



**REFERENTIAL COMPETENCY
MODEL
IN DIGITAL HEALTH**
Version 2.0



REFERENTIAL COMPETENCY MODEL IN DIGITAL HEALTH v2.0

Centro Nacional de Sistemas de Información en Salud - CENS

National Center for Health Information Systems - CENS

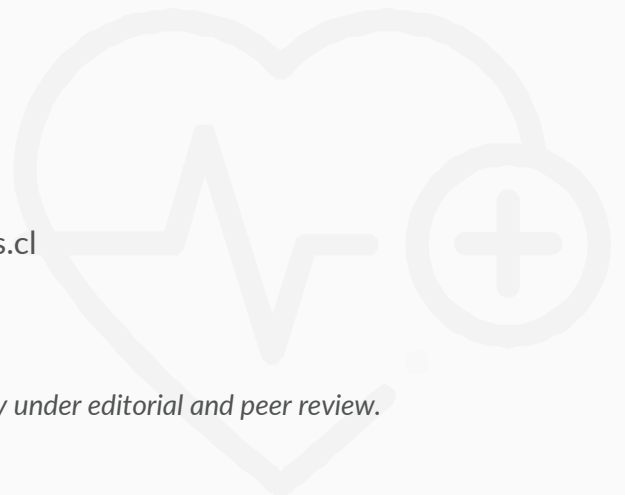
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Preliminary English translation of the original document – currently under editorial and peer review.



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INTRODUCTION

In 2018, the National Center for Health Information Systems (CENS) and its Human Capital area developed the Reference Competency Model in Health Information Systems (HIS) 1.0, aimed at defining the key knowledge, attitudes, and skills that every professional needs to perform competently in the field of Digital Health (DH).

However, the rapid advancement of digital technologies, together with the experience and lessons learned from the pandemic, has meant rethinking this model and making its structure more complex, including a name change, new target users, dimensions, and knowledge areas. This new proposal is based on a critical analysis of the previous model and an international comparative review of new frameworks¹.

As of 2024, the Model of Referential Competencies in Digital Health 2.0 continues to contribute to the development of job profiles associated with DH, and the design of undergraduate and postgraduate training programs, establishing a common training standard, at both national and regional levels.

MATERIALS AND METHODS

A two-stage qualitative action research study was conducted:

- Documentary review: PRISMA was used for the bibliographic screening and selection. Three international models were selected for comparison.
- Model construction: clinicians, non-clinicians and Digital Health experts were strategically selected to participate in focus group. The information was triangulated to draw bottom-up conclusions and to cluster relevant responses according to trends identified based on relevance and pertinence criteria.

¹References were primarily drawn from: Development of a digital competency framework for UK Allied Health Professionals, Topol, 2020. Recommendations of the International Medical Informatics Association (IMIA) on Education in Biomedical and Health Informatics: Second Revision, IMIA, 2023. Health Informatics Professional Competencies, Canadá, 2022.



RESULTS

Based on the methodology described above, two new domains are created: (i) Digital Health Transformation Management, which groups Health Information Systems, people, and organizations, with a focus on change management; and (ii) Telehealth, in response to its expansive use since the pandemic. The domain of Ethical, Legal and Governance Aspects is considered cross-cutting because it provides guidelines for the design, development, implementation, and adoption of technology.

The fundamental change is that the 2.0 model places people at the center by guiding essential knowledge, skills and attitudes toward the use of technology in healthcare.

Thus, the resulting model includes: four central users at the center, nine domains, and 103 specific competencies (Figure 1).

DISCUSSION

This new model has been developed in response to the demand brought about by the rapid advancement of Digital Health, enabling the identification of knowledge gaps and the strategic alignment of training initiatives at the national level.

The development of a people-centered model is crucial to ensure that competencies and knowledge contribute to a satisfactory patient experience and quality of care, and thereby also contribute to better health.

Although the current model seeks to address new needs, it still faces challenges related to deepening territorial aspects and part of the regulations related to the law that regulates the Rights and Duties that people have in relation to actions related to their health care (Law 20.584), in addition to new trends in Artificial Intelligence and the Internet of Things (IoT). In addition to the above, it is essential to continue defining the competencies linked to patients, which is especially important considering that many elements of Digital Health constitute essential points of contact in the patient's experience as a user of healthcare services.

Finally, and as is already known, due to the accelerated obsolescence of information technologies, it is necessary to update the model on an ongoing basis in dialogue with the changes and needs that arise in the healthcare ecosystem.


Model of Referential Competencies in Digital Health



Figure 1. Model of Referential Competencies in Digital Health.

Table 1. Referential Competencies in Digital Health detailed by three user groups and nine domains.

*The table below contains acronyms and concepts, the meanings of which can be found in the Glossary at the end.

DOMAIN	COMPETENCIES		
	Decision-Makers	ICT Users	Clinical Users
 A. Digital Health Transformation Management	<p>Propose strategies and guidelines for institutional digital transformation, aimed at enhancing the quality of internal processes, ensuring continuity in patient care, and improving health outcomes.</p> <p>Ensure that the implementation of information systems aligns with the national health model and supports the organization's strategic goals.</p> <p>Integrate best practices and change management methodologies into institutional guidelines to facilitate digital transformation processes in healthcare organizations.</p> <p>Lead and empower multidisciplinary teams by recognizing individual strengths and weaknesses, coordinating efforts to manage the processes integral to digital transformation.</p> <p>Foster the effective use of information systems through management focused on digital transformation, optimizing clinical processes with a user-centered approach.</p>	<p>Organize technical aspects, identifying gaps and analyzing enablers needed to implement the digital transformation strategy.</p> <p>Model the functioning of the health system, considering standards and best practices, the interrelationships between organizational, administrative, and clinical levels, to ensure the scope and quality of a Digital Health project.</p> <p>Collaborate in change management, providing information on benefits, risks and impacts of a Digital Health project.</p> <p>Promote the development of technical and cognitive skills in multidisciplinary work teams, to facilitate the implementation of digital transformation in healthcare.</p> <p>Integrate SIS with a view to continuous improvement in order to correct, adapt and project them in the medium and long term, considering modernization cycles.</p>	<p>To foster a positive work environment, focused on well-being and a culture of trust to facilitate the implementation of the digital transformation strategy proposed by the institution.</p> <p>Link the clinical information contained in the SIS in the context of the national health model, to ensure timely protection and availability of the information.</p> <p>Integrate change management methodologies and best practices to facilitate digital transformation in healthcare as positive agents of change.</p> <p>Facilitate the implementation of digital transformation in healthcare through active and flexible management, in multidisciplinary work teams.</p> <p>Promote and use SIS (such as CER, LIS, RIS/PACS), respecting record quality, information security and the use of terminology nomenclature, for the optimization of user-centered clinical processes.</p>

DOMAIN	COMPETENCIES		
	Decision-Makers	ICT Users	Clinical Users
 B. Process Architecture	<p>Ensure that the architecture of patient care processes is fully aligned with the institution's mission, vision, and strategic objectives.</p> <p>Ensure that processes are accurately mapped and documented, enabling the identification of areas where the use of information systems can add significant value to the institution.</p> <p>Prioritize process improvements by evaluating the relevance, impact, and risks associated with projects and services involving information systems.</p>	<p>Collect information associated with the existing processes in the institution, using specific techniques and tools for its documentation.</p> <p>Document processes based on best practices, standards, and regulations, for the development and continuous improvement of SIS.</p> <p>Evaluate the incorporation of an SIS in existing processes, with a view to their optimization.</p> <p>Redesign processes based on information extracted from clinical practice, considering a patient-centered vision, to improve the impact of SIS on care.</p>	<p>Identify clinical and administrative processes through process modeling techniques to guide and optimize the construction of SIS.</p> <p>Document processes and activities derived from healthcare, using standards, regulations, and best practices to integrate SIS into the clinical workflow.</p> <p>Propose process improvements, using information extracted from clinical care, to optimize the impact of SIS.</p>
 C. Design, Development and Implementation	<p>Plan digital health projects leveraging human, financial, technological, and organizational resources to effectively achieve the institution's strategic objectives.</p> <p>Ensure that digital health projects are designed and developed with a patient-centered approach, while aligning with the institution's goals and priorities.</p> <p>Foster the systematic adoption of digital health innovations, incorporating implementation science models to guide and support the transition.</p> <p>Evaluate the compliance and impact of digital health implementation through defined indicators, enabling the monitoring and optimization of the processes involved.</p>	<p>Identify requirements by functionally and organizationally analyzing the workflow for the development of Digital Health projects.</p> <p>Collaborate in the planning of Digital Health projects, as an active member of the team, facilitating the achievement of the objectives set by the institution.</p> <p>Design e-Health projects, incorporating best practices to safeguard the usability, quality, regulations, and legal aspects required in the health field.</p> <p>Develop Digital Health projects under quality criteria, security, standards, terminologies, and functional/non-functional requirements, considering software engineering methods.</p> <p>Apply Implementation Science models to promote the systematic adoption of practices that improve the effectiveness, efficiency and sustainability of Digital Health developments.</p> <p>Evaluate the performance of the Digital Health implementation, considering functional and non-functional requirements stipulated in the design.</p>	<p>Specify requirements that describe their needs as users, using elicitation techniques, for optimal design and development of e-Health projects.</p> <p>Actively collaborate in each and every stage of the development of a Digital Health project, ensuring compliance with regulations and quality standards of clinical care, to minimize potential risks involved.</p> <p>Evaluate the performance and usability of the Digital Health implementation, identifying gaps that may affect the care process, in order to adopt corrective and/or preventive measures.</p>

DOMAIN	COMPETENCIES		
	Decision-Makers	ICT Users	Clinical Users
 D. Interoperabilidad y Estándares	<p>Establish strategic guidelines to enable interoperability, considering economic, human, and organizational resources, to facilitate the exchange of information across different systems, institutions, levels, and/or territories.</p> <p>Ensure interoperability within data exchange frameworks by adhering to quality and security standards, ensuring compliance with current regulations, and protecting the information being exchanged.</p> <p>Promote interoperability across various systems, institutions, levels and/or areas to enhance the quality of care, streamline clinical administration and improve patient experience.</p>	<p>Evaluate feasibility of implementation and sustainability of interoperability models in SIS.</p> <p>Develop interoperability models based on best practices and semantic, syntactic and organizational standards to facilitate SIS interoperability.</p> <p>Implement interoperable systems based on syntactic and semantic standards and their best practices, contained in the developed models, to facilitate the exchange of information.</p> <p>Execute validation and/or certification tools for data exchange to ensure its quality in accordance with current regulations.</p>	<p>Analyze the integrated operation of the SIS and its benefits in clinical and administrative care, using terminology services, interoperability concepts and standards as a reference.</p>
 E. Innovación y Transformación Digital en Salud	<p>Promote an innovation management system that prioritizes health system users, defining policies, communication strategies, and other initiatives to enhance service delivery and improve care quality.</p> <p>Lead the scaling of successful innovations, considering key factors such as technology, budget, culture, regulation, and other enablers to ensure their successful adoption within the organization.</p> <p>Evaluate the impact of successful innovations using relevant indicators to inform clinical, administrative, and financial decision-making within the institution.</p>	<p>Recommend models of continuous innovation and good management practices, to provide solutions to the challenges identified and thus stimulate digital transformation processes in healthcare.</p> <p>Lead innovation processes in the challenges detected, applying change management and team building strategies to assess their scalability.</p> <p>Implement innovation initiatives, facilitating their technical incorporation into the workflow within the institution.</p> <p>Monitor the success indicators defined in the innovation implemented for its continuous improvement.</p>	<p>Identify problems, challenges and opportunities, performing active surveillance to innovate processes that positively impact clinical care.</p> <p>Lead innovation processes in the challenges detected, applying change management strategies and team building, to assess their scalability.</p> <p>Implement innovative solutions in clinical and administrative workflows, focusing on the continuous improvement of the health care process.</p> <p>Adopt innovative solutions in clinical and administrative workflows, focused on continuous improvement of the health care process.</p> <p>Monitor the adoption and user experience of the innovation implemented, to propose improvements and generate new knowledge.</p>

DOMAIN	COMPETENCIES		
	Decision-Makers	ICT Users	Clinical Users
 <p>F.</p> <p>Clinical Decision Support Systems</p>	<p>Promote the adoption of evidence-based Clinical Decision Support Systems (CDSS) to reduce healthcare errors and enhance clinical practice.</p> <p>Prioritize clinical interventions that can be supported by CDSS, evaluating their clinical and economic feasibility for integration into the workflow.</p> <p>Assess the clinical, economic, and cultural impact of CDSS-supported interventions at the institutional level, using qualitative and quantitative indicators.</p>	<p>Evaluate technical aspects and available resources for the feasibility of incorporating a CDSS to optimize clinical practice.</p> <p>Plan the incorporation of CDSS into the clinical flow, considering human, technological and organizational factors.</p> <p>Design the incorporation of CDSS, responding to needs detected based on the best available evidence.</p> <p>Ensure the incorporation and maintenance of CDSS by executing and developing tests for effective adoption.</p> <p>Evaluate CDSS performance, considering requirements stipulated in the design, with a focus on continuous improvement that allows its adjustment and correction.</p>	<p>Identify areas of clinical practice and specific processes that can be optimized using CDSS.</p> <p>Collaborate in the design of the incorporation of CDSS, providing relevant information, according to regulations and scientific evidence, to harmonize the clinical flow.</p> <p>Adopt CDSS in the clinical workflow as an effective tool to reduce errors associated with health care and optimize clinical practice.</p> <p>To evaluate the optimization of interventions using CDSS, through evidence-based clinical practice methodologies.</p>
 <p>G.</p> <p>Secondary Use of Health Data</p>	<p>Develop an institutional health data governance strategy that outlines guidelines for the capture, storage, management, and secondary use of data.</p> <p>Enhance decision-making within the institution by promoting the integration of data science in research and innovation, aimed at improving care and management practices.</p> <p>Foster a research-driven culture focused on the secondary use of data, supporting it through funding and incentives for research, development, and innovation.</p> <p>Develop an institutional health data governance strategy that outlines guidelines for the capture, storage, management, and secondary use of data.</p>	<p>Collaborate in the data governance approach, considering tools, methods and technologies, to ensure the availability of quality data according to institutional strategic needs.</p> <p>Model the data recorded in the SIS, using Data Science, to identify interesting patterns that contribute to better decision making.</p> <p>Interpret data through visualization and synthesis of the results, to facilitate their understanding and application according to the needs of the institution.</p> <p>Safeguard the quality of the data, ensuring that the information contained is confidential and complete and available for use in a timely manner.</p> <p>Collaborate in the data governance approach, considering tools, methods and technologies, to ensure the availability of quality data according to institutional strategic needs.</p>	<p>Record necessary, complete, reliable and accurate data in the SIS to support appropriate secondary use, decision making and continuous improvement.</p> <p>Collaborate in the process of data science, contributing from their experience and clinical knowledge, for a better understanding and validity of the results.</p> <p>Generate research and new knowledge from the secondary use of data to optimize clinical practice for the benefit of people.</p> <p>Record necessary, complete, reliable and accurate data in the SIS to support appropriate secondary use, decision making and continuous improvement.</p>

DOMAIN	COMPETENCIES		
	Decision-Makers	ICT Users	Clinical Users
 <p>H. Telehealth</p>	<p>Implement telehealth strategies tailored to available resources—such as personnel, professionals, care locations, networks, internet, and platforms—to ensure accessible and timely care.</p> <p>Supervise telehealth services focused on users or families, ensuring compliance with ethical and legal standards, and guided by institutional protocols.</p> <p>Evaluate the clinical and technical quality of Telehealth services using performance indicators, with a focus on continuous improvement.</p> <p>Promote the use of certified mobile devices to enhance patient education, follow-up, and monitoring of clinical conditions.</p>	<p>Ensure quality and compatibility of telehealth platforms, integrating new processes, software and systems for remote patient care and attention.</p> <p>Promote user experience-based platform design and functionality to ensure integration into the clinical workflow.</p> <p>Safeguard reliability and resilience of platforms, monitoring performance of functions, availability, resilience and fault tolerance.</p> <p>Ensure that Telehealth platforms meet minimum criteria for authenticity, personnel authorization, and information audit and integrity.</p> <p>Evaluate the quality of mobile health platforms, considering communication standards and their integration with SIS, to ensure their functionality and subsequent recommendation.</p>	<p>Perform telehealth care, considering good practices and ethical-legal aspects to improve patient care.</p> <p>Incorporate the use of mobile devices in health care and attention, applying quality criteria to safeguard the safe delivery of information.</p>
<p>I. Ethical, Legal and Governance Aspects</p>	<p>Ensure the secure, confidential, and unique safeguarding of patient information within the institution through integrated Information Systems, supporting high-quality care.</p> <p>Establish guidelines to control access to the information systems, ensuring that only authorized personnel can view records or input new data, while maintaining the security and ethical use of information.</p> <p>Supervise the secure storage of information within information systems is securely stored to guarantee the confidentiality, integrity, and preservation of the data.</p> <p>Foster a people-centered culture, strengthening the clinical-patient relationship by incorporating technology as a tool to enhance the quality of care.</p>	<p>Ensure that the patient information recorded in the SIS contains the minimum data in accordance with the national regulatory framework, to safeguard the quality of the records.</p> <p>Ensure access to patient information, in a timely, continuous and restricted manner, to those directly related to the patient's health care.</p> <p>Guarantee the integrity and preservation of information through storage that ensures confidentiality, authenticity and traceability of the changes made, in order to provide continuity of clinical care.</p> <p>Evaluate the information security requirements, identifying the points of risk and vulnerabilities of the SIS, in order to adopt the necessary preventive and/or corrective measures.</p> <p>To promote the development of technological solutions focused on people and their environment, which facilitate clinical processes and improve the user experience.</p>	<p>Safeguard the authenticity of the record, its completeness, integrity and format to ensure the quality of the records and their use.</p> <p>To provide health care in a timely manner, under criteria of access, privacy and confidentiality of the content recorded in the SIS, for the ethical and legal protection of patients.</p> <p>Establish in each encounter a clinical-patient relationship based on respect, humanization of care and ethical principles associated with the use of technology.</p>

GLOSSARY

Apps: Computer programs designed for mobile devices, such as smartphones and tablets, that offer services and functions related to health and wellness.

Big data: Set of data whose management or analysis is of high difficulty because they are of a great variety and/or complexity, presented in increasing volumes and at a higher speed requiring the use of specialized computational systems and tools to extract information from them.

Data Science: Scientific discipline focused on the analysis of big data sources to extract information, understand reality and discover patterns with which to make decisions.

Implementation Science: Conceptual framework that provides theoretical structures and methodologies to guide the successful implementation of eHealth interventions in clinical practice.

Competencies: Knowing how to act in a relevant and complex manner in a particular context, facing problems with a clear criterion of quality, for which internal resources are articulated and mobilized, being able to answer for their decisions and actions and taking responsibility for the effects and impacts of the same.

Data: Refers to raw, unprocessed facts, observations or information that is collected, recorded or stored. Data are basic elements that, by themselves, have no particular meaning.

Mobile device: Refers to a portable electronic device, such as a smartphone or tablet, that is used to provide health-related services, monitoring, diagnosis, treatment, or management of medical information.

Domains: Corresponds to the configuration of a field of the profession or discipline, by a "family of problems" that are distinguished from others, and that together represent the main challenges that professionals must face in the practice of the profession.

Semantic standards: Instruments of Semantic Interoperability, which allows computer systems to exchange data with an unambiguous meaning. It is a requirement for health data not only to be shared between different systems or applications, but also to be understood.

Syntactic standards: This refers to a set of rules and standards that define how Digital Health data should be structured and presented to ensure its information exchange between different health systems and applications. The standards at this level define the structure and format of the information to be exchanged.

Organizational standards: These are sets of rules and guidelines established by an organization to regulate and direct its operations. These standards help to establish uniform practices, improve efficiency, ensure quality and meet specific requirements in various aspects of the organization's operations.

Standards: A document, established by consensus and approved by a recognized body, that provides, for common and repeated use, rules, guidelines or characteristics for activities or their results, in order to achieve the optimum degree of order in a given context.

Governance: A concept used to describe the process and structures through which decisions are made, control is exercised, and rules are established in an organization, a community, or a system in general. Governance involves the interaction of different actors, the definition of roles and responsibilities, and the establishment of mechanisms for decision-making and accountability.

Certification tools: These are devices used to assess and verify compliance with specific standards and requirements related to the quality, safety and efficacy of healthcare products, services or systems. These tools play a crucial role in ensuring that processes and products in the healthcare sector comply with established regulations and standards.

Validation tools: These are instruments or processes used to evaluate and confirm that healthcare technology solutions meet established requirements and function accurately, safely and efficiently. These tools are essential to ensure the quality and reliability of the applications, devices and systems that are part of Digital Health.

Artificial Intelligence: refers to the ability of algorithms encoded in technological means to learn from data in order to perform automated tasks without the need for a person to explicitly program each step of the process.

Interoperability: The ability of different applications to access, exchange, integrate and use data in a collaborative and coordinated manner using common interfaces and standards, within or outside the same institutional, regional and national setting, to provide rapid and seamless portability of information and optimize health outcomes.

Internet of Things (IoT): A system of interrelated computing devices, analog and digital machines, objects, which are provided with unique identifiers and the ability to transfer data over a network without the need for human-person or human-computer interaction.

LIS (Laboratory Information System): Computer software that processes, stores and manages data from all stages of clinical laboratory processes.

Interoperability Model: A set of rules that defines how to approach interoperability in defined and delimited scenarios, allowing the adoption of interoperability from a strategic vision.

PRISMA: Qualitative methodology for the classification and organization of studies included in a systematic review according to certain predefined criteria.

EHR (Electronic Health Record): A record in digital format of a subject's own health data, which includes relevant information about a person's health throughout his or her life.

RIS (Radiology Information System): Refers to the system that is designed to manage information related to medical imaging and radiological processes. It facilitates the scheduling of appointments, tracking of patient information, management of radiological imaging information and integration with other health information systems.

PACS (Picture Archiving and Communication System): A computerized system for the storage, retrieval, management, distribution and presentation of digital medical images.

Digital Health: The field of knowledge and practice related to the development and use of digital technologies to improve health. Digital Health extends the concept of e-health to include digital consumers, with a broader range of smart devices and connected equipment. It also encompasses other uses of digital technologies in health, such as the internet of things, artificial intelligence, big data and robotics.

e-Health: The use of Information and Communication Technologies (ICT) for health.

Mobile Health (m-Health): The practice of medicine and public health supported by mobile devices, such as cell phones, patient monitoring devices and other wireless devices.

Terminology Server: An application that, integrated into any information system or electronic medical record, allows health data to be represented in a flexible manner.

HIS (Health Information Systems): These are defined as a mechanism for the collection, processing, analysis and transmission, as well as the use of the information needed to increase the effectiveness and efficiency of health services through better management at all levels of health services.

CDSS (Clinical Decision Support System): Electronic systems designed to assist clinical decision making, in which individual patient characteristics are used to generate recommendations that are presented to clinicians in a timely manner in the workflow for their consideration.

Health system: A set of health infrastructures that, following a given policy, aims to contribute to improving the health of the population. It is made up of different institutions, agencies and services that, through planned and organized actions, carry out a variety of health programs.

Interoperable System: A system is interoperable due to its ability to transfer patient information from one system to another. This action is impossible to achieve without the use of standards that allow for effective interoperability.

Software: Refers to the computer programs, instructions and data that enable a computer system to perform specific tasks. It is composed of programming code that instructs the computer on how to perform various functions.

Elicitation techniques: These are methods used to obtain information, needs and expectations from stakeholders. These techniques are essential for understanding the requirements of a system or project and ensuring that they are captured effectively.

Digital technology: Refers to the use of information and communication technologies to improve clinical care delivery, health management and wellness promotion. It includes a wide range of applications and tools that leverage the capabilities of informatics, connectivity and data collection to improve efficiency, accessibility and quality in healthcare.

Telemedicine: The provision of health services at a distance for the health objectives of promotion, prevention, diagnosis, treatment and rehabilitation, carried out by health professionals using information and communication technologies that allow them to exchange data for the purpose of facilitating access and timeliness in the provision of services to the population.

Telehealth: Provision of health services using information and communication technologies, especially where distance is a barrier to receiving health care. The set of health-related activities, services and methods that are carried out at a distance with the help of Information and Communication Technologies. It includes, among others, telemedicine and tele-education in health.

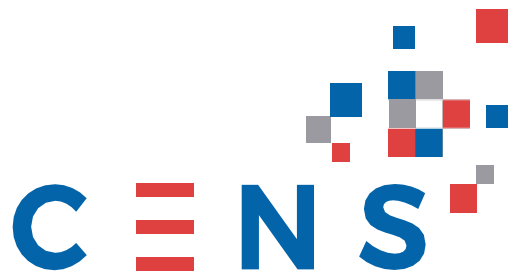
Digital transformation: Refers to the process by which organizations adopt digital technologies to improve and optimize their operations, processes and the delivery of value to stakeholders.

ICT user: Actors responsible for supporting organizations in the design, development, implementation and optimization of health information systems, based on the use of information and communication technologies.

Clinical User: Actors who have formal education in the health area and who provide health care to patients.

Decision-Making User: Those actors responsible for making decisions in different areas and levels of a health organization.

Wearable: Electronic devices that can be worn or attached to the body, generally designed to perform specific functions and provide information in real time.



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