Interoperability as a data-driven sociotechnical practice: digital maturity, governance, and the Danish experience

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The Danish healthcare sector

- Population 6.0 million
- HC expenditures:
  - 9.8% of GNP
  - Funded by taxes
- Private GPs:
  - Gatekeepers
  - Fee for service (public)
- Hospitals:
  - 27 hospitals (72 locations)
  - 15,000 beds
  - Almost all public (97%)
  - Owned & run by 4 regions
- Long term & home care:
  - Run by 98 municipalities

Central trends and challenges
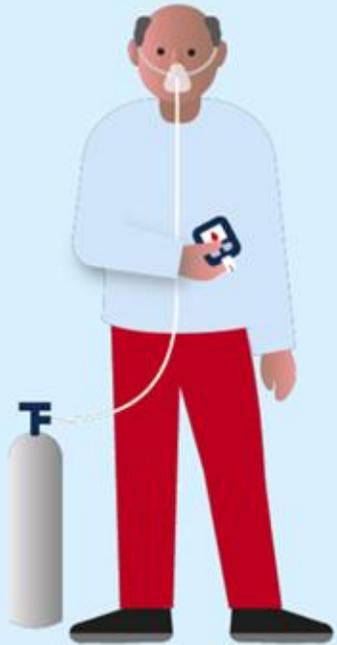
20% of the population have one or more chronic conditions

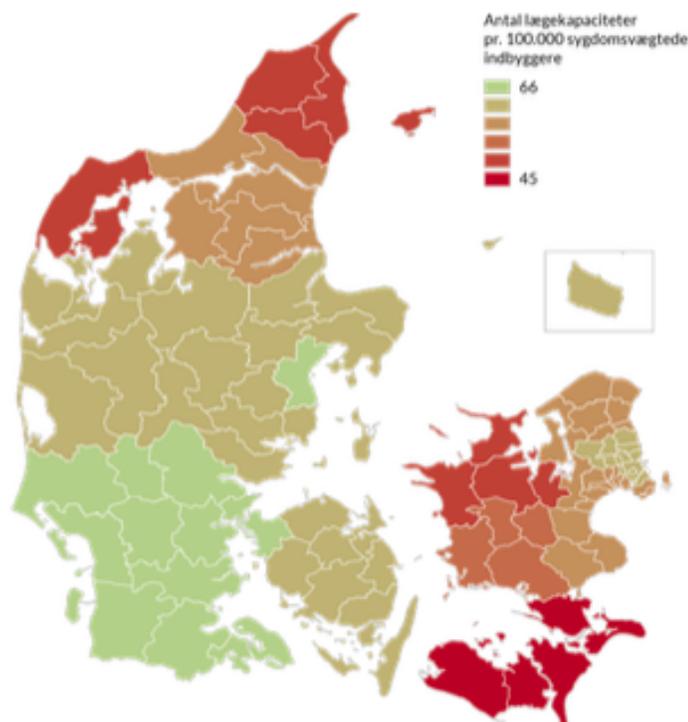By 2035, there will be 50% more elderly people over the age of 80

Citizens' expectations of the health service are growing as we become richer as a society

There may be a shortage of 15,000 more social and health care assistants in 2035 compared to today
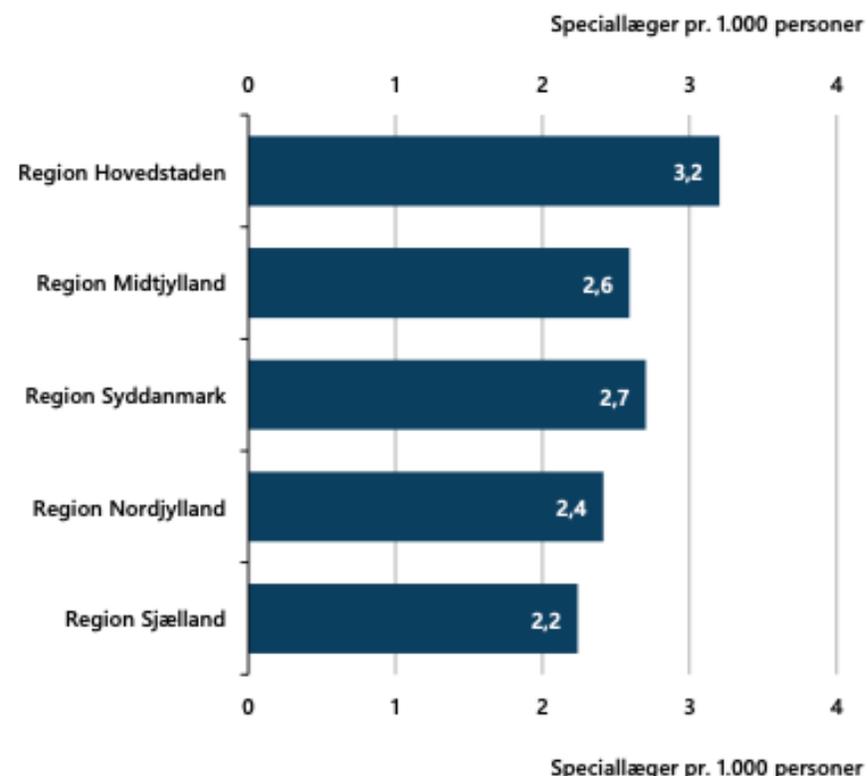
The geographic balance in health issues is challenged

Antal lægekapaciteter pr. 100.000 sygdomsvægtede indbyggere

Antal lægekapaciteter pr. 100.000 sygdomsvægtede indbyggere

- 66
- 45

Antal speciallæger pr. indbygger, fordelt på region

Speciallæger pr. 1.000 personer

Region	Speciallæger pr. 1.000 personer
Region Hovedstaden	3,2
Region Midtjylland	2,6
Region Syddanmark	2,7
Region Nordjylland	2,4
Region Sjælland	2,2

Speciallæger pr. 1.000 personer

Kilde: Sundhedsdatastyrelsen og ministeriets egne beregninger.

Kilde: Sundhedsdatastyrelsen, 2019, Lægeprognose 2021-2045: Udbuddet af læger og speciallæger, og bevægelsesregistret.

Anm.: Antallet af borgere vedrører bopælsregion, mens antal sundhedspersonale vedrører arbejdsstedsregionen.

NEW HEALTH REFORM – 2024 to 2028

A political document

With a broad political agreement, the direction has been set for the largest reform of the Danish health service since the structural reform in 2004. The 2024 health reform will strengthen the quality of health services throughout the country, bring health services closer to citizens and prepare the health service for the needs of the future.

The aim of the health reform is to make the health system deliver more equal, local, and more coherent healthcare

More equal: Better distribution of (e.g. doctor) resources, so that everyone has access to high-quality health services

Closer proximity: Transition to closer, less specialized and digital health services (outside hospitals)
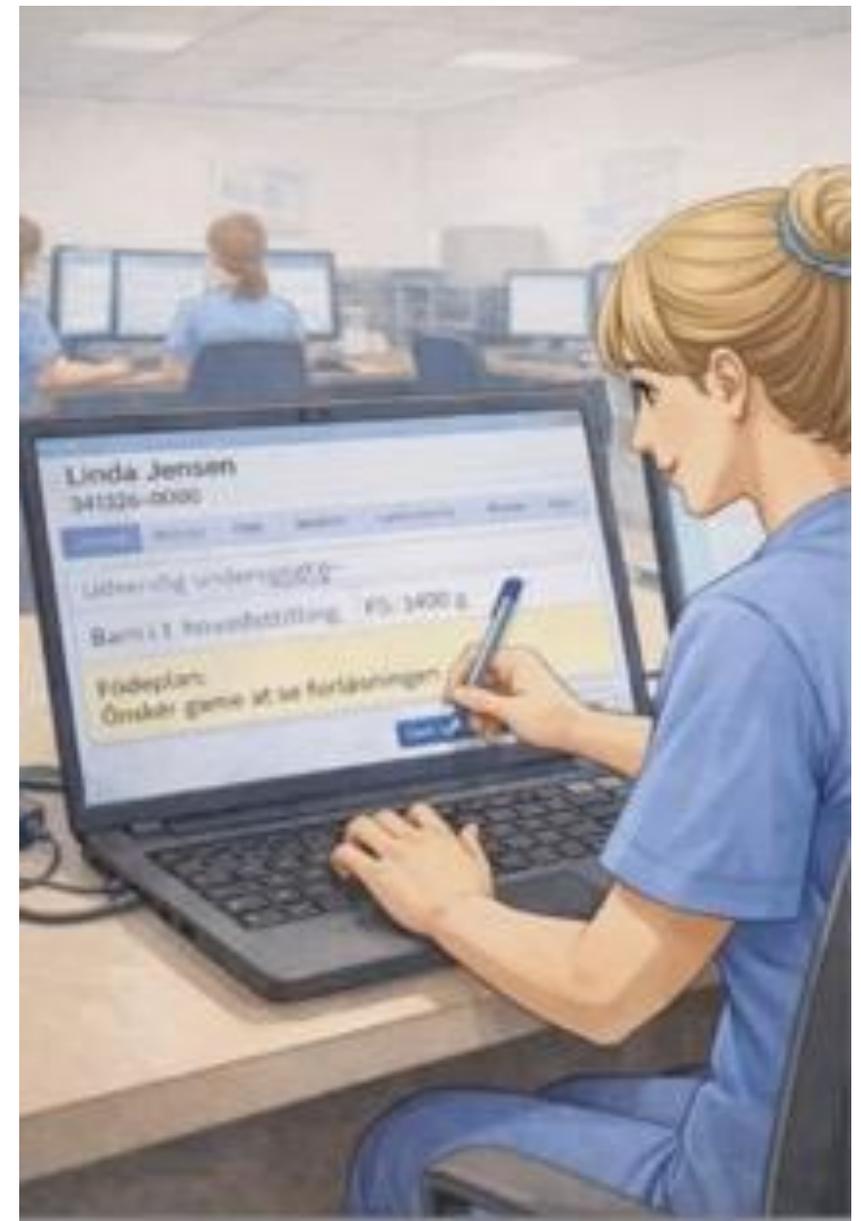
Context: More overall and coherent responsibility for patient care

**Reducing inequalities,
closer proximity of health service delivery,
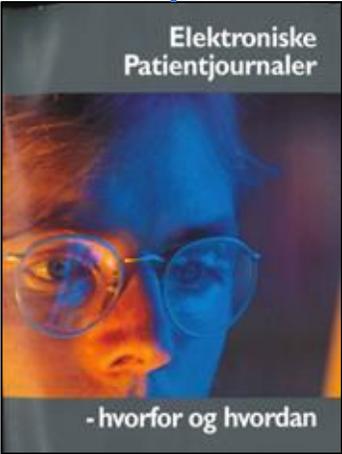coherent responsibility
require the use of digital technologies**

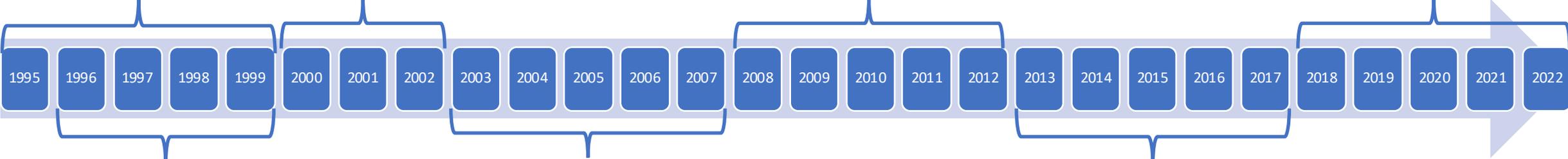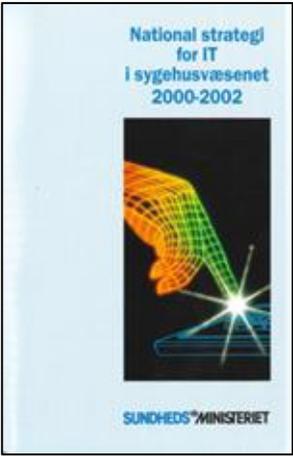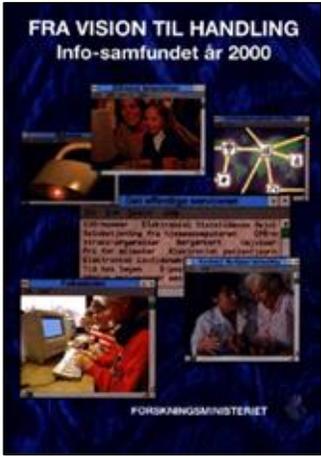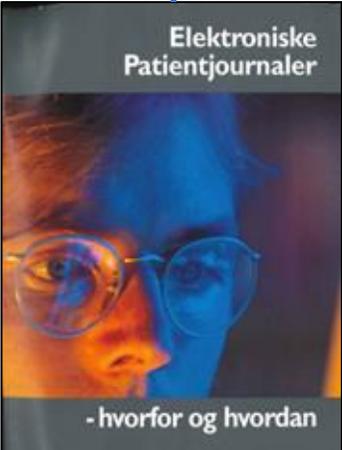DIGITAL TRANSFORMATION of the health system
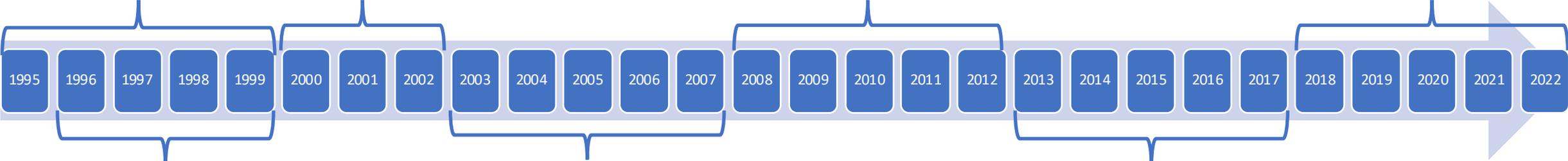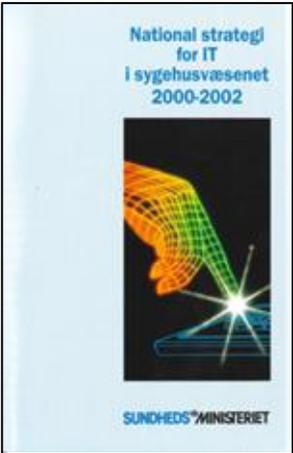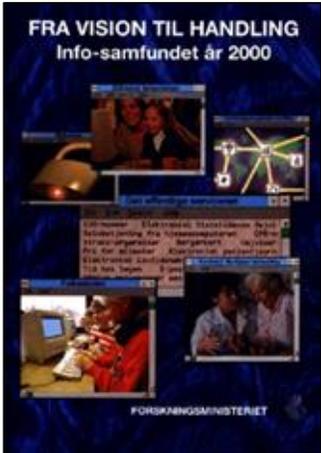
Or

DIGITAL HEALTHTRANSFORMATION

AI generated drawing of a nurse taking entering a note in the medical record.

National strategies for health informatics in Denmark since 1995

National strategies for health informatics in Denmark since 1995

FRA VISION TIL HANDLING — Info-samfundet år 2000 (FORSKNINGSMINISTERIET)

National strategi for IT i sygehusvæsenet 2000-2002 (SUNDHEDSMINISTERIET)

National strategi for digitalisering af sundhedsvæsenet 2008 - 2012

Ét sikkert og sammenhængende sundhedsnetværk for alle — STRATEGI FOR DIGITAL SUNDHED 2018-2022

| 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |

Elektroniske Patientjournaler — hvorfor og hvordan

National IT-strategi for sundhedsvæsenet 2003-2007

DIGITALISERING MED EFFEKT — NATIONAL STRATEGI FOR DIGITALISERING AF SUNDHEDSVÆSENET 2013-2017 (REGERINGEN, KL, DANSKE REGIONER)

The new reform will focus on solutions with advanced digital technologies.

"Easy" access to the health care system:
- Digital first – or digital frontdoor

Patients who can stay home will stay home and not in hospitals:
- Tele medicine -care -health
- Advanced sensors

Use of AI
- E.g. Radiology – interpretations of x-ray
- Finding guidelines and handbook information
- Clinical documentation

Increased use of health data to management purposes
- Data driven health care

Digitization vs digitalization vs digital transformation

Digitization focuses on converting a recording data.

Digitalization is about developing processes and changing workflows to improve manual systems.

Digital transformation enhance engagement and redefines the value propositions in all areas
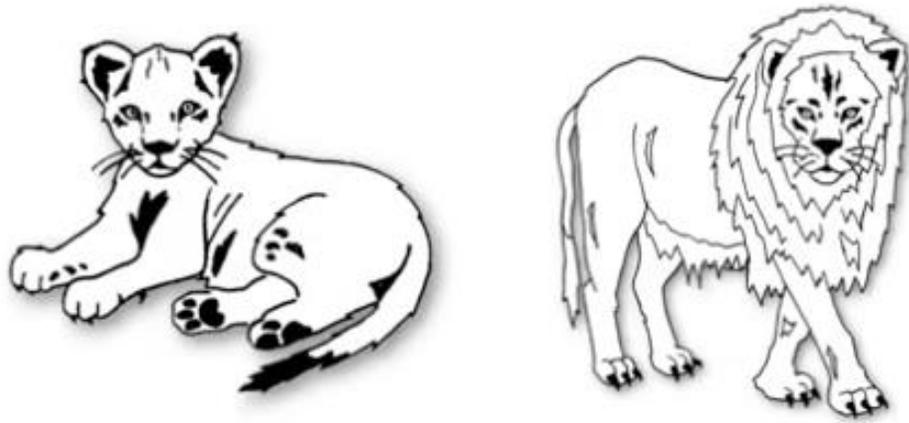
The difference between digital transformation and IT activated organizational transformation

The difference between digital transformation and IT activated organizational transformation
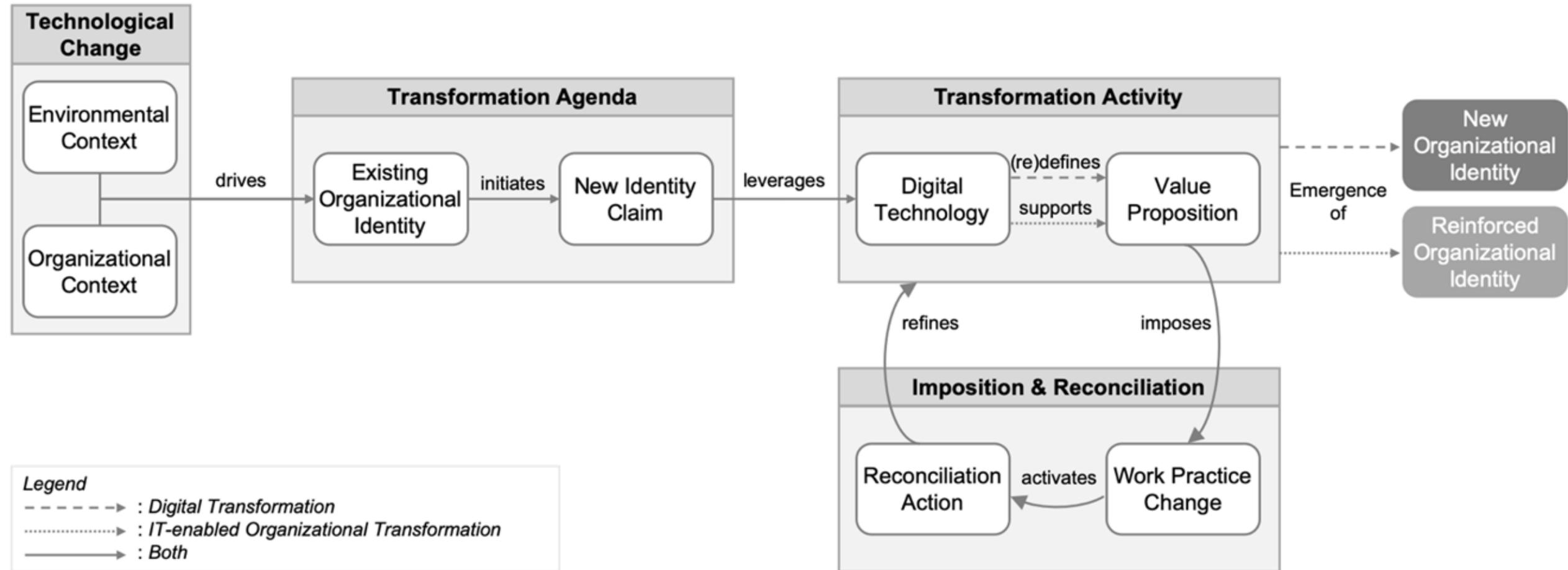
The difference between digital transformation and IT activated organizational transformation

IT-ENABLED ORGANIZATIONAL TRANSFORMATION **VS** DIGITAL TRANSFORMATION

https://www.youtube.com/watch?v=ewYBZ1HnOMw

The difference between digital transformation and IT activated organizational transformation

Lauri Wessel, Abayomi Baiyere, Roxana Ologeanu-Taddei, Jonghyuk Cha, Tina Blegind-Jense: *Unpacking the Difference Between Digital Transformation and IT-Enabled Organizational Transformation*. March 2020 Journal of the Association for Information Systems 22(1).

The iron law of IT projects

100.0%

All IT projects
(n=6,004)

Source: IT projects from Oxford Global Projects Database (January 2020)
Note: Measured from decision to build, in real terms
© Bent Flyvbjerg

11

Ben Schneiderman (et. al)
University of Maryland

Computer User Frustration (CUF) studies 2006

Time lost to solve problem:
42,7% to 43,7%

Morten Hertzum
Roskilde Univerity

Kasper Hornbæk
Copenhagen University

Frustration: Still a Common User experience 2023

Time lost to solve problem:
11% to 20%

"IMPORTANT, TIMELY, INSTRUCTIVE, AND ENTERTAINING."
—Daniel Kahneman, Nobel Prize-winning author of *Thinking, Fast and Slow*

HOW BIG THINGS GET DONE

THE SURPRISING FACTORS THAT DETERMINE THE FATE OF EVERY PROJECT, FROM HOME RENOVATIONS TO SPACE EXPLORATION AND EVERYTHING IN BETWEEN

BENT FLYVBJERG and DAN GARDNER

Overspending is a pattern – in many cases a business model

Easier to get forgiveness than permission

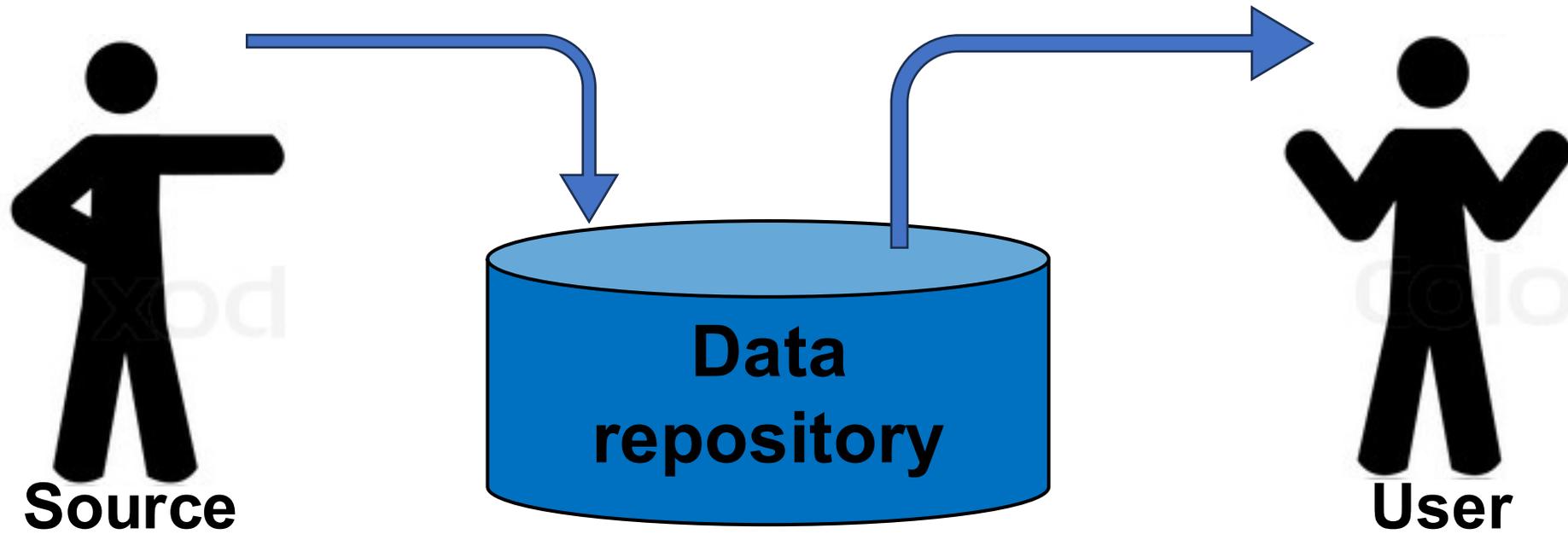Often based on **optimism** – a basic human characteristic, but misplaced

Availability bias – Focus only on our immediate idea

Uniqueness bias – inhibit experience

Shannon-Weaver communication model

Noise

Channel

Transmitter
Encoding

Receiver
Decoding

Source

Destination
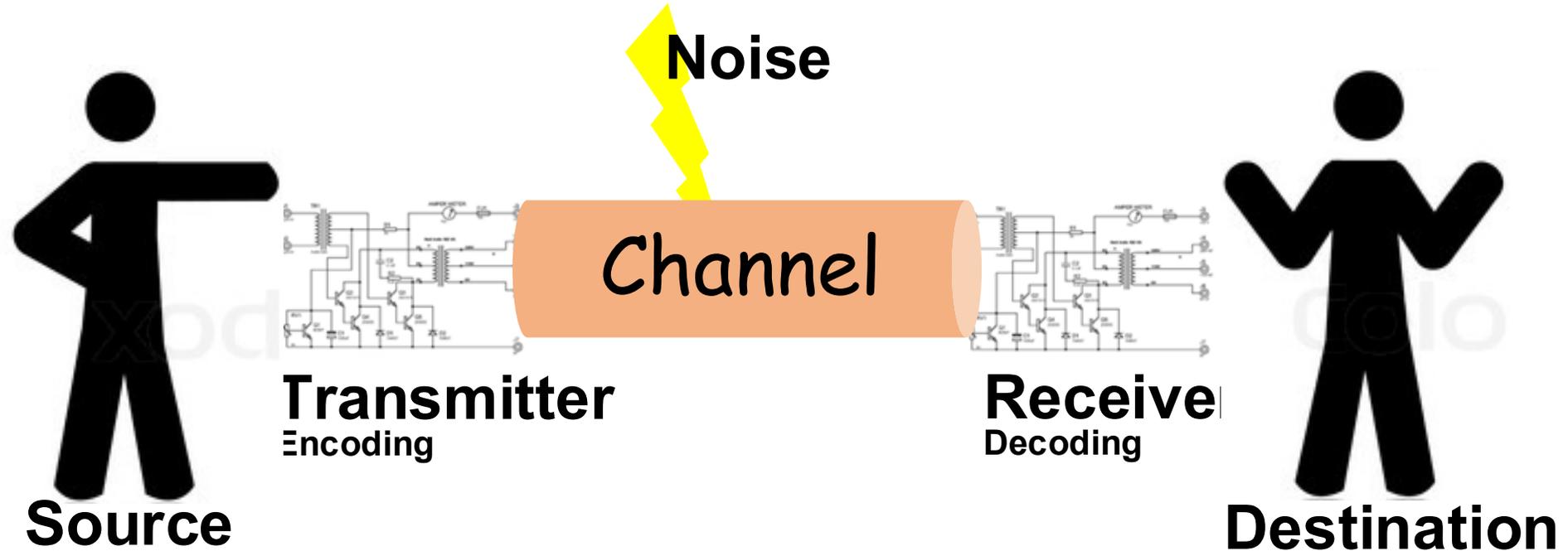
Shared data communication model

Source   Data repository   User
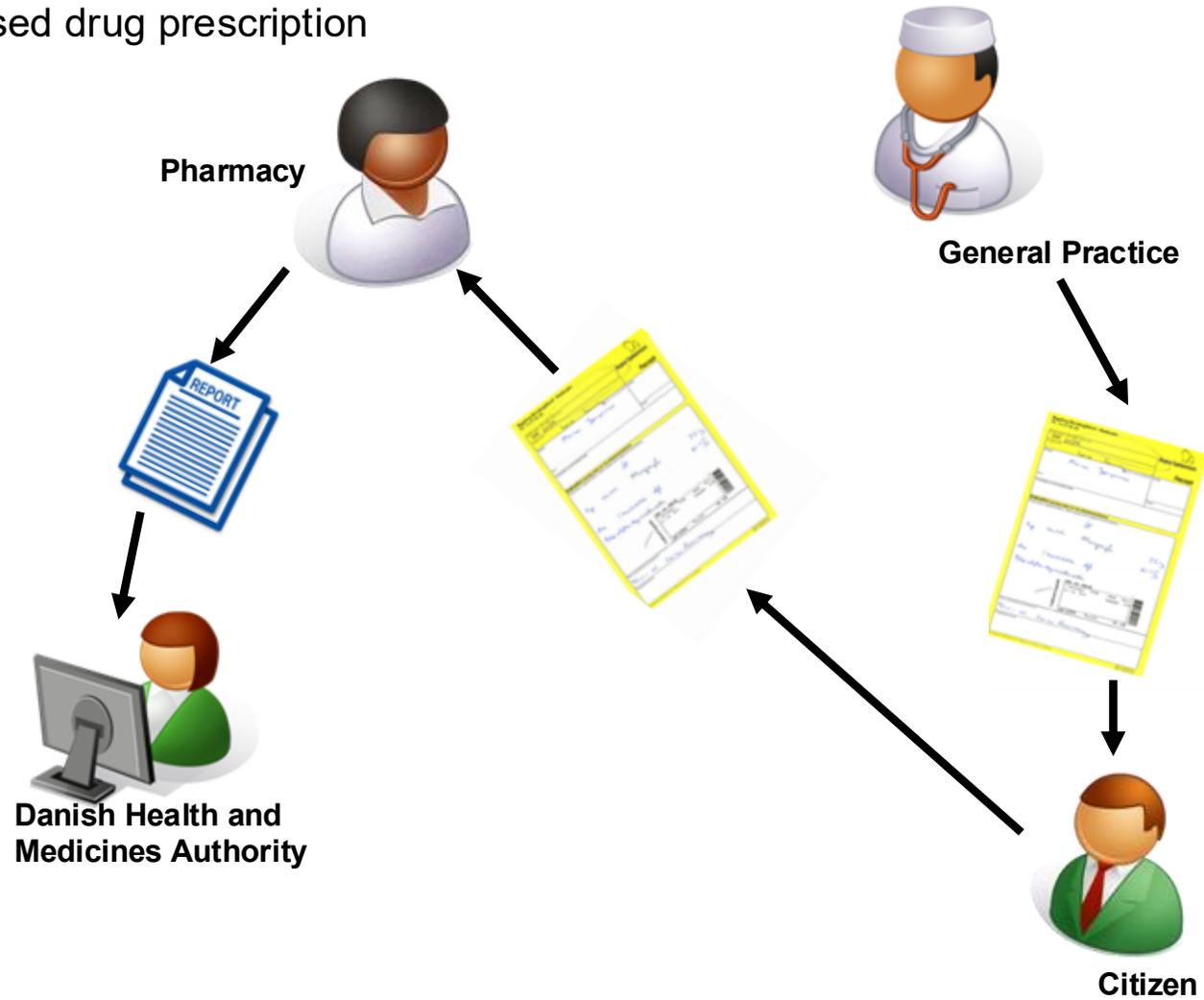
Shared Medication Record

Attempt to solve significant problems:

1. Many medication errors

2. Medicine reconciliation difficult

3. Patients have no overview of medication
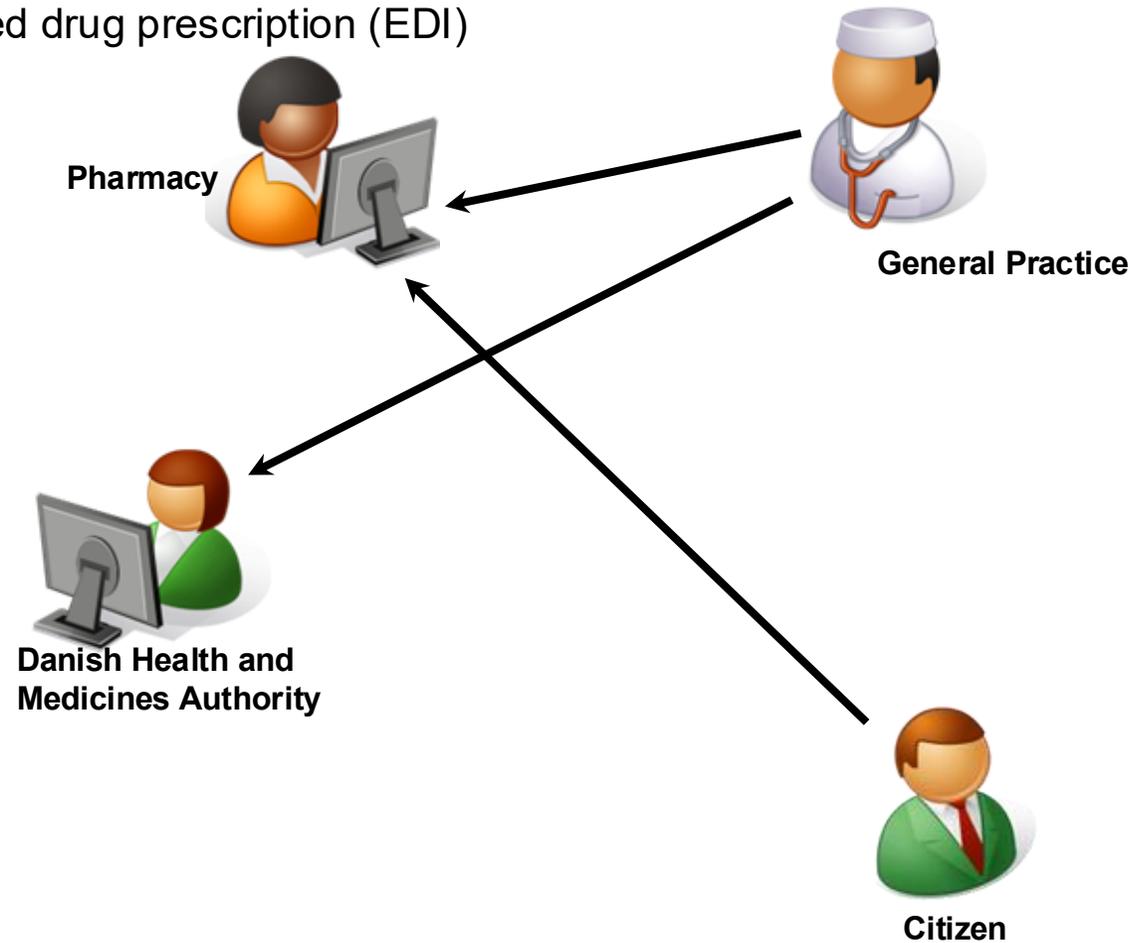
Implementation started 2010
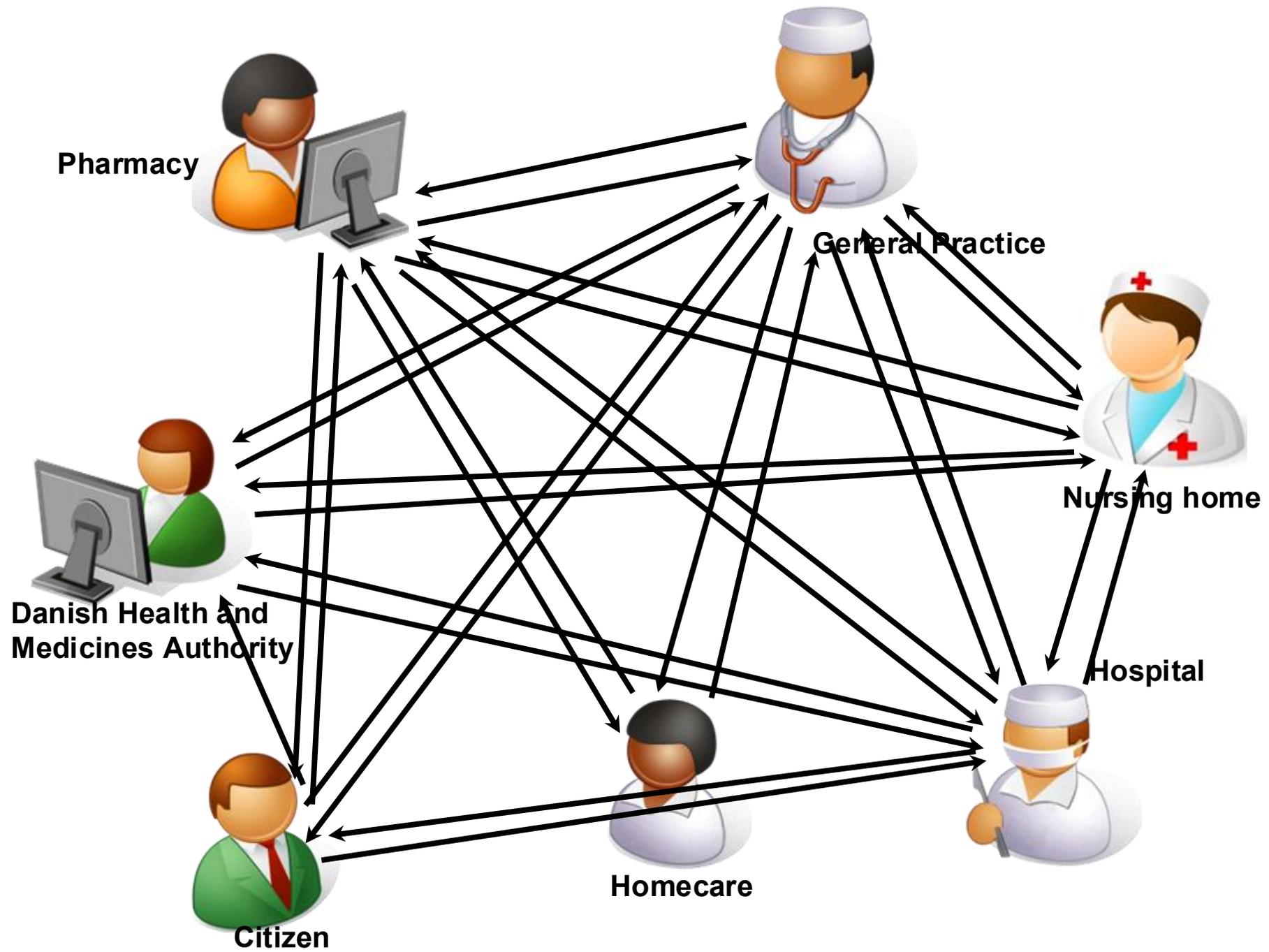
Changes in the communication
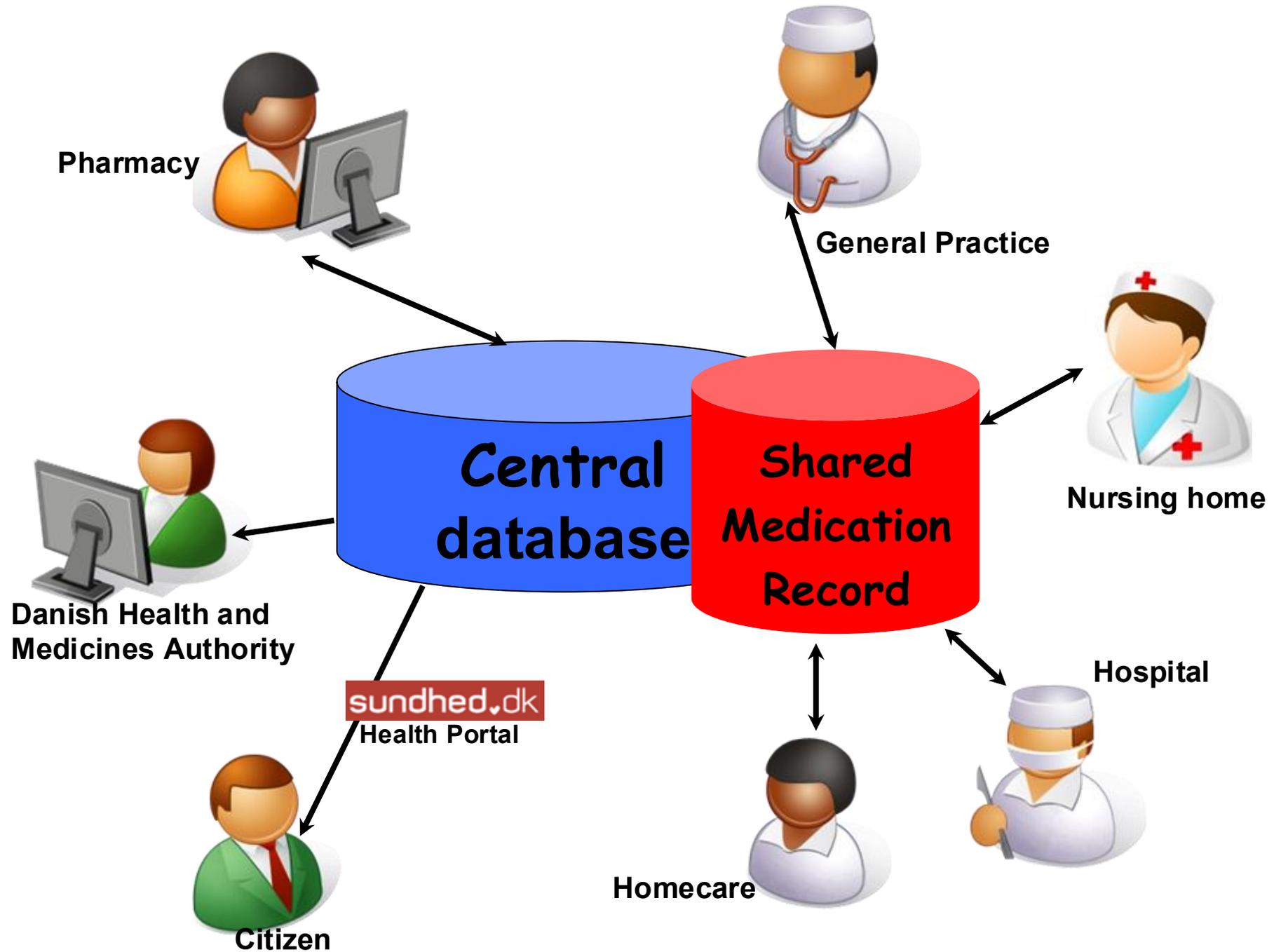
Paperbased drug prescription

Changes in the communication

Message-based drug prescription (EDI)

Pharmacy

General Practice

Danish Health and Medicines Authority

Citizen

Pharmacy

General Practice

Nursing home

Danish Health and Medicines Authority

Hospital

Homecare

Citizen

Pharmacy

General Practice

Central database

Shared Medication Record

Nursing home

Danish Health and Medicines Authority

sundhed.dk
Health Portal

Hospital

Homecare

Citizen

Shared Medication Record

1. One central server holds ALL prescriptions

2. Everybody (including patients/citizens – GP – hospitals – Home care) can access this database

3. Data are handled within "own" system (GPs)

4. All preconditions in place – by 2010

5. Fully implemented in 2013-2015

Percentage of updates in relation to SMR consultations in general practice per region, all patients in January 2015 - June 2016

Legend: Nordjylland — Midtjylland — Syddanmark — Hovedstaden — Sjælland — — Hele landet
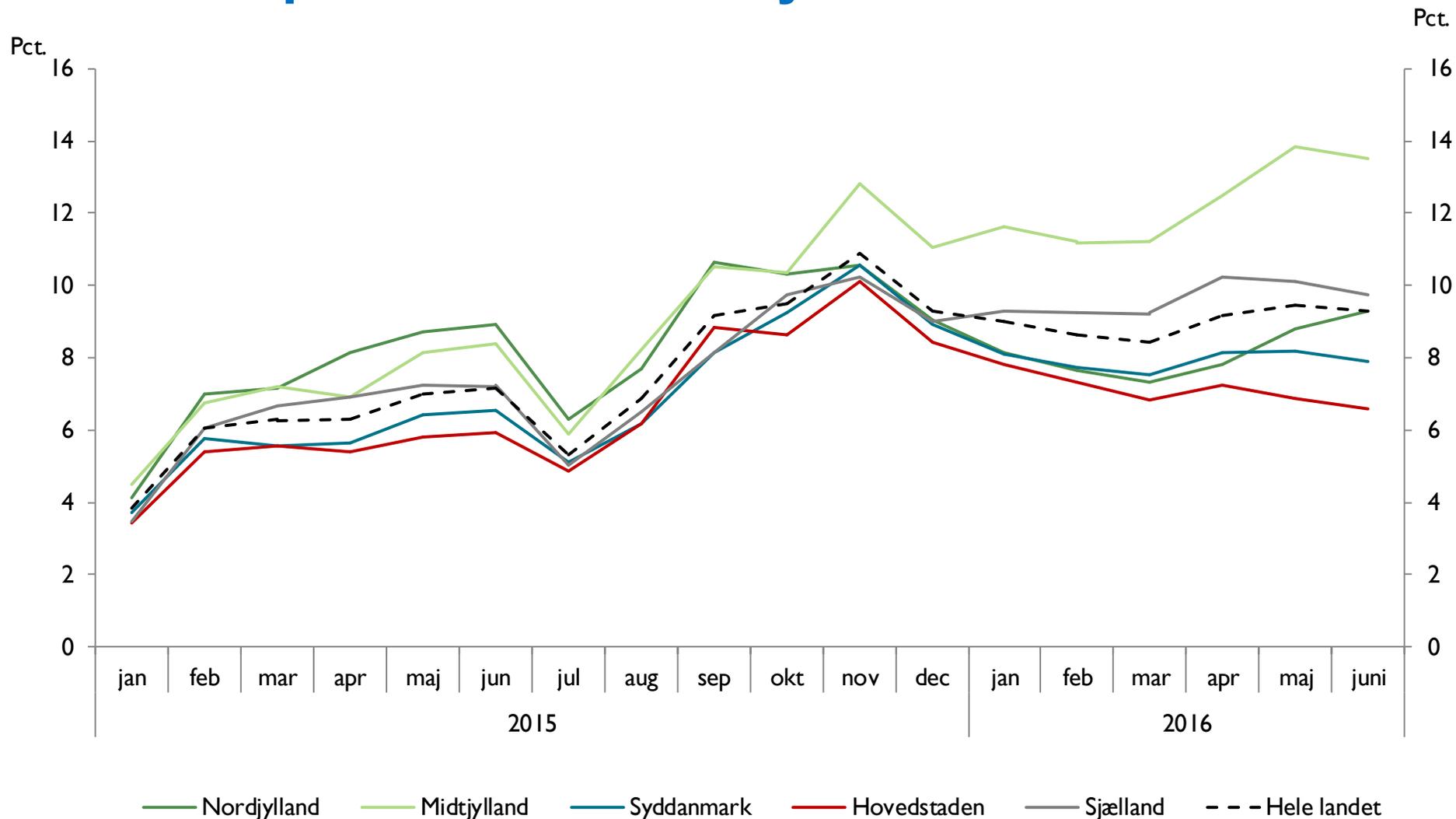
Success:
Technical Implementation

- Technical interoperability achieved

Failure:
Organizational implementation

- Contradiction of stakeholder's interests are exposed when data has to be shared

Similar national systems in other areas:

Referral hotel
- database containing all referrals from GP to specialized diagnostics and treatment

Test results
- database containing all laboratory testresults

Images
- Description of all scannings (not the whole picture)

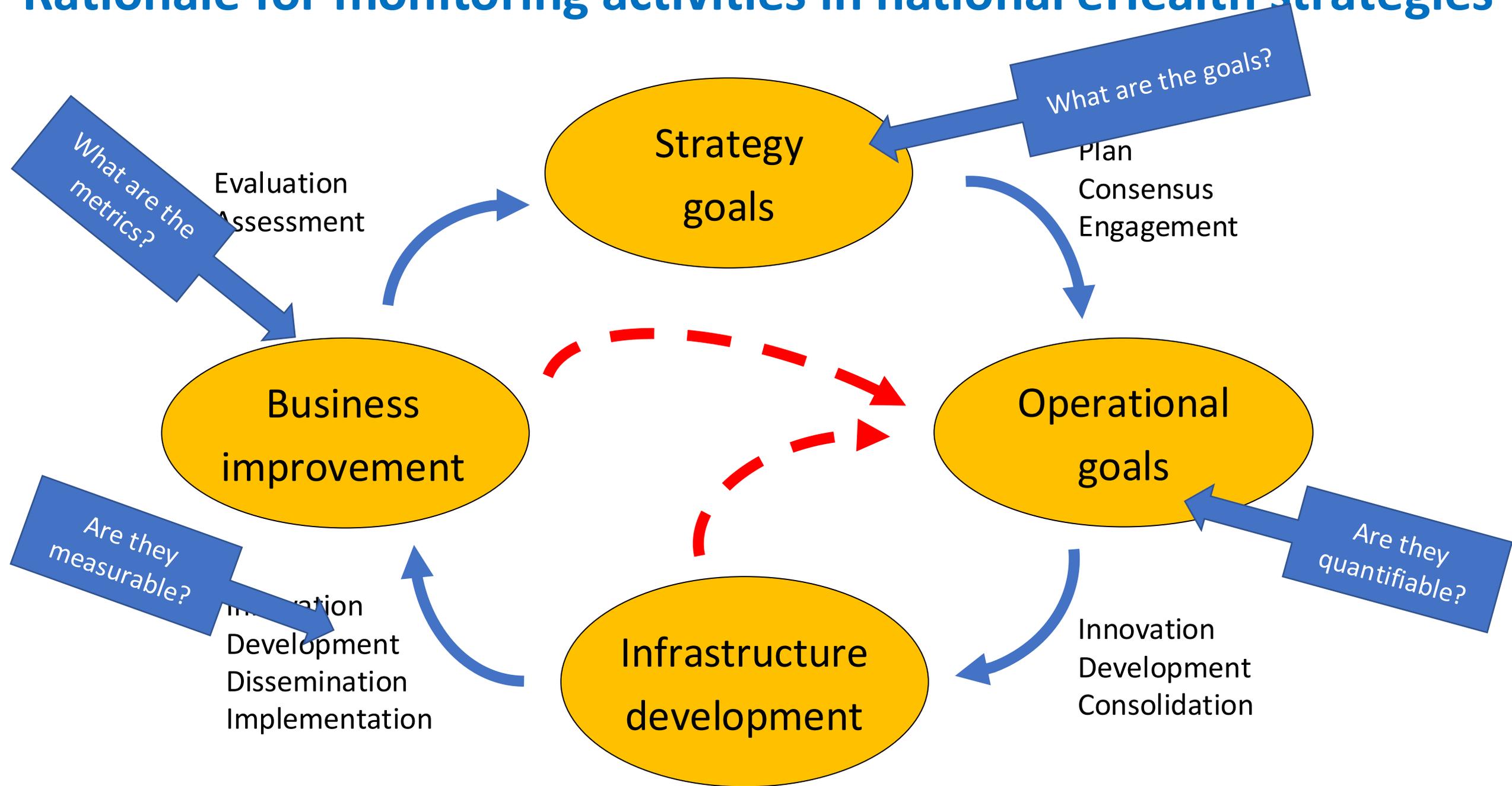Implementation of new technology takes time !!

We should strive to build better and more modern and sustainable solutions

Involve the users in the fundamental design processes

Rationale for monitoring activities in national eHealth strategies

What are the goals?

Strategy goals

What are the metrics?

Evaluation
Assessment

Plan
Consensus
Engagement

Business improvement

Operational goals

Are they measurable?

Implementation
Development
Dissemination
Implementation

Infrastructure development

Are they quantifiable?

Innovation
Development
Consolidation

Human Factors Engineering

You can't **write** all that you say

You can't **say** all that you know

You often don't know what you know until you **need** to

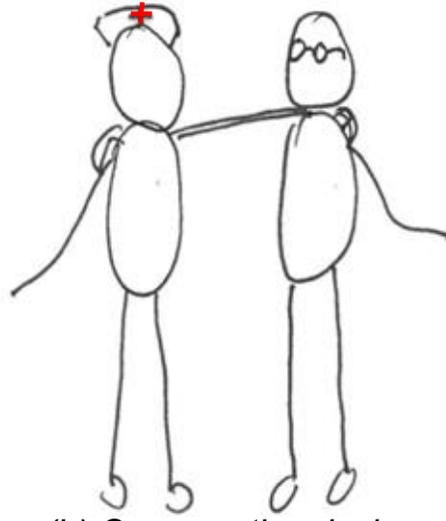You often know how to **find** who does know

Knowledge arises as much from **interaction** as from evidence

Different modes of user involvement in IT systems design
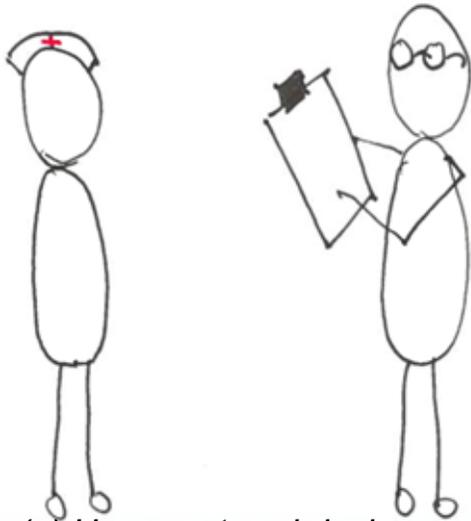
(a) User-centered design

(b) Co-operative design

(c) User-driven innovation

Challenge: how to understand users' need and design for these needs

Challenge: how to co-operate with users in the design process

Challenge: how to create space for user innovation, collect and sort out user-innovations and transform these into new products

Work practice must be studied on three levels.

1. What they **say** they do

Work practice must be studied on three levels.

1. What they **say** they do
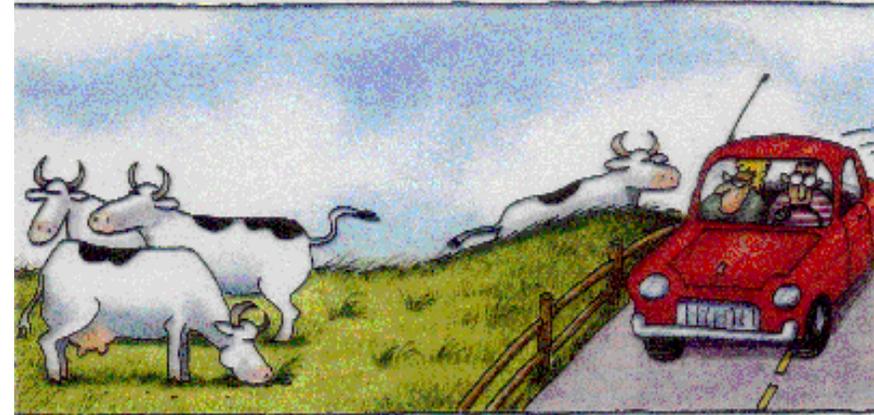
2. What they **think** they do

Work practice must be studied on three levels.

1. What they **say** they do

2. What they **think** they do

3. What they **actually** do

What problems do our mission encounter?
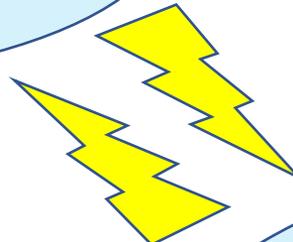
Basic requirements:
Classification, Terminology, and Transfer

Classification

Elements are grouped based on commonalities
The grouping occurs according to rules and standards

ICD-n

Terminology

Contains concepts that try to capture everything relevant to a given area
Terminology > Classification

SNOMED

Data transfer

To enable systems to send and receive data from each other

HL7 FHIR