant. Telemedicine, on the other hand, is the use of IT and telecommunications to hold synchronous or real-time medical appointments between health professionals and their patients. Telehealth services include: telemedicine (which could include telepathology, teledermatology, telecardiology, teleoncology, or other specialties), telecare, telementoring, mHealth (mobile health—healthcare assistance using mobile devices), remote patient monitoring, tele-surveillance, telediagnosis, and many other services.

Telemedicine is not new. From 2005 to 2016, countries that invested in remote public care achieved surprising results, eliminating 70 to 80% of transfers of patients to specialized or higher-level healthcare centers, saving 10 to 15% of the municipal health budget, and receiving 10,000,000 second opinions on electrocardiograms and imaging tests.¹²⁵

The pandemic reaffirmed the relevance of this set of technologies, which allowed care services to continue, especially for non-communicable chronic diseases and mental health conditions.¹²⁶ A survey conducted in the United States in April 2020 by the American Telemedicine Association (ATA) found that 97% of primary care doctors used telemedicine to treat patients, and more than three quarters of them stated that telemedicine helped provide better care. Meanwhile,

83% of patients surveyed indicated that they will potentially continue using telemedicine after the pandemic.¹²⁷

Furthermore, in LAC,¹²⁸ telemedicine offers major potential to improve the efficiency of healthcare. For example, estimates indicate that it could eliminate 60% of emergency room visits, a very important achievement considering the fact that many hospitals in the region do not have enough staff or resources to meet the demand for care.¹²⁹

¹²⁵ Sebastian Garcia Saiso et al., “Barreras y facilitadores a la implementación de la telemedicina en las Américas”, *Rev Panam Salud Publica*, 45, (octubre de 2021), <https://iris.paho.org/bitstream/handle/10665.2/54981/v45e1312021.pdf?sequence=1&isAllowed=y>.

¹²⁶ Ibid.

¹²⁷ American Telemedicine Association, “The Adoption of Telehealth” (2020), <https://www.americanteamed.org/wp-content/uploads/2021/05/Adoption-of-Telehealth.pdf>.

¹²⁸ In Colombia, for example, there were more than nine million telemedicine appointments since the start of the COVID-19 pandemic, increasing virtual shifts by more than 7,000% compared to the previous year. See: Federación Latinoamericana de la Industria Farmacéutica, *Recorrido por la telemedicina en América Latina*, 4 de noviembre de 2020. Disponible en <https://fifarma.org/es/recorrido-por-la-telemedicina-en-america-latina/>. In Chile, according to the analysis of the Statistics and Data Generation Unit of the Superintendency of Health, in the period between March and October 2020, 198,854 telemedicine consultations were made. See: Superintendencia de Salud, Gobierno de Chile, 2020. Disponible en <https://www.supersalud.gob.cl/prensa/672/w3-article-19740.html>. In Argentina, it doubled the number of public centers with telemedicine health services and the National Ministry of Health provided the provinces with necessary technical equipment (computers, TV, camera and service of video call). See: <https://www.argentina.gob.ar/noticias/durante-la-pandemia-se-duplico-la-cantidad-de-centros-publicos-con-servicio-de-telesalud>.

¹²⁹ Willis Towers Watson, Encuesta “2021 Global Medical Trends”. Disponible en <https://www.willistowerswatson.com/es-AR/Insights/2020/11/encuesta-2021-global-medical-trends>.



The webinar [Telemedicine during the COVID-19 pandemic: Lessons learned one year later](#), organized by PAHO and IDB, shares the experiences of four countries in the region that were able to successfully expand telemedicine. It offers their challenges, successes, and opportunities for improvement as resources for other countries in the region.

However, using telehealth and telemedicine on a large scale requires overcoming technological, human and social, psychosocial and anthropological, governance, and economic barriers. For this reason, it is important to plan and implement these strategies in an organized way as part of a long-term national digital health strategy and with a comprehensive approach that includes each of these aspects.

To help countries and institutions assess their level of maturity before launching telemedicine services, the IDB partnered with the PAHO to develop a [tool](#) that scores institutions' level of maturity for introducing remote medical care on a scale of 1 to 4.

Another important resource in this area is the WHO report [eHealth in the Region of the Americas: Breaking down barriers to implementation](#), which shares key findings from the WHO's Third Global Survey on eHealth and key recommendations in different areas.

The array of applications and digital health practices is very broad, and achieving widespread use of a tool is a highly complex endeavor. However, there is consensus on some aspects that are essential to success. All applications must:

- Be aligned with the governance environment and digital health policy.
- Have sustainable public and/or private funding.
- Tangibly address an unmet and priority need.
- Ensure ease of use, interoperability, and adaptability.
- Include the end-user at each stage of the development process.
- Be implemented by all stakeholders and actors, after first training and motivating them to undergo the change the tool entails.

On a more general level, there are two preconditions for using any tool or practice, especially in LAC countries. First, it is crucial and urgent to address the digital divide that excludes a significant portion of the population. Second, an application will not solve structural problems in the medical care system, such as institutions that lack a strategic vision, clear clinical processes, or governance. These problems should be addressed prior to or in parallel with the implementation of a digital health application.





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More telemedicine, less carbon emissions?

As part of their push to lower their carbon footprint and increase climate change resilience, countries should take full advantage of the potential sustainability opportunities that DT processes offer. A systematic review¹³⁰ showed that telemedicine reduces the carbon footprint of medical care (by between 0.70 and 372 kg of CO2 emissions per appointment), primarily by reducing transportation-related emissions. However, these numbers are very context-specific, and it was found that carbon emissions produced by using the systems inherent to telemedicine were very low in comparison. To successfully implement telemedicine services, there needs to be more research into the specifics of each context and into possible knock-on effects.

A major area of opportunity

One field in which the benefits of technological tools have gained wider recognition is mental health care via telemedicine. The COVID-19 health crisis demonstrated the exponential value of this modality. Movement restrictions forced providers and patients to look for ways to access and provide care in a safer way, with everything from therapy to meditation sessions done by video call. This comes as no surprise, given the rise in mental health problems during the

crisis. [In fact, in June 2021 in the United States, 60% of diagnoses treated using telemedicine were related to mental health.](#)

Of these, 28.3% were generalized anxiety disorder, 23.6% were major depressive disorder, and 18.3% were adjustment disorder.

In upcoming years, the region must explore new and substantial ways for its health sector, in particular, and public services, in general, to address its population's mental health. During the pandemic, telemedicine was an essential bridge that allowed care to continue. There is now an opportunity to build on the progress made and the reinvent online and hybrid models that enhance access to assistance and care, as well as their outcomes and affordability.



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¹³⁰ Amy Purohit et al., "Does telemedicine reduce the carbon footprint of healthcare? A systematic review", *Future Healthcare Journal* 8, no.1 (marzo de 2021), <https://www.rcpjournals.org/content/futurehosp/8/1/e85>.

XX. Me, the patient

When we, the patients in LAC, are asked what we think of our health systems, the major areas for improvement become clear. Eighty-eight percent of us believe that our country's health system needs fundamental changes in order to function better, and only forty percent characterized the quality of service as "very good" or "excellent."¹³² To be more specific, we repeatedly demand better access to services and better use of our information to create a more efficient and higher quality system. More than half of us report not being able to schedule doctor's appointments digitally, and we don't think medical specialists have enough information on our medical history from our primary care providers.¹³³ Naturally, this situation exasperates us. We know our medical information exists because we've shared it a thousand times. We also know there are technologies that streamline the use of that information because almost all of us have a cell phone and use it daily.

In this context, the age of [digital health](#) holds great promise for us. We hope digital transformation brings health systems that are more centered on us and our needs and that offer services that are higher quality, more efficient, and more accessible. We hope digital health is indeed a step towards further "democratizing" health care¹³⁴ to give us increasing access and direct control over our health information and let us take a much more active role in our care. We hope digital health fuels a more equitable approach that puts patients, in all our diversity, at the center of health care.

I, a patient in the digital age, should have an up-to-date, reliable, and easy-to-access medical file with my health information. The results from my medical consultations, lab tests, and

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“For just as Gutenberg democratized reading, so there is the chance that smart phones will democratize medicine. That will ultimately be achieved when each individual has unfettered, direct access to all of their own health data and information.”¹³¹

Eric Topol

imaging should be close-at-hand. I should be able to schedule a doctor's appointment or submit insurance claims with just one click.



Hear from an end-user
of digital health in
Uruguay

¹³¹ Eric Topol, *The Patient Will See You Now: The Future of Medicine Is in Your Hands*, (New York: Basic Books, 2015).

¹³² BID, *Desde el paciente: Experiencias de la atención primaria de salud en América Latina y el Caribe*, (Washington D. C.: BID, 2018), el estudio incluye datos de Colombia, Mexico, Brazil, El Salvador, Panama and Jamaica..

¹³³ Ibid.

¹³⁴ Topol, Eric. 2015. *The Patient Will See You Now: The Future of Medicine Is in Your Hands*. New York: Basic Books.



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With telemedicine solutions, I, the patient, should have more efficient access to healthcare services, especially in areas of the country where there are few professionals or specialized services. I also know that digital solutions can make it easier for me to access educational content on preventing diseases and promoting health that helps me keep better track of my health, especially if I, like millions of my peers, suffer from a chronic disease requiring constant monitoring. During the pandemic, I clearly saw how digital tools can help me access key public health information on how the virus is spreading and how to stop it, and how they can help me better manage my testing or vaccination certificates. In the age of digital health, I, the patient, know that I can feel more empowered. I know that thanks to digital health, healthcare personnel will have access not only to my medical information and file, but also to the most up-to-date knowledge to give me higher quality service, the most novel diagnostic tools, and information on the effectiveness of possible treatments.

So I, like many of my peers, demand more and better digital health in my country. While there is still little data, well-functioning digital health is a reality in many countries in the world. In Canada, for example, 91% of users surveyed during the pandemic were satisfied with their online healthcare experience, and more than three fourths (76%) are willing to continue receiving health care in that way after the pandemic.¹³⁵ My Canadian neighbors see digital healthcare services as especially positive when it comes to care for chronic diseases or routine processes like renewing prescriptions, accessing test results, and accessing their medical history and records from anywhere and at any time.¹³⁶

For me, and my friends and family across Latin America and the Caribbean, the pandemic marked an important shift in our perception of digital health. An IDB study

shows that 60% of us that were surveyed are willing to share their health data to combat the virus, provided it is done in a safe and protected environment and it benefits them, their family, and their community. More than 70% of patients like me said they were willing to install apps for reporting symptoms, 75% asked for digital solutions for receiving information on virus exposures, and more than 85% approved using technology to ensure that social distancing and lockdown measures are properly implemented.¹³⁷

I, the patient, am also aware of the risks and possible limitations in the age of digital health. My first concern in this new world is about ethically and safely processing my health data. Protecting personal and sensitive data is one of my main demands. Like many of my peers, I want legal and technical guarantees that this will happen. I also know that digital health can be a challenge for certain groups of patients who face obstacles like difficulty accessing the Internet or devices or poor technological skills. For certain groups and patients, like older people or people with fewer digital skills, digital health can be intimidating, so we need to find solutions tailored to each user group and always combine digital channels with traditional, in-person modes of health care. I, the patient, demand that digital health be for all of us.



¹³⁵ Canada Health Infoway, "Consulting Canadians on the Future of Their Health System: a healthy dialogue", (noviembre de 2020), <https://www.infoway-inforoute.ca/en/component/edocman/resources/reports/3850-a-healthy-dialogue-executive-summary>.

¹³⁶ Government of Canada, "Digital Health Services Survey: What We Heard from Canadians", Competition Bureau, (febrero de 2021), <https://www.competitionbureau.gc.ca/eic/site/cb-bc.nsf/eng/04573.html>.

¹³⁷ IDB, 2021, encuestas a usuarios sobre salud digital.

CONCLUSION

The region is at a complex juncture where fiscal constraints force governments to make difficult decisions and prioritize some expenses over others. These decisions are most likely made amid debates about whether to make long-term investments or spend on short-term emergencies: Do we buy vaccinations and medications today, or embark on a DT process?

This publication argues that **digitally transforming health is a must rather than an option**. Spending on health in LAC is on the rise, and without good information systems, inefficiencies will continue to exacerbate this trend. Furthermore, countries run the risk of attempting a DT and failing. In this case, they will have shelved critical short-term investments, while at the same time failing to achieve long-term results. The purpose of this publication is to share the experience of the IDB and international digital health experts on how to complete a successful DT in health.

This document shows that we have learned a lot about both successes and failures in digital transformation, and we have turned those lessons into guidelines to improve the design and implementation of digital transformation projects in health. Additionally, the growing number of recent studies find largely positive outcomes for the different elements of DT in health. The most recent evidence shows even more encouraging results, which could mean we are learning and improving with

each process. Throughout this guide, we used a phrase critical to successful DT in health: well-implemented. This phrase encapsulates the great potential of these processes to improve the quality and efficiency of health care in the region. At the same time, we must ensure the DT does not deepen the region's already profound inequality.

How can we implement a digital transformation of the health sector process well?

The steps recommended here are not steeped in new technology. They do not focus on artificial intelligence or block chain. Rather, they are based on a disciplined use of common sense. This does not make the process simpler. On the contrary, a DT requires a serious intention backed by strong and ongoing commitment from the state.

DT is a long-term processes, and the countries that have done it the best worked on it for more than a decade. But there are also many early victories along the way that will help countries stay the course and bring improvements to the population and entire health ecosystem.

So...

- Let's start today with a clear vision of the system we want to achieve, centered on people, not technology—a multidisciplinary and multi-sector vision based on the eight guiding principles for digitally transforming health.



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- Let's get a clear and objective idea of the current state of the national health system, and let's build the path that will take us to the desired future. This path must have buy-in from all actors and users to avoid constant and wearying shifts in direction that lead us farther from our destination.
- Let's assemble and integrate all the components we need, including infrastructure, infostructure, informed policy and practice, governance, people and culture, and health-specific applications.
- Let's give patients, who are at the epicenter of this fundamental change, a voice and broad participation in the process.
- Let's work together as a team: private sector, government, civil society, academia, and international development partners. Only by combining the knowledge of different institutions and countries will we be able to move forward. The IDB has developed broad technical capacity and experience in supporting countries on their DT journey. It also has strong

alliances with other multilateral organizations, especially the PAHO, and with partner institutions, like the Hospital Italiano de Buenos Aires and CETIC.br, among others, and countries like Israel and South Korea.

Several countries from the region have proven that success is possible. Despite the current complex socioeconomic situation, countries should build on the progress made so far and give priority to digitally transforming the sector to bring it into the digital age and ensure that current and future health systems do not repeat the long-running failures of the past. This starts by focusing not on the type of technological system to be built, but rather on the types of societies that countries want to build.

In his TED talk in 2015, Bill Gates did more than warn that the next global crisis would be caused by microbes rather than missiles. He also said it would be a recurring threat. Today, most of the international community agrees. By the next health emergency, the region should be fortified and well prepared to face it. Building this preparedness can start today.

EPILOGUE: One day, in the future state...

Dr. Fernandes

CMIO, Ministry of Health

Chair of the Regional Public-Private Commission for Inclusive Digital Health

Opening Remarks

REGIONAL ANNUAL DIGITAL HEALTH CONNECTATHON OF LATIN AMERICA AND THE CARIBBEAN

It is an honor and a privilege to kick off this event by sharing with you how the efforts to strengthen the foundations of digital health in Latin America and the Caribbean have borne fruit.

First, thanks to improved regional public health surveillance systems, we were able to detect and prevent the spread of the X Virus, preventing the devastating effects of previous pandemics, like COVID-19.

Also, 85% LAC's citizens have expressed their satisfaction with the digital services offered by their governments to enhance the quality and efficiency of medical care.

This year, we reduced prescription errors by 47%, and we screened 76% of the region's population for high blood pressure and diabetes, with the help of digital tools on cell phones, helping detect new cases so we can intervene early.

We have saved citizens time and money by safely expanding telehealth services, focusing on promoting medical care and prevention.

We have helped combat burnout in medical workers, providing them confidential telehealth services for mental well-being and behavioral health.

Some countries have significantly expanded the use of online appointments, electronic prescriptions, and home deliveries of treatment. Others have empowered community health workers in remote areas with digital tools that

support their decision-making processes and improve the quality of home care visits.

Finally, this year, we received the recognition of the world's most digitally secure region.

But we are not even close to being done with this process.

Our task force on software as a medical device has been studying gender bias in recommendations for heart patients. Although we have identified the problem in the design phase, we have not yet corrected it in the implementation.

While the pilot programs for using machine learning technology in skin cancer screenings at public healthcare centers have yielded important lessons, there are still serious obstacles for diagnosing lesions in dark-skinned patients.

Meanwhile, a new regional search engine is being developed to allow people with disabilities to find accessible websites, but there is still much work to be done, in partnership with the business sector, to ensure inclusive software is built into more devices and mobile apps. Our emerging technologies task force is just getting started.

Even though we have reduced the digital divide by 32%, there is still work to be done! For that reason, I am pleased to announce that next month, our new Director of Inclusion will spearhead this region-wide effort.



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In the area of interoperability, we've made great strides on our Pan-American Highway for interoperable health data. Now 94% of countries have adopted national standards for interoperability, and last year 15 countries successfully exchanged patient summaries to improve continuity of care in cross-border telemedicine.

This year's Connectathon focuses on social determinants of health. In addition to the health sector, we now have the participation of representatives from public and private services in education, labor markets, and social protection. This crucial step allows us to maintain a complete approach to the population's health, rather than just limiting ourselves to medical care.

I would like to thank all stakeholders in the region for their efforts to continually improve the health systems and for their commitment to equity and digital inclusion in this sector.

But I would also like to ask you to join me in taking a moment to thank and congratulate everyone who, over the years, made it possible for us to be here today: decision-makers, government leaders, professionals, businesspeople, patients, multilateral organizations, and civil society associations that actively championed digital transformation processes to improve health, despite obstacles, setbacks, budget constraints, rapidly changing evidence, political costs, and the effort it required.

I leave you with one of my favorite quotes from political theorist John Homer Schaar: "The future is not some place we are going to, but one we are creating. The paths are not to be found, but made, and the activity of making them changes both the maker and the destination."

I can't wait to see what we will create next.

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