

# 30 Critical Concepts for Fighting COVID-19 in the Age of Digital Interdependence

| DIGITAL TRANSFORMATION TOOLKIT  
*KNOWLEDGE TOOLS*

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# PAHO



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## 30 Critical Concepts for Fighting COVID-19 in the Age of Digital Interdependence

**IMPORTANT NOTE:** *Keep abreast of the latest information on coronavirus disease (COVID-19) through the [PAHO](#) and [WHO](#) websites and through your national and local public health authorities.*

### Why **understanding** these **30 concepts** is key during and post COVID19?

As millions of people around the world are quarantined or in physical isolation, with border closings and restrictions in travel, Information Technologies (IT) have become the main means of interaction and communication. Suddenly, Digital Health and related concepts have begun to appear in every conversation related to the Health Systems' response to the pandemic. And despite being longstanding concepts, the current situation has elevated them to the forefront of all discussions and decision-making about the pandemic response.

Digital transformation	Interoperability	Digital contact tracing	Electronic Health Records	Electronic Medical Records
Technology Readiness in Public Health	Public Health Information Architecture	Universal connectivity	Digital cooperation	Digital Inclusion
Patient Portals	Standards	Blockchain technology	Artificial Intelligence	Machine learning
Chatbots	Bluetooth vs GPS location apps	Bandwidth	3g/4g/5g Networks	Internet of Things (IoTs)
Predictive Analytics	Big Data (Including mobility apps)	Data Governance	Data Disaggregation	Data Visualization
Data Warehouse	Data lakes	Open Data	Data Privacy	Infodemic

Concept	Description	Why it is important in the response to the Pandemic
<p><b>Digital Transformation</b></p>	<p>Digital transformation for health means <u>positioning the public health sector at the vanguard in the age of digital interdependence</u>, and not simply digitizing or utilizing more hardware and software in health care delivery. It requires high-level commitments to improve data-driven solutions and whose focus is people-centered care.</p>	<p>Digital tools have guaranteed the continuity of care for many acute and chronic conditions through the use of telemedicine; as well as enabled smarter logistics to meet the increased demand for medical supplies and equipment.</p>
<p><b>Interoperability</b></p>	<p>Ability of different information systems, databases, software applications, content, and networks to communicate, to exchange data and information accurately, effectively, and consistently and to use the information that has been exchanged.</p>	<p>Ensures that information systems for health can communicate with each other in an expeditious and effective way, facilitating adequate and cost-effective data sharing, informed policies, and decision-making.</p>
<p><b>Digital Contact Tracing<sup>1</sup></b></p>	<p>It is the process of identifying persons, through digital tools, who may have been exposed to a person with a disease of interest.</p> <p>Contact tracking apps can notify people that they have been in contact with someone who has tested positive for COVID19 after that interaction.</p>	<p>It can support overcoming traditional contact tracing challenges such as incomplete data of contacts, paper-based reporting inefficiencies, data management and timeframes from identification to isolation.</p> <p>Implementation on a <u>large scale</u> can be effectively supported by the use of such technological tools. However, it is imperative to have strong information systems (IS) and data management process in place.</p>
<p><b>Technology Readiness in Public Health</b></p>	<p>It aims to evaluate the preparedness of the organization to support technological change. It is an assessment of an organization's technical environment, infrastructure and IT service capabilities.</p>	<p>It helps to prepare organizations for rapid technological adoption or change. The assessment investigates the physical and technical environment of an organization and helps to identify any gaps and areas for critical investments.</p>

<sup>1</sup> As stated by the World Health Organization, contact tracing is an essential public health measure and a critical component of comprehensive strategies to control the spread of COVID-19.

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<p><b>Electronic Health Records (EHR) and Electronic Medical Records (EMR)</b></p>	<p>Both EMR/EHR are digital records. However, an EHR is a health record residing in an electronic system specifically designed for data collection, storage, and manipulation, and to provide safe access to complete data about patients.</p> <p>EMR are more limited because it usually remains at the health worker's site of service delivery.</p> <p>EHR is more holistic than EMR and offers many benefits such as accessibility, support for multiple views, improved communication between providers, communication with patients, data aggregation, access to knowledge bases, and integration with decision support tools.</p>	<p>It is critical to have immediate access to patient data centralized in one place, at the right time and in the right format for quick processing, responses and coordinated actions and decisions.</p> <p>EHR facilitates the access and sharing of data within the public health system, thus allowing better monitoring and reporting of suspected and confirmed cases, treatment regimens and abnormal conditions, among many others.</p> <p>This allows us to understand more quickly the behavior of the pandemic in a given population; so that adequate and timely containment and/or mitigation interventions can be put in place.</p>
<p><b>Public Health Information Architecture</b></p>	<p>Blueprint of how information is stored, organized, and used in an organization by its systems and users. Information architecture allows organizations to capture the structure of its information, and how systems and users produce and interact.</p>	<p>Improves decision-making, and identification of information flows for ensuring interoperability. It also reduces risk of new technology failing to meet needs, increases efficiency and decreases costs.</p>
<p><b>Universal Connectivity</b></p>	<p>Democratize access to a stable, high-quality and affordable high-speed broadband connection to the Internet, so that everybody from all regions can make use and seize all opportunities of today's digital age.</p>	<p>It allows all populations affected by the pandemic to benefit from the digital strategies designed to manage the pandemic. In addition, it also leads them to have a digital footprint that is integrated into the global data management system and thus be able to be recipients of the public health interventions directed at these populations.</p>

Concept	Description	Why it is important in the response to the Pandemic
<b>Digital Cooperation</b>	Cooperation in the digital space among Governments, the private sector, civil society, international organizations, academic institutions, the technical community and other relevant stakeholders.	It is essential in order to design, apply, manage, expand, monitor and evaluate any policy concerning the use of digital tools as well as the reach and benefits of universal connectivity .
<b>Digital Inclusion</b>	“ <i>Not leaving anyone behind</i> ” regarding high quality and affordable access to internet connection and necessary information technologies, regardless of their socio-economic situation.	It allows everyone to benefit from all the initiatives, projects and interventions conducted and supported through the Internet and information technologies.
<b>Patient Portals</b>	Platforms where patients can communicate and exchange information about their health with other patients and with health providers and health professionals.	Important tool to disseminate updated information and keep patient’s contact with the health system without putting them or the professionals at risk of infection.
<b>Standards</b>	Standards are the underlying basis of interoperable information systems. However, in its absence, catalogs, common nomenclatures and other resources are also used.	Common use of standards enables the gathering and analysis of data from different sources into a common model used for decision making.
<b>Blockchain technology</b>	It is a novel technology that allows decentralized transactions that require no intermediaries and that stores all data in a distributed ledger	Possible applications would be to improve efficiency of pandemic-related data transfer due to the unneeded decentralized transaction process. It also would make the data more secure due to its intrinsic encryption. Some other applications are of controlling and blocking false information spreading.
<b>Artificial Intelligence (AI)</b>	It is the capacity of a programmed machine to perform tasks associated with the intelligence of humans	Applications of AI are deployed to provide early warning of outbreaks, rapid track of cases and deaths, perform predictions and find patterns, diagnose, treat and for social control

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<b>Machine Learning</b>	<p>Subset of artificial intelligence (AI), that uses computers to automate the discovery of patterns in very large datasets.</p> <p>The computer is said to be “learning” because it is programmed to improve its own performance.</p>	<p>Several ML approaches have been identified to help in the COVID-19 pandemic response increasing the power of epidemiological and decision-making models::</p> <ul style="list-style-type: none"> <li>-early detection of symptoms and risk factors,</li> <li>-improved diagnosis of atypical cases,</li> <li>-monitoring of existing cases and new outbreaks in different populations,</li> <li>-contact tracing of people with confirmed or suspected infection,</li> <li>-as well as accelerating vaccine development and identifying new treatments or new uses for existing treatments for other illnesses.</li> </ul>
<b>Chatbots</b>	<p>A chatbot is an automated two-way communication solution used to perform a chat conversation with a virtual (non-human) agent. When effective, using machine learning technology, it can convincingly simulate the way a human would behave in providing the needed answer to a specific request for information.</p>	<p>It is an easy-to-use messaging service that has the potential to reach billions of people with the right information at the right time.</p> <p>Since it is not a human who answers, some topics that are too specific or sensitive cannot be addressed by a chatbot.</p>
<b>Bluetooth vs GPS location apps</b>	<p>GPS is a <b>Global Positioning System</b> provides <u>geolocation</u> with meters even centimeters of precision.</p> <p>Bluetooth is a Wireless technology standard created to exchange data in <u>short</u> distances.</p>	<p>Bluetooth is being used for contact tracing apps. GPS facilitates crowd mapping.</p> <p>These technologies still have a margin of error in their precision that must always be taken into account. Also, in households where a single cell phone is shared, it can create confusing location data.</p>
<b>Bandwidth</b>	<p>It refers to the maximum data transfer rate of a network, including the Internet.</p>	<p>As a consequence of the pandemic, many activities have been partially or completely transferred through broadband communication services, radically increasing their demand.</p> <p>It is important to ensure its resilience and stability, so that the continuity and agility of the processes that were previously done in person are not interrupted.</p>



Concept	Description	Why it is important in the response to the Pandemic
<b>3g/4g/5g Networks</b>	It stands for the third, fourth and fifth generations (g) of cellular (mobile) broadband wireless networks. A higher generation means faster data rates, higher connection density and lower latency. 3G and 4G are already in place and much of the transmission of data is done through these networks. 5G is still under development.	Many initiatives supported by information technologies have been directed largely to cell phones, which is why 3G and 4G networks have represented a key tool in a reliable and agile transmission of useful data for the management of the pandemic.  At the same time, possible uses of the 5G generation are currently being explored to improve these same initiatives.
<b>Internet of Things (IoT)</b>	The internet-facilitated connection of objects in a system such that they can share data and metadata between them.	IoT can improve connectivity, real-time information delivery, automated treatments, telehealth consultations, expand scope of used infrastructure, screening and forecasting.
<b>Predictive Analytics</b>	Predictive analytics is statistical analysis that uses data mining, machine learning, and algorithms based on historical data series to identify behavior patterns and trends to predict future scenarios. Although predictive analytics is a well-known analytical method, recently it has been enhanced by the availability of large data resources or Big Data, increased computational capacity, and modern analytical mechanisms.	Predictive analytics allows us to estimate the pandemic's behavior within an acceptable degree of uncertainty by establishing when and under which conditions countries can expect increases, peaks, and reductions in new cases (incidence) and deaths (mortality).
<b>Big Data (Including mobility apps)</b>	Data sets that are too large (volume) to be analyzed in traditional manners, characterized by its velocity of production, variety of formats and presentations and by its veracity.	It provides opportunities to model and understand the pandemic and people's online behavior: such as social mobility, sentiment analysis, searches, flows of information and disease.
<b>Data Governance</b>	Set of practices for making decisions about data and for managing data throughout its lifecycle to optimize the organization's capability to use data to generate information that informs policy, strategy, and operational management.	It gives organizations control over their data and improves their capability to use data to generate quality information that can inform decision-making.

Concept	Description	Why it is important in the response to the Pandemic
<b>Data Disaggregation</b>	Disaggregated data refers to the separation of compiled information into smaller units to discover underlying trends and patterns. Compiled data may come from multiple sources (the public/private sectors and national/international organizations) and have multiple variables or “dimensions.” To enhance understanding of a situation, the data is grouped by dimension, such as age, sex, geographic area, education, ethnicity, or other socioeconomic variables.	<p>When a pandemic occurs, a quick identification of factors that can accelerate or slow down transmission is key to ensure an efficient response, especially in protecting vulnerable populations.</p> <p>High quality, accessible, trusted, timely, open, and reliable disaggregated data is critical to generate valuable information used for real-time decision-making.</p> <p>For instance, to determine if an intervention (e.g., mass self-screening) is effective, we need to know what proportion of the population has been tested.</p> <p>This may require an analysis disaggregated by age, geographic area, and/or other socioeconomic confounders.</p>
<b>Data Visualization</b>	Data visualization consists in displaying data and statistics in a graphic and descriptive ways.	<p>It facilitates understanding, cleaning, exploring, detecting, and identifying trends and patterns and information analysis.</p> <p>It is key for faster decision-making processes as well as communication at all instructional levels and with the public.</p>
<b>Data Warehouse</b>	Information system that collects data from a wide range of sources within an organization. Data warehouses are used as centralized data repositories for analytical and reporting purposes.	Having a single repository as a data warehouse, where data from various sources, topics, and characteristics are gathered, makes it easier for comprehensive interventions to be designed.
<b>Data Privacy</b>	It deals with the management of health data, to comply with the regulations that recognize it as particularly sensitive data, guaranteeing privacy and intimacy and providing security for its collection, storage and use.	It is an important requirement in data management particularly sensitive data to avoid possible re-identification and discrimination.



Concept	Description	Why it is important in the response to the Pandemic
<b>Data Lakes</b>	A storage repository that stores massive amounts of raw data in all formats including structured, semi structured and unstructured data.	The covid-19 pandemic generates enormous amounts of data in multiple formats (structured, semi-structured and unstructured) that, once properly processed and analyzed, can inform about trends and patterns associated with the pandemic, with the aim of improving interventions in public health.
<b>Open Data</b>	It refers to data that is easily accessible, in a format that can be processed and analyzed freely for any purposes and no limitations.	It has increased the access of multiple stakeholders to varied sets of data on the behavior, risks, challenges and needs associated with the pandemic. This has impacted in decentralization and agile response in the design of specific interventions to face the pandemic.
<b>Infodemic</b>	<p>An overabundance of information – some accurate and some not – that makes it hard for people to find trustworthy sources and reliable guidance when they need it.</p> <p>Infodemic refers to a large increase in the volume of information associated with a specific topic and whose growth can occur exponentially in a short period of time due to a specific incident, such as the current pandemic.</p> <p>In this situation, misinformation and rumors appear on the scene, along with manipulation of information with doubtful intent. In the information age, this phenomenon is amplified through social networks, spreading farther and faster like a virus.</p>	<p><u>An infodemic can make the pandemic worse by:</u></p> <ul style="list-style-type: none"> <li>• Making it hard for people, decision makers, and health workers to find trustworthy sources and reliable guidance when they need it. Sources may be apps, scientific organizations, websites, blogs, “influencers,” and more</li> <li>• By increasing people’s anxiety, depression, causing them to feel overwhelmed, emotionally drained, and unable to meet important demands.</li> <li>• By affecting decision-making processes when immediate answers are expected, and not enough time is allotted to deeply analyze the evidence.</li> </ul>

## Why is **strategic learning** important? What to read and **why?**

Document	Leading agency	Strategic highlight
<u><a href="#">“The Age of Digital Interdependence”: Report of the High-level Panel on Digital Cooperation.</a></u>	<b>Independent Expert Panel</b> called by United Nations Secretary General	Panel included five sets of <u>recommendations</u> : <ol style="list-style-type: none"> <li>1. Build an inclusive digital economy and society;</li> <li>2. Develop human and institutional capacity;</li> <li>3. Protect human rights and human agency;</li> <li>4. Promote digital trust, security and stability;</li> <li>5. Foster global digital cooperation.</li> </ol>
<u><a href="#">Report of the Secretary-General Roadmap for Digital Cooperation</a></u>	<b>United Nations</b>	<u>8 Key areas for action</u> : <ol style="list-style-type: none"> <li>1. Achieving universal connectivity by 2030</li> <li>2. Promoting digital public goods to create a more equitable world</li> <li>3. Ensuring digital inclusion for all, including the most vulnerable</li> <li>4. Strengthening digital capacity-building</li> <li>5. Ensuring the protection of human rights in the digital era</li> <li>6. Supporting global cooperation on artificial intelligence</li> <li>7. Promoting trust and security in the digital environment</li> <li>8. Building a more effective architecture for digital cooperation</li> </ol>
<u><a href="#">A World That Counts: Mobilising The Data Revolution for Sustainable Development.</a></u>	<b>UN Independent Expert Advisory Group</b> on a Data Revolution for Sustainable Development	<u>An urgent call for action</u> : <ol style="list-style-type: none"> <li>1. Develop a global consensus on principles and standards</li> <li>2. Share technology and innovations for the common good</li> <li>3. New resources for capacity development</li> <li>4. Leadership for coordination and Mobilisation</li> <li>5. Exploit some quick wins on SDG data</li> </ol>
<u><a href="#">Approach to Digital Transformation: Guidelines and Recommendations</a></u>	<b>IDB’s Social Protection and Health Division</b>	<u>Digital principles</u> : <ol style="list-style-type: none"> <li>1. Understanding the Existing Ecosystem</li> <li>2. Be Collaborative</li> <li>3. Design with the User</li> <li>4. Reuse and Improve</li> <li>5. Design for Scale</li> <li>6. Address Privacy &amp; Security</li> <li>7. Use Open Standards, Open Data</li> <li>8. Open Source, and Open Innovation</li> <li>9. Be Data Driven</li> <li>10. Build for Sustainability</li> </ol>

## What are the main **challenges**<sup>i</sup> when **implementing digital solutions**?

- Reaching every corner of society and ensuring “no one is left behind”, especially those lacking access, connectivity or knowledge of IS.
- Managing information overload and the large number of available technological tools.
- Managing false expectations about achieving solutions.

- Addressing cybersecurity, including issues of privacy, ethical use, and confidentiality of personal data.
- Understanding new technological concepts that have become increasingly complex.
- Having the judgment needed to select the tool that is most effective for the purpose and having the skills needed to use it properly.

## Where can I find **additional information** about these concepts?

- [PAHO COVID-19 Digital Health Factsheets](#)
- [PAHO Knowledge Capsules Interoperability in Public Health](#)
- [WHO Digital tools for COVID-19 contact tracing](#)
- [PAHO Knowledge Capsules Technology Readiness in Public Health](#)
- [PAHO Technical Documents – Coronavirus Disease \(COVID-19\)](#)
- [World Health Organization. Contact tracing in the context of COVID-19](#)
- [WHO Health Alert brings COVID-19 facts to billions via WhatsApp](#)
- [CDC Resources for Conducting Contact Tracing to Stop the Spread of COVID-19](#)
- [Considerations for Digital Contact Tracing Tools for COVID-19 Mitigation: Recommendations for Stakeholders and Policymakers](#)
- [Digital tools against COVID-19: taxonomy, ethical challenges, and navigation aid](#)
- [Use of Open Government Data in response to the coronavirus \(Covid-19\) outbreak](#)
- [Internet of things \(IoT\) applications to fight against COVID-19 pandemic](#)
- [A Comprehensive Review of the COVID-19 Pandemic and the Role of IoT, Drones, AI, Blockchain, and 5G in Managing its Impact](#)
- [Keeping the Internet up and running in times of crisis](#)

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***PAHO highlights and appreciates the support of the Spanish Agency for International Development Cooperation (AECID), the United States Agency for International Development (USAID), and the Government of Canada.***

## Acknowledgements

This factsheet was prepared in collaboration with the **Inter-American Development Bank (IDB) Social Protection and Health Division**; **Salud.uy** from Uruguay, the *Centro Nacional de Excelencia Tecnológica en Salud* from Mexico, the **Department of Health Information of the Italian Hospital of Buenos Aires** (PAHO/WHO Collaborating Center for Information Technologies and Digital Health); the **Open University of Catalonia** (PAHO/WHO Collaborating Center for Digital Health); the **University of Illinois Center for Health Informatics** (PAHO/WHO Collaborating Center for Information Systems for Health); the **Central American Health Informatics Network (RECAINSA)**; and the **PAHO Network of Experts on Information Systems for Health (IS4H)**.

And with the special support of **Tina Purnat**, Department of Digital Health and Innovation, Science Division, World Health Organization, Geneva, Switzerland.

PAHO/EIH/IS/COVID-19/20-0017

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[PAHO COVID-19 Factsheets: The potential of frequently used information technologies during the pandemic](#)