Collaborating for Digital Health and Care in Europe

eHealth Governance - Country Report: Catalonia

In collaboration with

Funded by the European Union

Catalonia (Spain)
eHealth Governance - Country Report

Author: Tino Marti, EHTEL
Version number 1.0 – 17 August 2021
Quality review: Marc Lange, EHTEL

Table of Contents

1 Introduction

1.1 Scope of the document

This report is one of the 6 reports on the eHealth Governance commissioned by EY Baltic to EHTEL in the context of a contract[1] aiming at proposing a new "Health ICT Governance Framework" to the Ministry of Social Affairs of Estonia (MoSA).

With these reports, EY and MoSA have access to a sample of international good practices on how to govern the deployment of digital health within a country or a region.

	Health system	Governance	EHR architecture
Belgium	Bismarck	Bottom-up/ Top-down	Decentralised
Catalonia	Centrally Managed	Top-down	Centralised
Denmark	Centrally Managed	Top-down	Decentralised
Israel	Bismarck	Bottom-up	Decentralised
Scotland	Centrally Managed	Top-down	Centralised
The Netherlands	Bismarck	Bottom-up	Decentralised

Figure 1: Profile of the countries and regions retained for their good practice in eHealth Governance

These reports have been prepared by EHTEL experts who either have an inside knowledge of the country or region subject to the report or worked in close collaboration with experts having such a knowledge.

They describe, for each country or region,

- The context, i.e., the health and care system and its enabling eHealth system, with its technical building blocks
- The organisation in place for involving stakeholder and
- The main governance processes

A short historical retrospective and a short analysis of successes and what could be done better helps to put these good practices in perspective.

This international experience is intended to be used as input for Deliverable 3 "To-Be model for eHealth system governance" defined in the above-mentioned contract.

This document was produced with the financial assistance of the European Union via the Technical Support Instrument. The views expressed herein can in no way be taken to reflect the official opinion of the European Union.

1.2 Methodology

The methodology for the developing these reports has been designed in two steps:

- Distinguishing IT governance from IT management
- Defining what should be included under the term eHealth governance framework.

[1] Contract reference: REFORM/SC2021/003, signed on 10.02.2021 between European Commission and EY.

The line between IT governance and management has been drawn as follows:

- The governance function is responsible for determining strategic direction.
- The management function takes that strategic direction and translates it into actions to achieving the strategic goals.

To define what needs to be covered under the term eHealth Governance, a few models have been looked at and COBIT 5 has been retained as a relevant one to support health and care in systems in their digital transformation journey[2].

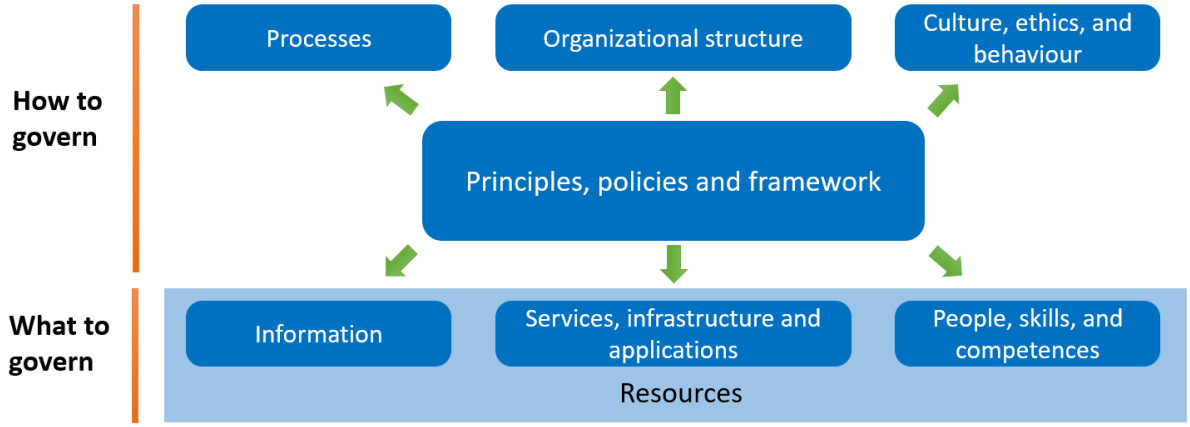

Figure 2. Digital Health Governance Framework [Marcelo et al, 2018]

2 Report on Catalonia

2.1 Health and care System description

The Spanish healthcare system is defined as a National Health System since the Healthcare General Act in 1986. Health and care services are decentralised at regional level (Autonomous Communities). Each region holds jurisdiction in planning and organisation of public health and healthcare services. The decentralisation process started in 1981 and finalised in 2002. A national coordination body, the Interterritorial Council of the National Health System (CISNS), fosters harmonization of regional health policies across Spain.

Catalonia was the first Autonomous Community to receive the devolution of healthcare competencies and since then, it has developed a regional health system capitalising on existing healthcare infrastructures. Thus, Catalonia is characterised by a multi-provision health system composed of public, non-for-profit consortia and foundations, and private providers.

The Department of Health is the health authority and responsible for planning health services while the Department of Social Rights is for social services. This duality of departments in the government makes health and care integration more challenging as health and social policies and related funding are fragmented. Different attempts to increase coordination between both departments have been tried in the past. Recently, the new Catalan government has announced to close this gap with the creation of a public Integrated Health and Care Agency.

[2] See "Transforming Health Systems Through Good Digital Health Governance", Alvin Marcelo, Donna Medeiros, Kirthi Ramesh, Susann Roth, and Pamela Wyatt (2018)

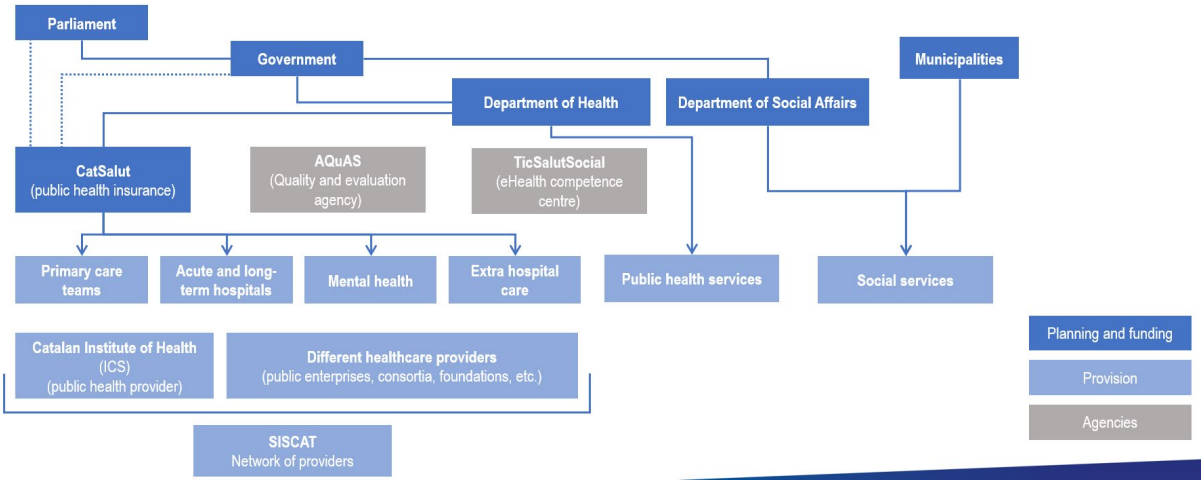

Figure 3. Overview of the Catalan health system

Since 1991, CatSalut (also known as Catalan Health Service) is responsible for purchasing health services for all Catalan citizens through service contracts with healthcare providers. This purchaser-provider split initiated in 1991 with the Catalan Healthcare Order Act has encouraged competition as well as cooperation between providers. There are five major service lines contracted by CatSalut: primary care, acute hospital care, long-term care, mental health services, and extra hospital care. eHealth services do not have specific provisions. Thus, investments on eHealth are left to healthcare providers decision and are funded indirectly through these contracts. Public health services are now in the process of being integrated in CatSalut's service contract framework. Most of healthcare providers are part of SISCAT, a network of healthcare providers entitled to establish continuous contracting with CatSalut.

From the provision side, the largest healthcare provider is the Catalan Institute of Health (ICS), a public enterprise that manages 8 hospitals and 280 primary care teams, employing more than 40 thousand health professionals. A myriad of different types of organisations coexist to manage the other hospitals and health centres. Most of them are public or mixed and non-for-profit consortia and foundations. Only a small portion are entirely private and for-profit.

All healthcare providers are managed autonomously and can decide independently how they invest their resources and manage their operations. This fact is especially relevant for eHealth as the adoption of Electronic Medical Records (EMR) of healthcare institutions have remained under general management decision since the first wave of digitisation.

Three major healthcare organisation associations defend the interest of their associates in the bargaining process with CatSalut related to the public service contract and employment agreements.

Social services are provided by the regional and local government with separated funding schemes. The Department of Social Rights provides nursing home services through the Catalan Institute of Social Care (ICAS) while the municipalities provide a number of social services targeting population groups at risk of social exclusion.

Two public bodies play an important role in the field of eHealth: the Foundation TicSalutSocial and the Catalan Agency for Healthcare Quality and Evaluation (AQuAS). TicSalutSocial was founded in 2005 as an eHealth competence centre with the mission of promoting eHealth adoption in the health sector. In 2016, its status was adapted to expand its mission to the social services, incorporating the Department of Social Affairs in the governance body. AQuAS is the public source of health system

performance information and oversees strategic programmes and projects such as the Results Central, innovative public procurement and the Programme of Data Analytics for Health Research and Innovation (PADRIS)[3].

2.2 eHealth System

The current eHealth system in Catalonia is the result of a long-term endeavour initiated by healthcare providers and steered by the Department of Health and CatSalut since late 90s. This shared endeavour has entailed a sustained investment in eHealth during the last 25 years. Based on their organisational autonomy, healthcare provider developed or acquired their health information systems to support business operations for both administrative and clinical processes. The Department of Health developed diseases registries for epidemiological surveillance, health planning, monitoring and evaluation. CatSalut developed the key system registries of beneficiaries, services, providers, and facilities.

Therefore, to describe the eHealth system in Catalonia, it is important to differentiate central from local eHealth building blocks (i.e., a homogeneous set of infrastructure and services components). Central eHealth building blocks are designed and led by the Department of Health and CatSalut while local eHealth building blocks are responsibility of healthcare providers. Figure 4 lays out the key building blocks from both levels.

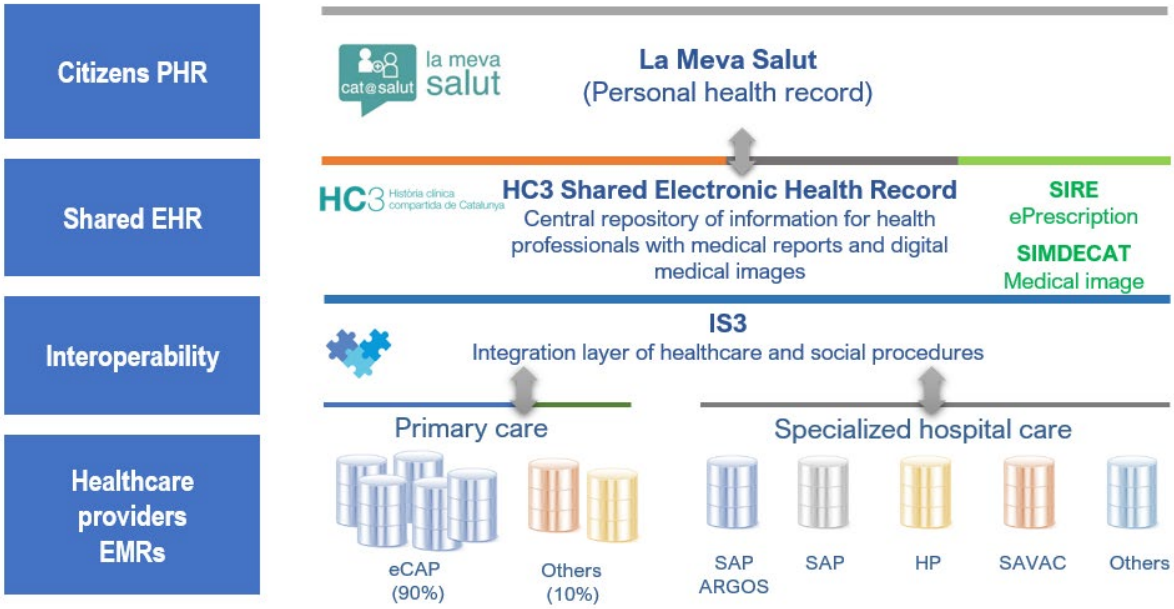

Figure 4. eHealth building blocks

In chronological order, local eHealth building blocks were set forth first to modernise health service delivery but unavoidably creating a fragmented eHealth landscape. This situation urged health authorities to develop central eHealth building blocks aiming at sharing patients' health information to improve coordination and integration of care.

2.2.1 Local eHealth building blocks

[3] PADRIS: https://aquas.gencat.cat/ca/ambits/analitica-dades/padris/index.html#googtrans(ca|en)

At present, all health providers use an EMR either developed or procured from international or national health IT vendors and financed with own budget resources.

Primary care led the digitisation process in the late 90s. Given that ICS is the main primary care provider, its EMR called ECAP is used by more than 90% of primary care teams and has become a fundamental health information source for the health system. This fact has led to a recent strategic decision of transferring the ownership of ECAP from ICS to CatSalut, in other words, from a provider to the payer, and thereby expanding the use of ECAP beyond ICS primary care teams.

Unlike primary care, the portrait of eHealth in the hospital sector is largely fragmented. For instance, there are 65 acute care hospitals contracted by CatSalut that use 29 different hospital information systems (HIS). The level of maturity of these HIS is uneven, with EMRAM levels ranging from Stage 0 to 6 and the majority at Stage 5,[4] and they are not interoperable between them. Tertiary hospitals have adopted a bespoke HIS built on SAP while community hospitals use adapted solutions from different vendors. A similar picture is valid for long-term care, mental health services and social services.

This eHealth jigsaw carries important consequences both in terms of health care integration and financial sustainability. Approximately between 1 and 2% of healthcare providers' budget is spent in IT. This average may soar up to 5% for large institutions. From a health system perspective, infrastructure and software maintenance and evolution costs are duplicated and financed from the same public funds provided by the contract with CatSalut. Moreover, because of this diversity and lack of interoperability, eHealth innovations that work for a healthcare provider cannot be easily scaled-up system-wide and thus becoming a source of inequities in access and quality of care.

2.2.2 Central building blocks

At the early age of digitisation, CatSalut developed some registries to organise its operation as public health insurer that have become central for articulating the current digital health system. For instance, the Insurees Central Registry (RCA) is the core database of healthcare beneficiaries used for authentication.

In 2005, aware of the fragmented health information systems resulting from the autonomy of healthcare providers in choosing their EMR, the Department of Health and CatSalut started to address data sharing among healthcare providers with the Shared Electronic Health Record (HC3) which was complemented further with the interoperability platform IS3.

Other relevant central building blocks include ECAP, the primary care EMR, ePrescription information system (SIRE) and the personal health record "La Meva Salut" (LMS).

2.2.3 Data sharing and access

HC3 is a health information exchange system developed by CatSalut and TicSalutSocial built upon existing EMRs. Originally, it only exchanged non-structured information such as discharge or emergency reports and worked as a cross-reference system based on pointers to electronic documents. Healthcare providers developed integration interfaces with HC3 from their EMRs to allow health professionals access to all patients' documented activities. By doing so, they set the first ground of organisational interoperability across the health system. At present, all healthcare providers have

[4] Buddrus U. Benchmarking EMR Adoption in Catalunya. HIMSS Analytics Europe, 2011. Available at: https://silo.tips/download/benchmarking-emr-adoption-in-catalunya

connected their health information systems to HC3, sending and accessing documents but also some structured data.

Alongside HC3, the Department of Health, CatSalut and TicSalutSocial defined new eHealth services like medical image sharing or ePrescription which were fully deployed in 2011. Based on an integrated health and care framework, further interoperability work was developed from 2014 through IS3, an integration layer to streamline care process between healthcare providers such as e-referrals, telemedicine, and activity alerts.

On top of HC3, CatSalut developed "La Meva Salut" (LMS), a web-based personal health record for citizens with a secure authentication system. LMS allows citizens to access their health data and files but also provides services such as e-appointment, e-consultation or advanced directives. Citizens' uptake of LMS remained however very low due to the administrative process to securely sign up. Changes introduced during the COVID-19 pandemic like a simplified sign-up process or the availability of a mobile responsive version of LMS and an app has spurred access to more than 60% of citizens. Now, for instance, vaccination certificates are accessed and downloaded via LMS, significantly reducing the burden of work of health centres' reception desks.

2.2.4 People, skills, and competences

A policy of digital skills development was enshrined by a competency accreditation programme based on training courses. A health-specific programme does not exist despite different attempts to develop one. Therefore, digital skills acquisition by health professionals is based on a combination of efforts from health organisations and scientific associations.

Although there is a lack of system developers, the critical deficit faced now is data scientists. There are no specific policies from the health system to address these needs hitherto.

2.3 eHealth system organisational structure - overview

The eHealth system organisational structure responds to the dual system described in the sections above. A central organisational structure to develop central eHealth building blocks and a decentralised layer of healthcare providers that develop local eHealth building blocks. The following sections describe the actors at play in each layer, their roles and responsibilities, highlighting the formal leadership or authority for each governance function.

2.3.1 Stakeholders of the central layer

On the central layer, different institutions have a stake in the eHealth building process. Their roles and leadership have changed over time reflecting how strategic eHealth has become to improve population health and the quality and efficiency of the health system since the first wave of digitisation.

All key actors at central level are public institutions attached to a government department. From the health domain, key actors are the Department of Health, CatSalut, TicSalutSocial and AQuAS whose mission and functions were described before. From the social sector, the Department of Social Rights and its agencies. And from the technology domain, the Centre of Telecommunications and Information Technologies (CTTI) and the Centre of Information Security (CESICAT).

A shared role in moving forward the eHealth development agenda has been constant since the beginning of health digitisation. TicSalutSocial has played a fundamental role during the first phases,

raising awareness of the benefits of eHealth and bringing international good practices that have inspired the current state of the eHealth system. However, one can observe how the role of CatSalut has become central since eHealth is not considered as an emerging trend but rather at the core business of healthcare and as the backbone of a modern health system. Furthermore, CatSalut indirectly finance local eHealth developments through the service contract.

This eHealth evolution from the edge to the core was materialised in 2013 with the appointment of the General Coordination of Health ICT, a Department of Health unipersonal senior management position originally hosted by TicSalutSocial and currently hosted by CatSalut.

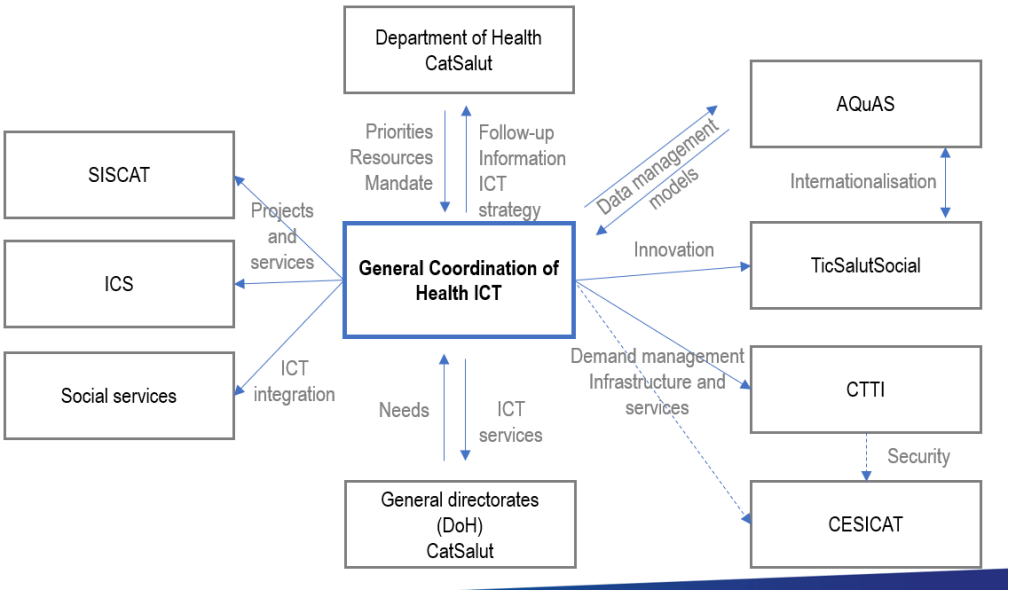

Figure 5. Relation map of the General Coordinator of Health ICT

Appointed by the Regional Minister of Health, the General Coordinator of Health ICT must establish a multiannual eHealth strategy, lead eHealth developments at central level and coordinate their deployment throughout the network of healthcare providers. A map of relations with key stakeholders is laid out in Figure 5.

To fulfil this mission and implement the strategy, the General Coordination of Health ICT counts with the eHealth Office. This office is responsible for the development of functional and technological governance and management of system-wide projects (HC3, IS3, LMS, eCAP) and it is sourced with professionals from CatSalut, Department of Health, ICS and TicSalutSocial.

Currently, the eHealth Office is structured in 12 organisational and thematic areas (Figure 6): Technical Area; Functional Area; Analytics Area; Catalogues and Standards Area; Technical Communication Area; Mobility Area; Information Security Area; Data Protection Area; Administrative Area; Primary care (eCAP) Area; Interoperability Area; and Image Diagnostics Area.

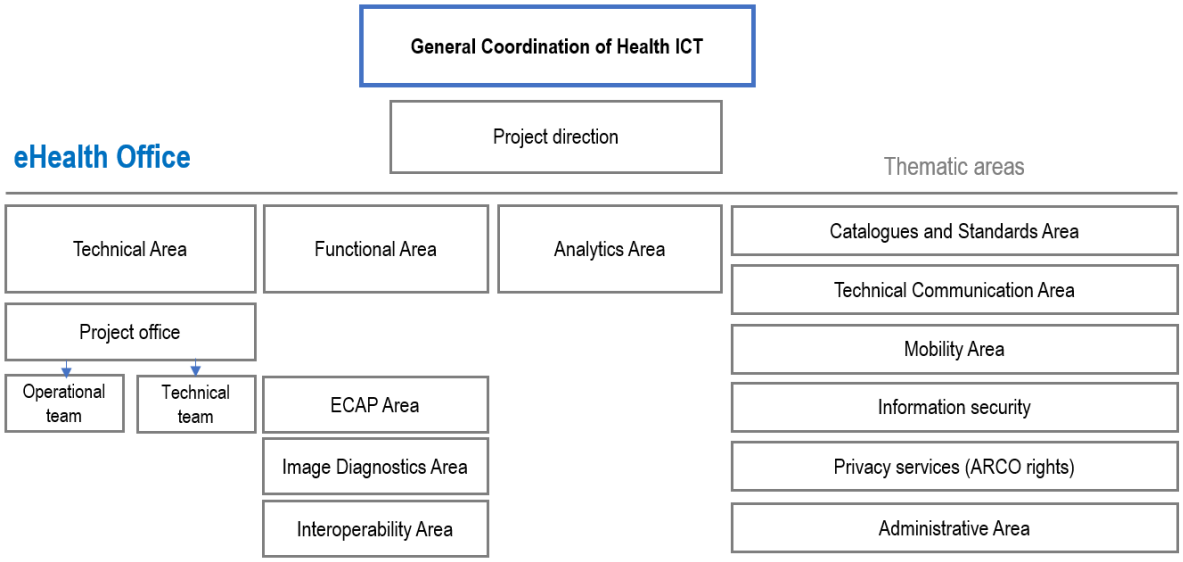

Figure 6. eHealth Office organisation and structure

2.3.2 Stakeholders of the health service provider layer

Participation of health service providers is mainly channelled through the Strategic Committee of Health ICT. This governance body has a consultative function to the General Coordination of Health ICT and it is composed by Chief Information Officers of several healthcare providers, mainly hospitals. They were actively engaged in the drafting of the Catalan Information Systems Master Plan. Furthermore, healthcare providers are involved at local level both in adopting central eHealth building blocks and developing their own eHealth systems. At central level, they are represented by healthcare organisation associations (UCH, CSSC, ACES) in the discussions and negotiations with the administration.

Due to its singularity as a public enterprise and the main healthcare provider of primary care services, ICS can also be considered a local actor. However, its role could be assimilated to a central key stakeholder and its eHealth developments are considered strategic from a system perspective.

Health professional associations such as the College of Physicians or the College of Nurses are also eHealth stakeholders and are consulted in the development of the projects where these professions are involved or act as ID providers.

Clinicians have not a formal representation body. Clinical champions are often consulted and involved in the development of functional modules in cooperation with the eHealth Office.

2.3.3 Stakeholders of the innovation layer (including businesses)

Promoting digital innovation in the health and social sector is the core mission of TicSalutSocial. To foster dialogue between the industry and the administration, TicSalutSocial set up the Industry Advisory Board where members reciprocally update on eHealth new developments and trends from the supply and demand side.

Technological centres such as Eurecat[5] or Leitat[6] play an important role in eHealth innovation mainly through the development of innovation projects for healthcare institutions or the participation in competitive European projects. These centres are private foundations with public and private board members representing technological industry associations, public agencies, and the government.

Other initiatives sponsored by the industry or healthcare organisations exist too and are focused on specific sectors such as digital health start-ups (e.g., Barcelona Health Hub[7]) or mHealth (e.g., Mobile World Capital Barcelona[8]).

2.4 Approach to main governance aspects

2.4.1 Planning and strategizing

At central level, the Department of Health is responsible for setting the health strategy through multiannual health plans which need to be approved by the Parliament. From the health plan, specific masterplans are derived. For instance, the last Health Plan 2016-2020[9] defined as a strategic action the development of the health information systems masterplan. Following this mandate, the Department of Health published the Catalan Information Systems Master Plan[10] in 2017 which was led by the General Coordinator of Health ICT. This masterplan defines the digital health strategy for strengthening the health system and develop health information systems and eHealth services between 2018 and 2023. The main objective of the plan is to establish a model for data management and an information architecture that is future-proof for the upcoming changes in the healthcare delivery model and the needs of patients and health professionals.

Once the health plan is approved, CatSalut is responsible for implementing the strategy mainly through the service contract that introduce financial incentives to healthcare providers linked to performance measures. For instance, CatSalut introduced the objective of connecting to HC3 as part of the variable part of the service contract which accelerated health data sharing among healthcare providers. CatSalut also uses ad hoc action plans for implementing health policies where the contract is not the most suitable implementation mechanism. An illustrative example is the business process reengineering based on applying Lean methods for streamlining primary care services and expanding the use of LMS.

Other public actors involved in planning and strategizing are TicSalutSocial, AQuAS, CTTI and CESICAT. TicSalutSocial participates in the definition of strategic actions contained in the Health Plan related to digital health innovation and takes the lead in the execution of some of them. AQuAS is leading the planning and development of secondary use of health data for research and innovation through PADRIS. CTTI and CESICAT support the Department of Health and CatSalut in the procurement and implementation process of central eHealth systems.

[5] Eurecat Technological Centre: https://eurecat.org/en/
[6] Leitat Technological Centre: https://www.leitat.org/en/
[7] Barcelona Health Hub: https://barcelonahealthhub.com/
[8] Mobile World Capital Barcelona: https://mobileworldcapital.com/
[9] Health Plan for Catalonia 2016-2020 https://salutweb.gencat.cat/web/.content/_departament/pla-de-salut/Pla-de-salut-2016-2020/documents/health-plan-catalonia_2016_2020.pdf
[10] Catalan Information Systems Master Plan. Building a digital health strategy for Catalonia together. Department of Health, 2017. https://catsalut.gencat.cat/web/.content/minisite/catsalut/actualitat/2021/documents/2021-05-14-The-Catalan-Information-System-Master-Plan.pdf

At local level, health and care providers develop their own strategic plans with specific eHealth strategic actions and ideally aligned with the strategic framework set forth by the Health Plan and the action plans developed by CatSalut.

2.4.2 Financing of eHealth investments

Central eHealth investments are carried out by CatSalut through the eHealth Office under the leadership of the General Coordination of Health ICT. They include the development, maintenance and evolution of central eHealth building blocks (i.e., HC3, IS3, ePrescription, La Meva Salut). An ear-marked multi-annual funding programme was approved in 2019 to secure and sustain the implementation of the 2018 Catalan Information Systems Master Plan. The first investment of this programme is the ongoing development of a central Electronic Health Record (EHR) that differs from HC3 as it will act as the main health data repository. Further investments include the evolution and renovation of ECAP (primary care EMR) which will use the new EHR data repository, the data model based on openEHR and OMOP and a new Hospital Information System (HIS) for those hospitals that need to update their HIS.

Healthcare providers invest in their eHealth systems from their annual budget. The main source of their income (up to 95%) is the contract with CatSalut for delivering care to public patients. Therefore, we can derive that eHealth investments are mainly funded indirectly by CatSalut. On average, healthcare providers spend in IT between 1 and 2% of their annual budget. However, IT spending is unevenly distributed, and large healthcare providers can spend up to 5%.

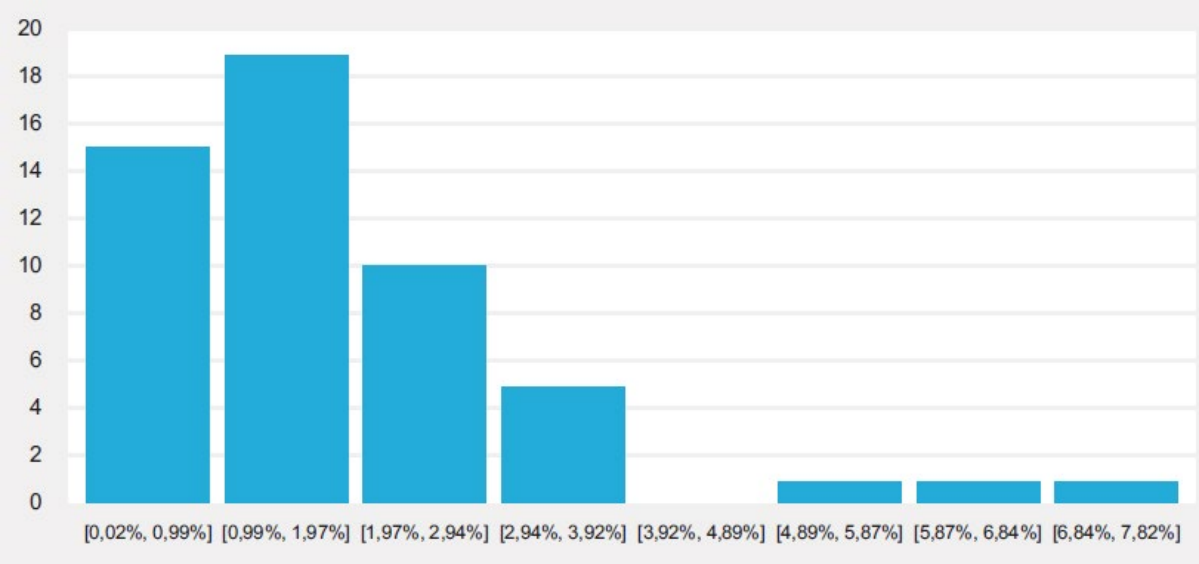

Figure 7. Total IT spending as % of annual budget (TicSalut, 2016)

2.4.3 Defining and enforcing an interoperability framework

The eHealth Office has a dedicated Area for Catalogues and Standards and a sub-Area for Interoperability that support the Technical and Functional Areas to ensure a coherent strategy in the adoption of interoperability standards for the different digital health platforms.

Through specific clauses in the service contract, CatSalut enforces healthcare providers to connect to the digital health platform to exchange structured and non-structured information through HC3 and to interoperate with other healthcare providers through IS3.

TicSalutSocial has also an office dedicated to standards and interoperability coordinated with the eHealth Office. This office monitors and propose the adoption of standards in the fields of social care and mobile health and social.

2.4.4 Developing, maintaining and improving eHealth building blocks

Developing new eHealth building blocks

In the past, central eHealth building blocks (HC3, IS3, ECAP and LMS) have been developed by CatSalut, ICS and TicSalutSocial. Currently, the new eHealth building blocks are under the responsibility of the General Coordination of Health ICT and its eHealth Office and follows the roadmap set forth by the 2018 Catalan Information Systems Master Plan. These developments are undertaken in coordination with the CTTI. Therefore, we can observe a concentration process of eHealth governance and management towards CatSalut.

The abovementioned multi-annual funding scheme secures funds to implement this eHealth development roadmap to update existing solutions at central level (HC3, IS3, LMS), at local level (ECAP and HIS) and develop new ones (EHR and clinical data model).

At healthcare provider level, each health institution remains responsible for maintaining their existing eHealth systems or upgrade them according to needs and level of obsolescence. However, their decisions need to comply with the organisational interoperability requests from CatSalut to exchange data and documents through HC3 and interoperate with IS3. Some healthcare providers with outdated EMRs are requesting support from the Department of Health and CatSalut to adopt a centrally built solution. According to the Master Plan, healthcare providers will have the option to adopt the new HIS developed centrally or they will have to adapt their systems to the data model developed in the new EHR.

Maintaining and improving existing eHealth building blocks

Maintenance and evolution of system-level eHealth infrastructures is responsibility of the General Coordination of Health ICT through CatSalut's eHealth Office. The eHealth Office supervises and manages IT service contracts with IT suppliers in coordination with CTTI.

Each healthcare provider must adapt its systems according to the requirements established by CatSalut through the eHealth Office to connect and exchange data and information with the digital health platforms HC3 and IS3.

Local eHealth infrastructures and services are maintained and evolved by each healthcare provider and sustained with their own annual budget. As seen in Figure 7, they allocate between 1% and 2% of their annual income to these functions.

2.4.5 Monitoring and evaluating eHealth service delivery

CatSalut monitors and evaluates the use of eHealth service delivery, namely the use of the Personal Health Record (La Meva Salut), the shared EHR (HC3), ePrescription, eConsulta and VideoConsulta. Through the service contract, CatSalut also monitors and evaluate other eHealth services such as different telemedicine initiatives such as tele-dermatology, tele-ophthalmology or tele-stroke with key performance indicators that eventually are linked to the variable part of the contract.

Each healthcare provider monitors and evaluates eHealth services delivered through their own eHealth infrastructures and services. Digital transformation initiatives at provider level exists and have been accelerated during the COVID-19 pandemic. These initiatives encompass projects to support virtual care, develop command centres for monitoring hospital activity and develop data lakes to support healthcare operations with health data from different sources (patient-generated, device-generated) and improve health research and innovation.

From a health system perspective, AQuAS performs annual evaluations of activity and performance of healthcare providers published in the Results Central[11], providing transparency and benchmarking. However, eHealth services are not featured, and they have just been partially covered. From 2007 to 2017, TicSalutSocial has produced the annual Map of Trends[12] that survey healthcare providers in their uptake and use of digital health, hence allowing monitoring over time. In 2021, TicSalutSocial has published the "State of digitisation of social services basic areas"[13], expanding from the health to the social sector.

2.4.6 Stimulating innovation in eHealth

TicSalut Foundation was created in 2006 with the mission of stimulating eHealth innovation in the health sector. Its creation was inspired by other European eHealth Competence Centres like the Estonian eHealth Foundation e-Tervis. Since the beginning, TicSalut helped to accelerate the uptake of digital health solutions in the Catalan health system and remains a key propeller of eHealth innovation in areas such as mHealth, telemedicine, artificial intelligence. Since 2016, it expanded its operations to the social sector changing the foundational name to TicSalutSocial. Its activity areas are the Observatory of eHealth, innovation projects, normalisation and homologation, and dissemination. It counts with three advisory boards: the industry council, the professionals and citizens council, and scientific council.

Over time, eHealth has become mainstream and healthcare providers have widely adopted eHealth solutions induced by the Department of Health and CatSalut policies, their own initiatives, and the collaboration with technologic centres (e.g., Eurecat, Leitat). Some healthcare providers, mainly tertiary hospitals, actively participate in European funded projects which goal is to innovate in eHealth.

Different attempts to build a "national" health data ecosystem for innovation and research have faced contended political discussions that held back the commercialisation of public health data. Currently, AQuAS is running PADRIS, the big data project of extracting value from the secondary use of health data.

2.5 Historical retrospective on how the current state has been achieved

Looking backward, the history of eHealth development in Catalonia can be divided in three decades. Table 1 outlines the key milestones of the eHealth journey in Catalonia:

- In the 90s, eHealth was driven by innovative healthcare providers that adopted the first EMRs. Health authorities developed the first region-wide databases but did not develop central eHealth policies. This led to a non-controlled spread of diverse eHealth systems that helped to climb the learning curve of digitisation but increased the fragmentation of the healthcare system.
- In 2000s, the first central policies took place under the leadership of TicSalutSocial and CatSalut with the landmark of developing the Shared Electronic Health Record of Catalonia (HC3) to address the fragmentation of EMRs. CatSalut increasingly adopted the eHealth

[11] AQuAS Results Central: http://observatorisalut.gencat.cat/en/central_de_resultats/
[12] TicSalutSocial Map of Trends 2007-2017: https://ticsalutsocial.cat/es/serveis/observatorio/informe-de-tendencias-tic/
[13] "State of digitisation of social services basic areas". TicSalutSocial, 2021. https://ticsalutsocial.cat/wp-content/uploads/2021/06/informe-ticss-abss_vfinal.pdf (in Catalan)

leadership needed to develop the digital health system and steer its evolution at healthcare provider level.

- In 2010s, the fruits of the eHealth investments blossom in a fully digitised health system with key building blocks in place (HC3, IS3, LMS, ePrescription and medical image). The appointment of the General Coordinator of Health ICT sent a clear message to the system that eHealth and digitisation is a public priority and has to be managed centrally by CatSalut, coordinating the efforts of healthcare providers.

Key milestones	
1990's	Adoption of first EMRs in primary care and first registry of users
1999	Development of ECAP (EMR used by 90% of primary care teams)
2000's	Adoption of EMR in hospital care
2005	Development of HC3 (Shared EHR)
2008-2011	Deployment of Medical Image access
2010	Development of La Meva Salut (Personal health record)
2007-2010	Deployment of ePrescription
2014	All healthcare providers are connected to HC3
2015	Deployment of eConsultation in primary care, mHealth plan
2018	Catalan Information System Master Plan
2019	Kickstart of the Master Plan implementation
2020	Acceleration of digital transformation as response to the COVID-19 crisis

Table 1. Key milestones in eHealth development in Catalonia

The fourth decade of eHealth has started with the COVID-19 crisis and the acceleration of digital health uptake. Services such as the personal health record (LMS) or eConsulta have rocketed during the pandemic reaching an unprecedented use. The implementation of the Catalan Information System Master Plan will guide the future achievements to strengthening a data-driven health system and overcome the main challenges experienced in the past.

2.6 Successes and what could be done better?

The eHealth development journey in Catalonia has benefited from structural conditions that favour adoption and expansion but that have brought complex challenges. The transition of leadership from healthcare providers to health authorities, first with the role of the eHealth competence centre and finally with the central stewardship of CatSalut reflects the emerging trend of eHealth from the edge to the core of the healthcare business.

Among the key successes of this journey, the early adoption of eHealth in the first wave of healthcare digitisation stands out. Healthcare providers autonomy has been decisive to experiment, evaluate and scale up EMRs. At primary care level, the consolidation of ECAP thanks to the dominant position of ICS and the support received by CatSalut can be considered a remarkable success. ECAP has contributed to establish a system-wide population health record that will underpin the future steps of a regional EHR.

Attempts to address the fragmentation of health information systems at healthcare provider level have contributed to leapfrog towards an integrated digital health system, allowing information and

data exchange to ensure continuity of care and foster cooperation between healthcare providers. The triad of HC3, IS3 and LMS have made possible this interconnectedness including patients and facilitating further coordination and integration of care services.

However, different challenges remain unsolved such as the proper integration with social care or the capacity of citizens to access and control health data.

Several are the areas for improvement to consolidate the Catalan digital health system which are pinpointed and addressed in the 2018 Catalan Information System Master Plan. The most challenging one is to tackle fragmentation of hospital information systems. Earlier action from the health authorities could have reduced or minimised these caveats which are present in most country health systems. Reducing the number of existing EMRs is a long-term objective that can be achieved by offering a system-wide solution in addition to the consolidated EMRs.

Another area for improvement is to boost quality and exchange of data for innovation and research including “omics” data. Reflecting social preferences in the design of this big data project would have avoid political resistance of previous attempts and fostered the health innovation and research ecosystem.

Finally, there is a need to adopt and formalise a participatory governance approach for eHealth that is set in principles but lack practical deployment. This approach should systematically combine executive leadership from health authorities with healthcare providers involvement in the design and development of new eHealth building blocks.