Catalonia's Journey Toward Person-Centric Digital Health

Information Systems Directorate
Catalan Health Service

8th of October 2025

eHealth Observatory - Odense (Denmark)

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Generalitat de Catalunya

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About Catalonia

About Catalonia

Characteristics

8.012.231
Population in Catalonia in 2024.

947
Municipalities spread across the Catalan geography.

Universal coverage
Pure Beveridge model: free healthcare for all Catalonian citizens and funded by taxes.

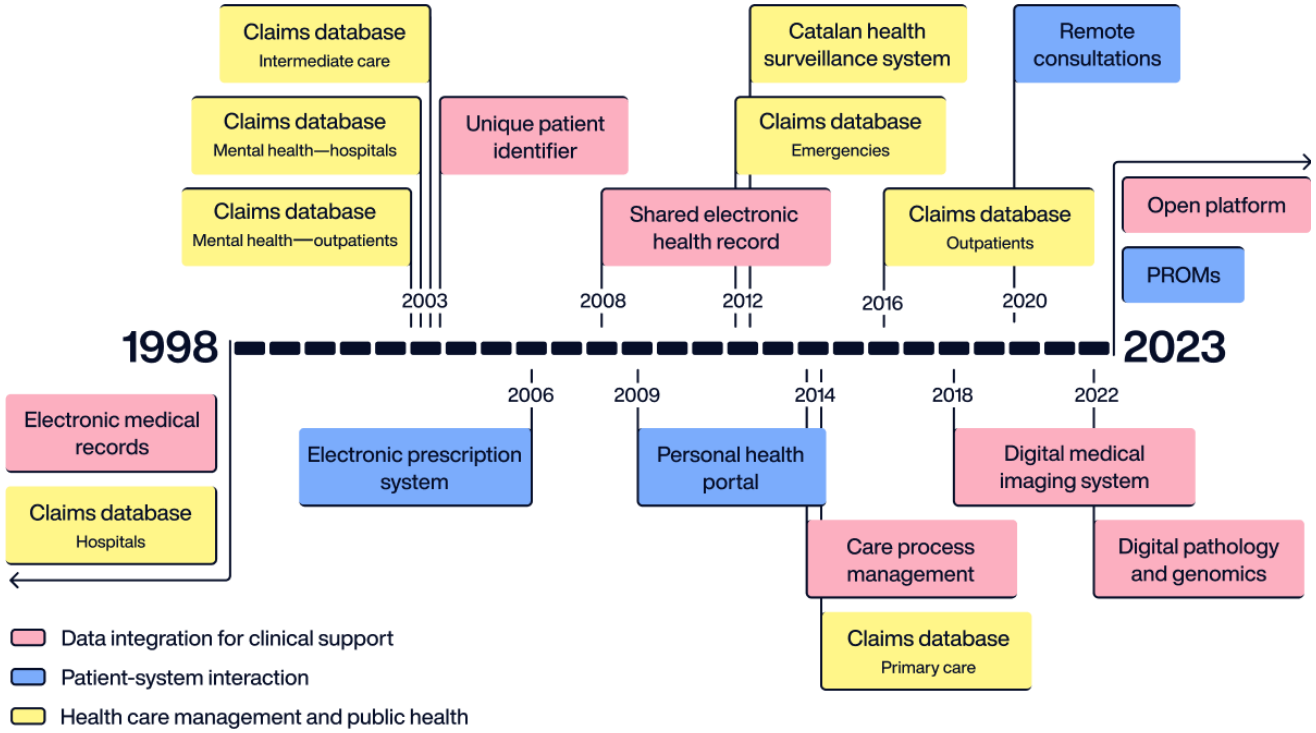
19,6%
Population aged > 65.

Healthcare facilities
69 - Hospitals across the region (12 high-complexity – third-level). 378 - Primary care centres. **Primary care is fully embedded within the public health system.** 99 – Intermediate care centres.

Social System
The social services are entrusted to the Municipalities through the Department of Social Rights and Inclusion.

The Catalan journey to health IT

Pionners in digitalisation



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Preprints (earlier versions) of this paper are available at https://preprints.jmir.org/preprint/58933, first published March 28, 2024.

A 25-Year Retrospective of Health IT Infrastructure Building: The Example of the Catalonia Region

Jordi Piera-Jiménez[1,2,3]; Gerard Carot-Sans[1,2]; Marina Ramiro-Pareta[2]; Maria Mercedes Nogueras[2,4]; Júlia Folguera-Profitós[1,2]; Pepi Ródenas[1]; Alba Jiménez-Rueda[2]; Thais de Pando Navarro[1,2]; Josep Antoni Mira Palacios[5]; Joan Carles Fajardo[6]; Joan Ustrell Campillo[5]; Emili Vela[1,2]; David Monterde[2,6]; Damià Valero-Bover[1,2]; Tara Bonet[1,2]; Guillermo Tarrasó-Urios[1,2]; Roser Cantenys-Sabà[1,2]; Pau Fabregat-Fabregat[1,2]; Beatriz Gómez Oliveros[2]; Jesús Berdún[7]; Xabier Michelena[2,8]; Isaac Cano[9,10,11]; Rubèn González-Colom[9,10]; Josep Roca[9,10,11]; Oscar Solans[6]; Caridad Pontes[2,7,12]; Pol Pérez-Sust[1,13]

Source: https://www.jmir.org/2024/1/e58933

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Let’s talk about health data

Once upon a time

A promise long term overdue

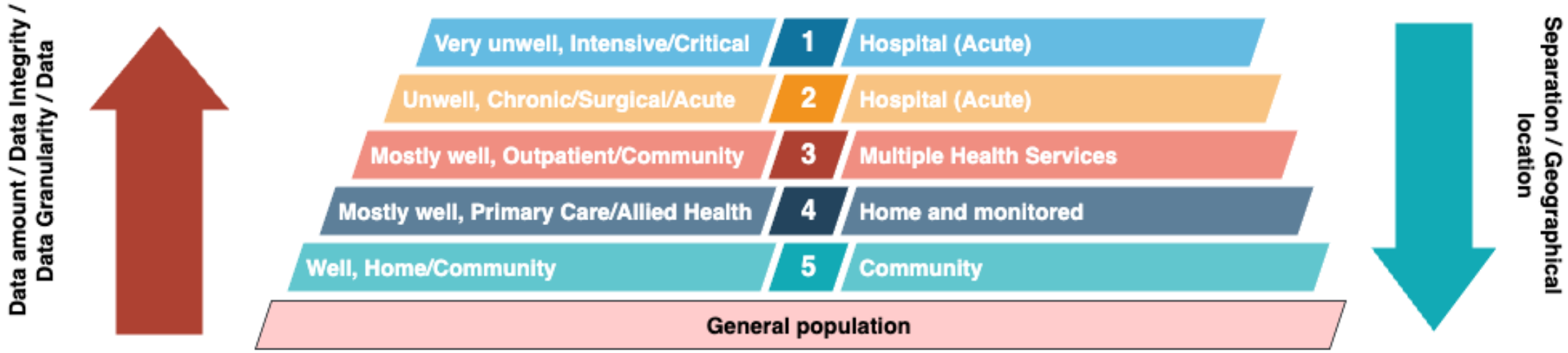
"… fundamental changes in health delivery with the main objective to improve the quality of care focusing on six qualities of care: Safe, Effective, Patient-centred, Timely, Efficient and Equitable".

"… to achieve the main objective, the care processes need to be redesigned and a ***strong investment in health information technology is required****. The focus of this investment has to be on supporting care processes in the context of the Internet revolution* ***to foster access of health information by all stakeholders****…".*

Source: Crossing the Quality Chasm (Institute of Medicine, 2001).

Where are health data produced?

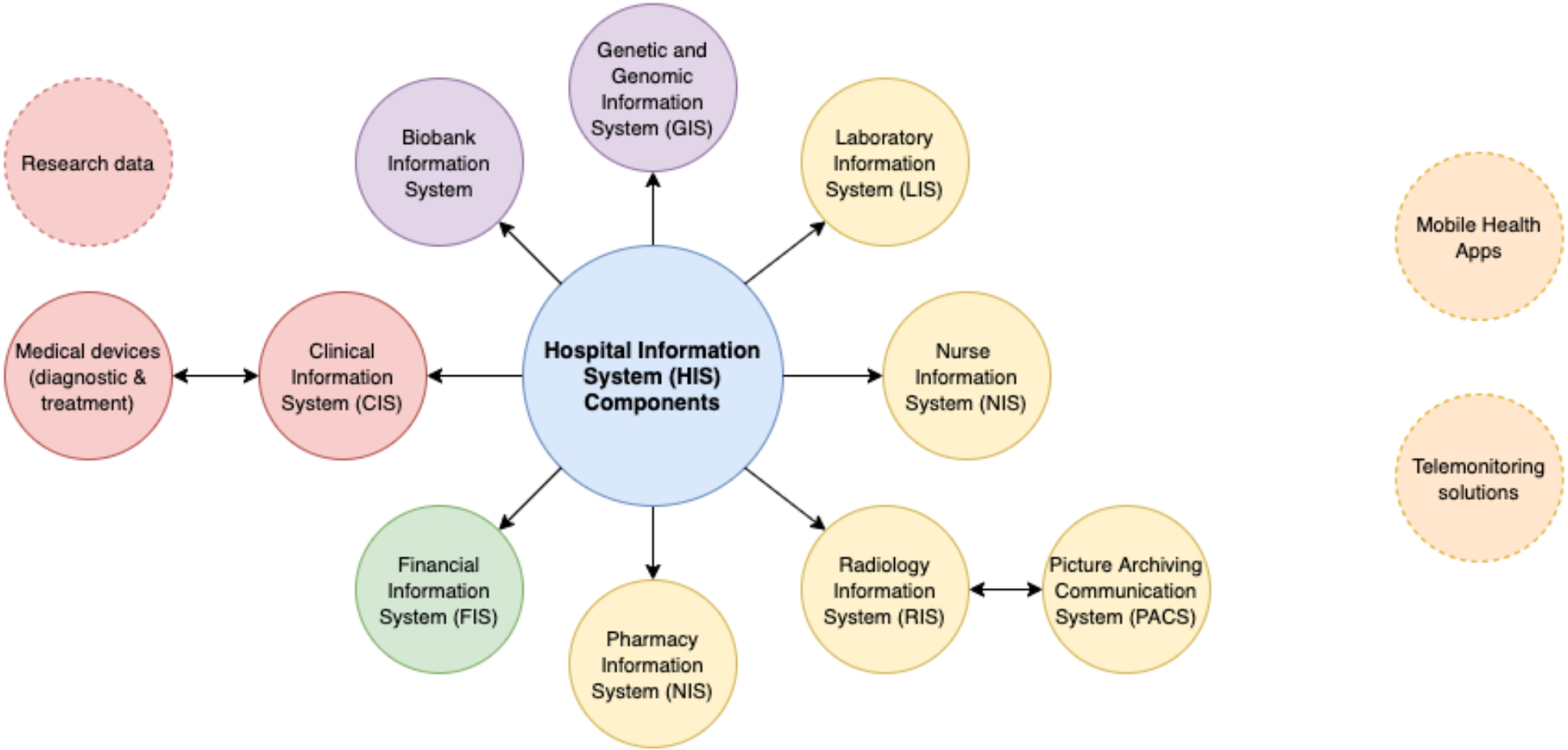
Quantity vs quality vs origin



Source: NIH Grant application (Jordi Piera-Jiménez et al, 2021).

The EMR is the main source

A system of systems



Source: Digital Health Strategy for Catalonia 2018-2022 (Jordi Piera-Jiménez, 2018).

EMRs seen from inside

A different perspective

Data silos in healthcare

A big burden for innovation

Using Catalonia as an example:

- ☐ 69 hospitals and 29 different EMR products
- ☐ Each tertiary hospital has around 600-800 silos of information
- ☐ Each secondary hospital has around 400-500 silos of information
- ☐ Our prospections indicate us we have more than 16k silos of patient-related information
- ☐ Huge heterogeneity of proprietary data models

Source: https://link.springer.com/article/10.1007/s40264-018-00793-z

When building a longitudinal EHR

Maybe just a dream?

...

Data is not understood

Surprise surprise

> J Am Med Inform Assoc. 2022 Apr 13;29(5):753-760. doi: 10.1093/jamia/ocab289.

Quantitating and assessing interoperability between electronic health records

Elmer V Bernstam [1 2], Jeremy L Warner [3], John C Krauss [4], Edward Ambinder [5], Wendy S Rubinstein [6], George Komatsoulis [6], Robert S Miller [6], James L Chen [7]

Affiliations + expand

PMID: 35015861 PMCID: PMC9006690 (available on 2023-01-07)
DOI: 10.1093/jamia/ocab289

- Allscripts
- Varian Medical Systems
- General Electric
- Cerner
- Epic Systems
- IntrinsicQ
- Elekta
- NextGen
- Flatiron Health

As defined in the study, ***intra-vendor interoperability*** refers to the ability to share information between instances of the same vendor's product (e.g., Epic > Epic). ***Inter-vendor interoperability*** refers to the ability to share information between instances of different vendor products (e.g., Epic > Cerner)."

A recent study of EHR interoperability found that **68% of data was "understood" when exchanged across different sites using the same vendor**, but only **22% was "understood" when exchanged across different EHR vendors.**

Discussion: *"In contrast to data elements required for successful billing, clinically relevant data elements are rarely standardized, even though applicable standards exist."*

About connecting systems in healthcare

Feels a bit patchy, don't you think?

Interoperability

FHIR

- Interoperability is bad: get the systems to agree on content up front
  - Still have protocol challenges etc
- In general, the earlier you can agree, the better off everyone is
  - Healthcare is characterised by being unable to agree
  - Messy interoperability isn't going away

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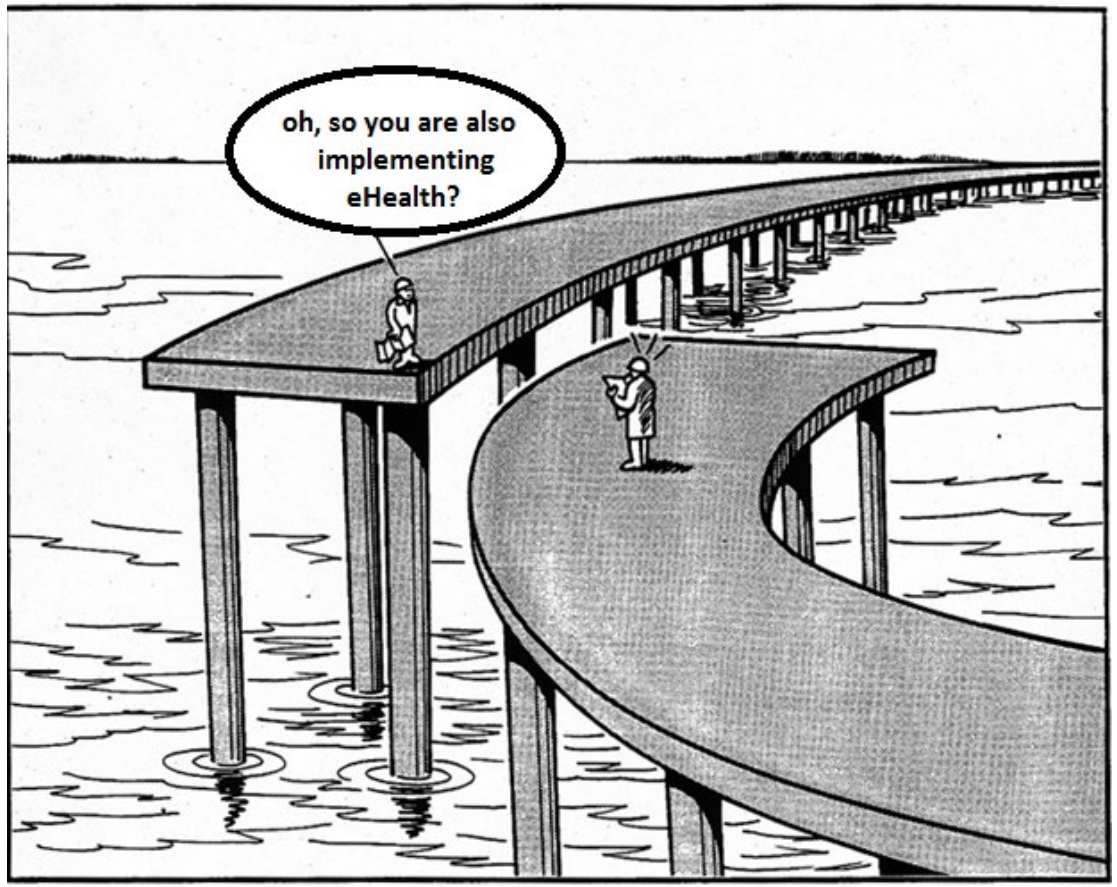
Source: Graham Grieve (HL7-FHIR) podcast with Sidharth Ramesh 2024.



Source: Ed Simons (Nijmegen University), David Baker (CASRAI) and Josh Brown at euroCRIS meeting in Amsterdam 2014.

What’s the real problem

Inconsistency in health data

Original Investigation | Health Informatics

April 30, 2025

Generalizability of FDA-Approved AI-Enabled Medical Devices for Clinical Use

Daniel Windecker, BMed[1]; Giovanni Baj, PhD[2]; Isaac Shiri, PhD[2]; et al

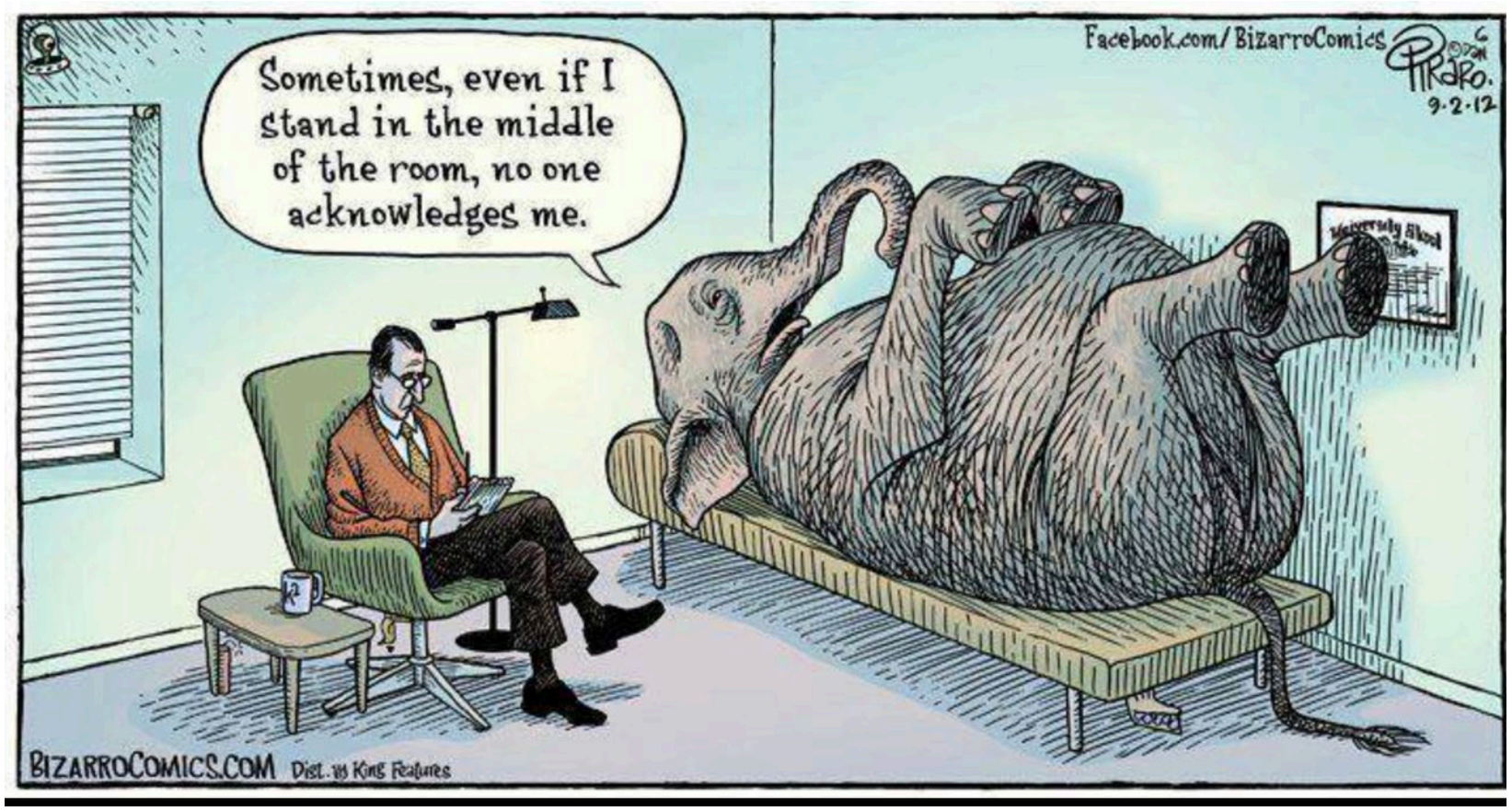
» Author Affiliations | Article Information

JAMA Netw Open. 2025;8(4):e258052. doi:10.1001/jamanetworkopen.2025.8052

Ensuring that AI models are trained on comprehensive and representative datasets is essential to avoid biases and ensure reliable outcomes in real-world applications.[14-18] AI models are highly dependent on the data on which they are trained. If the training data are not representative of the broader population (eg, in terms of demographics, disease prevalence, or clinical settings), the AI's performance may not perform equally well in different patient populations or environments.[17,19] Without robust evidence of generalizability, the effectiveness and safety of these devices may be compromised when used outside of the controlled conditions in which they were initially validated. In addition, AI-enabled devices may perform differently in varied clinical settings due to differences in equipment, protocols, and health care practices. Models trained in one setting may not be effectively applied to another setting without appropriate retraining or adaptation. An AI device developed and validated in one country or region might not perform equally well in another with a different patient population, potentially impacting the generalizability of AI models on a global level. Therefore, the clinical evaluation and validation of AI-enabled medical devices is crucial and remains challenging.[5,8,20]

The reality we must confront

We are health data rich, information poor



Rethinking our health IT model

Some limitations

- Broad ecosystem of applications with buried business logic and data models.
- Old-fashioned solutions and a dramatic increase in technical debt.
- Communication between service providers and the Catalan NHS through static and incoherent interoperability solutions.
- High costs for maintenance, corrective and evolutionary development.
- Difficulties in scaling up innovations and best practices.
- Rigid model that does not foster adaptation to change.

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Looking into the future

The promise is huge (if we succeed…)

The example of the European Health Data Space: transforming healthcare through data

EHDS optimises the use of health data to improve healthcare, foster innovation, and support evidence-based policymaking. It is expected to:

- ☐ generate €11 billion in savings over the next decade by enhancing data accessibility
- ☐ enhance healthcare service efficiency across EU member states
- ☐ drive 20-30% expansion in the digital health sector
- ☐ strengthen policy development and scientific research
- ☐ lead to better health outcomes for European citizens.

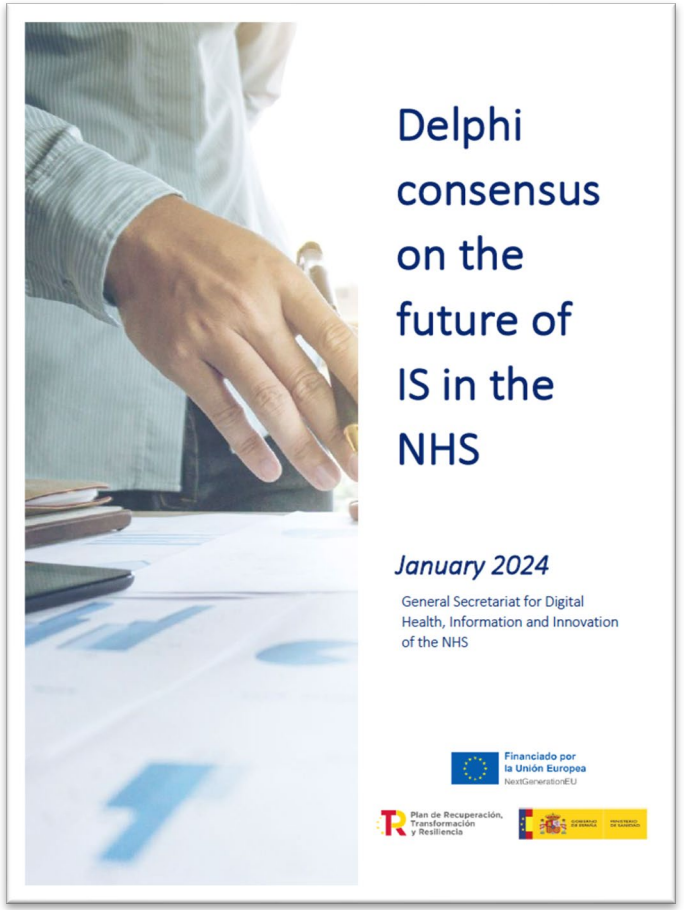
And:

- ☐ improved data exchange enables secure sharing of medical history supporting better diagnosis and treatment decisions
- ☐ reduces unnecessary duplicated medical tests, easing patient burden and cutting healthcare costs
- ☐ facilitates data-driven research and innovation, enhancing efficiency and affordability in medical advancements.

The future of Health IT in Spain

Consensus process among the 17 Spanish regions

- Spain has a national EHR since year 2011
- Establish a national consensus on the future of the health information systems model for the NHS as a whole, with a very specific focus on the evolution of the national EHR.
- Survey with 45 statements split among 4 sections (justification of need, functional requirements, technical requirements and governance)
- N = 152 participants
- 20 recommendations split among the 4 sections
- Conclusions validated among a panel of international experts
- The survey is currently being replicated in Australia



National survey on the current EHR

Healthcare professionals survey

Purpose of the study: To analyse the usability of the Electronic Medical Record system that is primarily used

- **Section 1:** Demographics
- **Section 2:** Your EMR/EHR system
  - Evaluation of the Electronic Medical Record System
  - Collaboration and information exchange
  - Advantages and disadvantages of the Electronic Medical Record

Contents lists available at ScienceDirect

International Journal of Medical Informatics

journal homepage: www.ijmijournal.com

Usability problems do not heal by themselves: National survey on physicians' experiences with EHRs in Finland

Johanna Kaipio[a,*], Tinja Lääveri[b], Hannele Hyppönen[c], Suvi Vainiomäki[d], Jarmo Reponen[e,f], Andre Kushniruk[g], Elizabeth Borycki[g], Jukka Vänskä[h]

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[b] University of Helsinki and Helsinki University Hospital, Inflammation Center, Clinic of Infectious Diseases, Helsinki, Finland
[c] National Institute for Health and Welfare (THL), Information Department, Helsinki, Finland
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[e] University of Oulu, Finntelemedicum, Research Unit of Medical Imaging, Physics and Technology, Oulu, Finland
Hospital of Raahe, Department of Radiology, Raahe, Finland
[g] University of Victoria, School of Health Information Science, Victoria, British Columbia, Canada
[h] Finnish Medical Association, Helsinki, Finland

Source: https://doi.org/10.1016/j.ijmedinf.2016.10.010

Thinking about the future

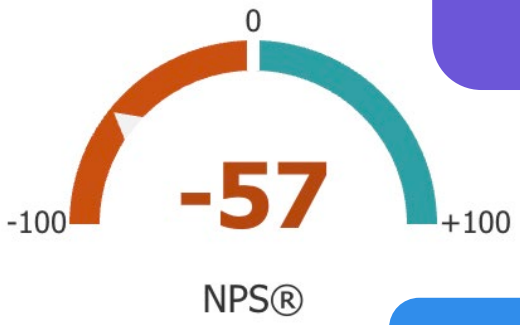
A participatory approach

3200+ responses

62% agreed the system is **slow**

43% of p**rofessionals use whatsapp/email** to **obtain information from patients**

64% have to **change systems** to deliver healthcare



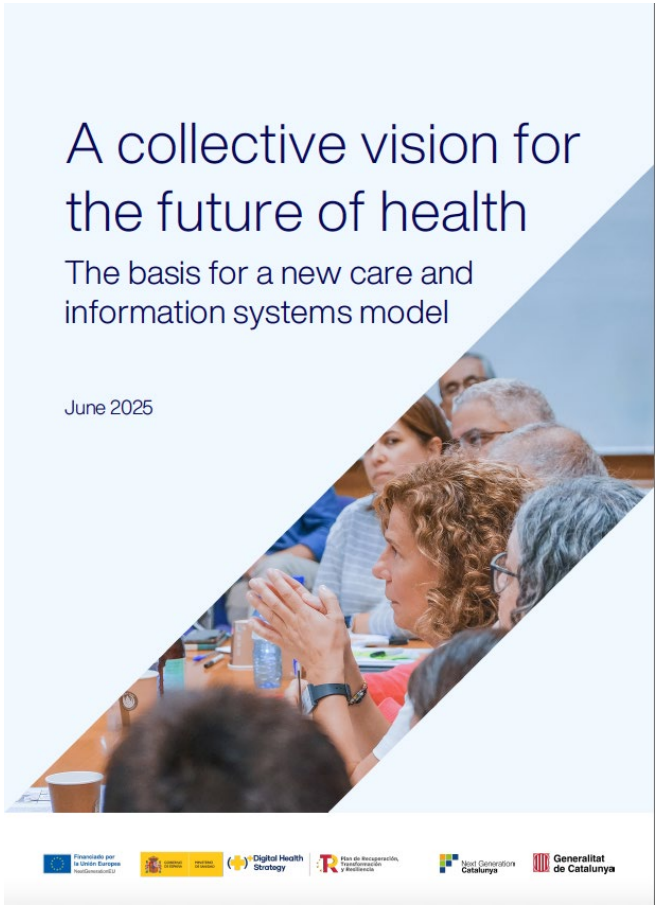
59% believe the EHR **removes attention** from the **patient**

48% claim that **EHR issues** have **impacted negatively a patient**

61% think that **structured data** facilitates **healthcare delivery**

A collective visison

Redefining our healthcare delivery model and how to support it with IT



Source: https://scientiasalut.gencat.cat/handle/11351/13197

The Digital Health Strategy 2026-2031

Aligned with the Catalan Health Plans

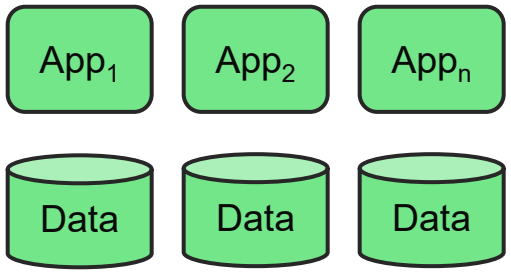
Integrated, **people-centred care**, supported by an **information system model** that systematically leverages **health data** to **build value-added services**, that fosters **innovation** and is built on a **collaboration** model based on **open standards.**

1. Construction and deployment of the new **Catalan Electronic Health Record**.
2. Deployment of an information systems model based on the **open platform paradigm**.
3. Deployment of **innovation** through the systematic use of health data.
4. Establishment of a governance model for information systems with the **participation** of all stakeholders within the Catalan health ecosystem.

What are the options?

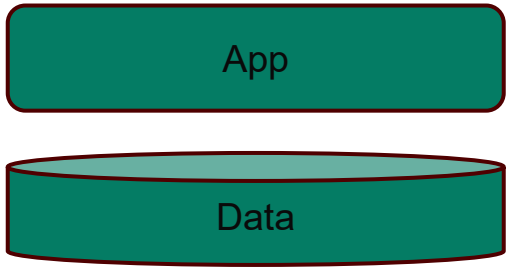
Three different approaches

First generation
"best of breed"
(Standalone)



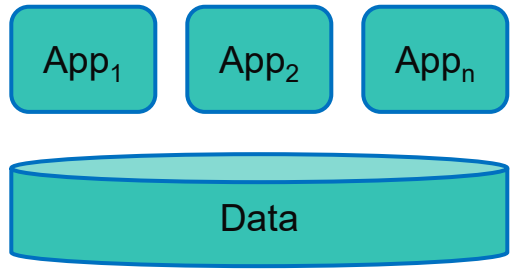
- Separate systems with integration work
- Standards-based but complex

Second generation
"best of suite"
(Mega suite or monolith)



- Single vendor solution
- High cost, loss of freedom

Third generation
"knowledge-driven platform" or "open platform"
(Open ecosystem or best of breed 2.0)



- Core services, data, capabilities
- in new paradigm
- Coherent service infrastructure
- Modern application technology

What is a platform?

The knowledge-driven or open platform in healthcare

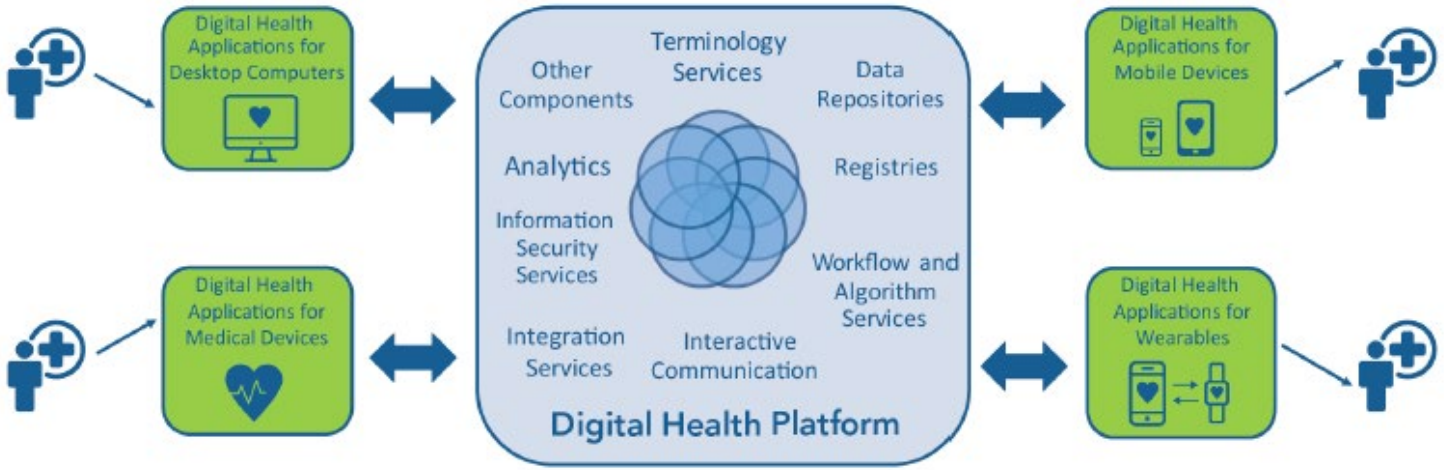
"A published architecture whose component interfaces form the basis for independent application development"

- ☐ A common base for higher-level components.
- ☐ Coherent and coordinated functionality.
- ☐ Component-based architecture with separation of concerns.
- ☐ Published interfaces (APIs) and shared information models.
- ☐ Avoids duplication of effort across applications.

Source: The Apperta Foundation 2017.

A Digital Information Infrastructure

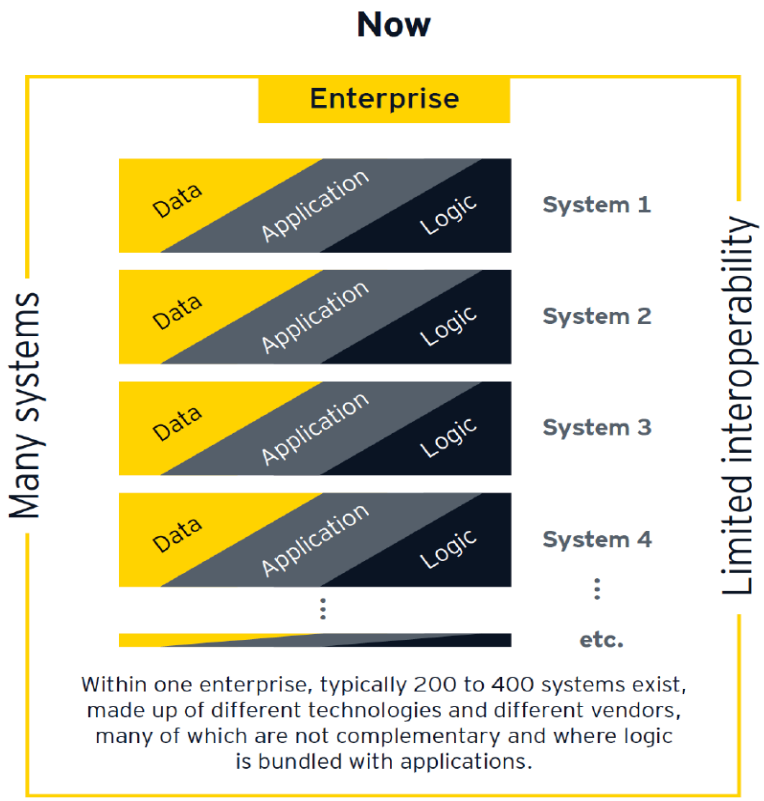
The infostructure for health



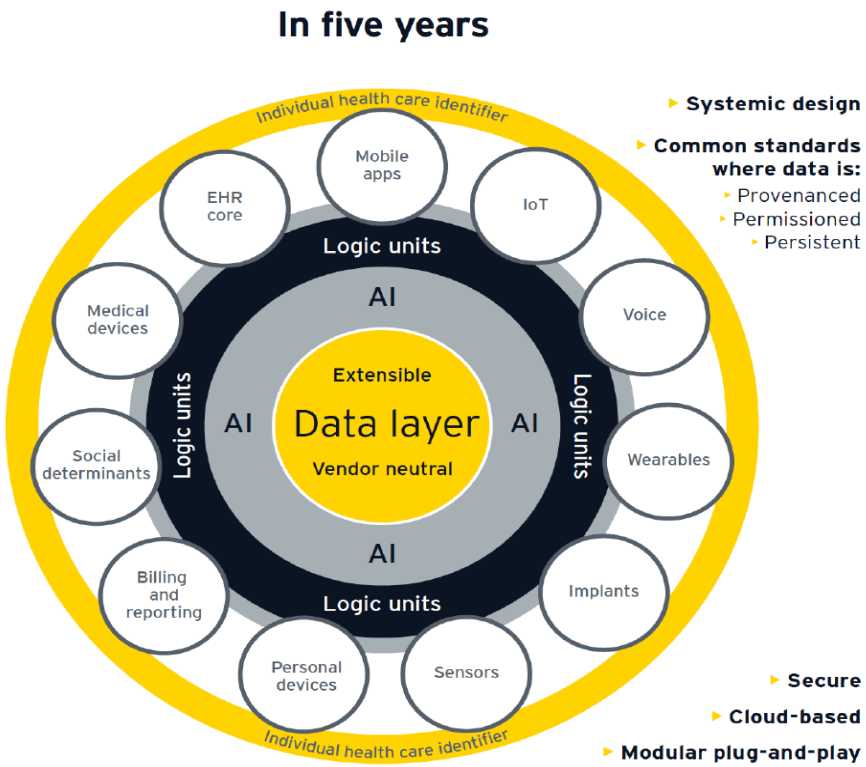
Source: WHO & ITU (2020).

What is this all about?

Current vs future view



Present: Many systems all with intimately bound data logic and applications



Future: A cohesive technology stack, giving a unified experience for clinicians, professionals and patients; unique data at the center accessed by applications in real time through micro-services

Business perspective

Foreseen benefits

- ☐ Plug-and-play vendors competing on application quality, not data lock-in.
- ☐ Customers retain control and ownership of data.
- ☐ Reuse of existing components.
- ☐ Open platform-based economic ecosystem.
- ☐ Procurement uses platform specifications as conformance points.
- ☐ Clinical experts involved in specifications and development.

Taking back control

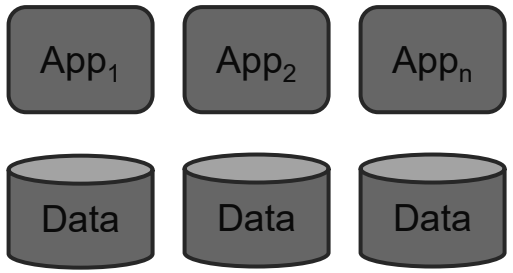
Foreseen benefits

- ☐ Platform represents conformance criteria held by procurement side.
- ☐ Makes buyer the owner of the solution.
- ☐ Vendors supply well-defined components rather than total solutions.
- ☐ Procurement side becomes master integrator.
- ☐ Integration becomes controlled and managed.
- ☐ Component-level formal conformance in tender documents.
- ☐ Escape from vendor lock-in.
- ☐ Data ownership by provider and/or subject, not vendors.

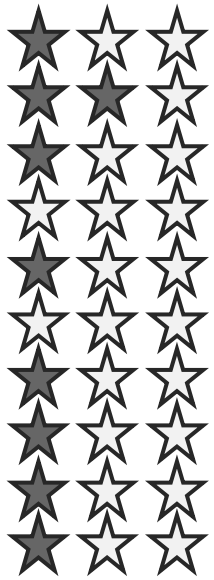
A good solution is plugged to the wrong problem (Patrik-Georgi Hemming, CMIO at Karolinska University Hospital)

Characterization of the different options

First generation
"best of breed"
(Standalone)



- Robustness
- Value for money
- Flexibility
- Vendor neutrality
- Innovation
- Data semantics
- Interoperability
- Renovation
- Decision support
- Reporting



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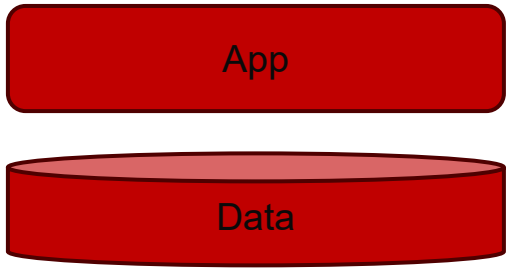

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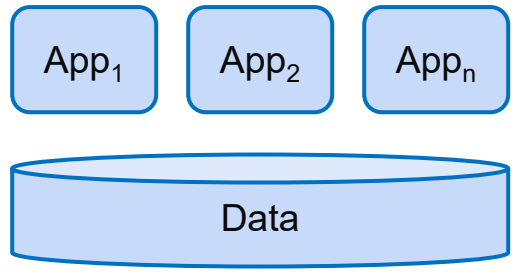

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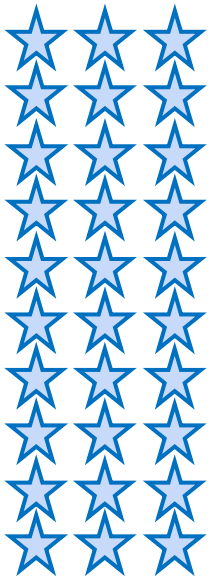

Final thoughts

Conclusions

- ☐ The knowledge-driven platform creates a platform economy where vendors compete on quality and not lock-in!
- ☐ Knowledge-driven platform addresses semantic incoherence.
- ☐ Sets procurement granularity to component level.
- ☐ Empowers procurement side as platform architecture owner.
- ☐ Formalises domain knowledge as computable models → this is done by clinicians!
- ☐ Shifts economics and management of work effort.
- ☐ Creates new activities: knowledge engineering and low-code development.
- ☐ Introduction requires careful planning over time.
- ☐ Enables sustainable digital health ecosystems.

Generalitat de Catalunya

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