FROM IT SILOS TO INTEGRATED SOLUTIONS. A STUDY IN E-HEALTH COMPLEXITY

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Background

Great expectations to national and regional e-health solutions:

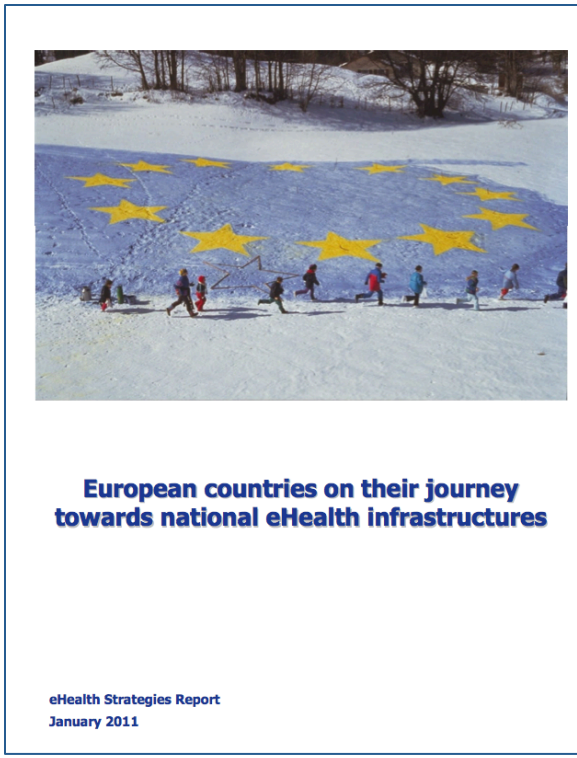
- Better health care services
- Reduced costs

Strategy:

- Standardization: Reduce complexity
- Integration: Connect solutions, dismantle the IT silos
- Centralized governance

However: Slow progress, many failures, rising costs (Sauer and Wilcocks, 2007; Hanseth et al., 2012; Currie, 2014)

Key problem: Socio-technical complexity



Research Question

How can we understand and manage the socio-technical complexity of large-scale integration in e-health?

Complexity:

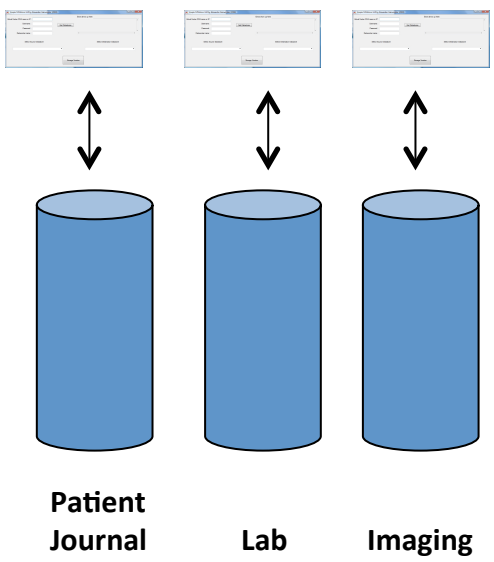
1. *The number and variety of components*
2. *The number and variety of interactions and interdependencies*
3. *The speed of change of the system*

Schneberger and McLean, 2003

The IT Silo Problem

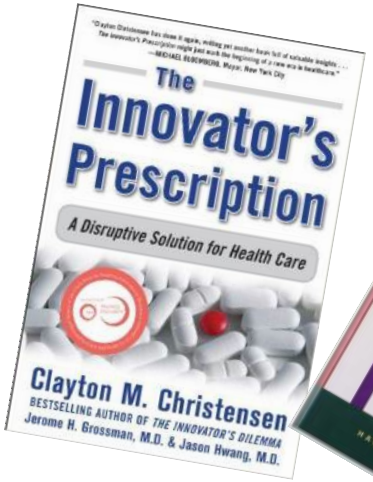
IT Silo systems support the functional division of labour, organisational hierarchies and rule-based decision making.

Max Weber



Weber principle	E-health silos
Functional specialisation of labour	Specialised systems for each function: Patient care, labs, radiology, surgery etc.
A hierarchy of authority	Specialist department owns system
A system of rules which limit discretion	The application logic supports and records diagnoses and effects of treatment
Impersonality	The system returns same results regardless of user
A career structure based on technical competence	User rights follow competence or roles; doctors, nurses, lab personnel
A written records of activities	Data base for documentation, research and statistics

Dealing with the IT Silo Problem



1. **Process thinking:** Patient centred care, logistics. (Christensen et al., 2009).
2. **Standards and interoperability*:*** Enabling connectivity and exchange of data (EU Commission, 2011)
3. **The "ERP" solution:** One suite for all services, such as EPIC or Cerner (Mccarthy et al., 2009).
4. **Enterprise Architecture (EA):** A holistic view of processes and technology (TOGAF, 2011)
5. **Service Oriented Architecture (SOA)**: Desiging loosely coupled services, not systems (Rosen, 2008)
6. **Data Warehouse**: Extracting from different systems, presenting BI (Chaudhuri et al., 2011).
7. **Centralised governance:** Top-down planning and governance (Ross et al, 2006)

Case: South-Eastern Regional Health Authority

The South-Eastern Norway Regional Health Authority (RHA)

- Governmental "holding company" for 33 hospitals, including thOslo University Hospital (OUS).
- Serves a population of 2,8 mill, and has 75.000 employees.
- IT Services is centralized, run by the company *HospitalPartner*
- around 3.000 applications

Case: “Digital Renewal” Programme

2013-18 with a budget of 5 bn. NOK (around 625 mill Euro)

Aims: standardization of work processes and technology.S

Six sub programmes:

1.Clinical Documentation: Standardizing electronic patient journal (EPJ) and other clinical systems within 2016.

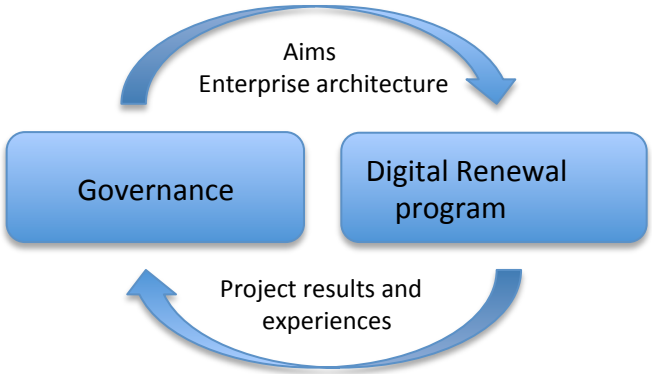
2.Radiology: Consolidating from several to one shared solution for x-ray, MR and CT within 2018.

3.Medical labs: Consolidating from several to one shared lab system within 2018.

4.Digital co-operation: Exchanging electronic messages on patient logistics between all hospitals (and also, to some degree, primary care).

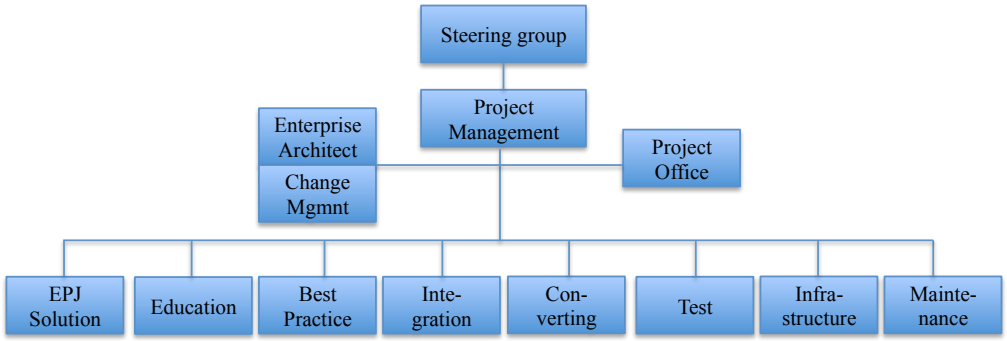
5.ERP: Shared solution with an ERP system

6.Infrastructure: Shared IT platform and data centre



The DIPS project

- Norwegian EPJ system
- 12.000 users at Oslo University Hospital
- Comprehensive project
- Top-down planning and control
- 685 MNOK (around 85 mill Euro).



2012: Feasibility Report: ”not primarily an IT project, but rather an organisation development effort”

2013-14: The implementation project
- 400 participants, 12.000 on courses
- Integration: 55 different systems should interacting with the new EPJ, with 345 physical integrations

October 2014: Start-up
- 128 mill patient records and 160 mill lab tests for 2.8 mill patient were converted, using 278 TB of disc space

Method

Case selection

- It was a head-on and ambitious initiative designed to solve parts of the IT silo problem
- A *typical case* of an e-health mega programme, which is considered useful for generalising (Gerring, 2007)

Data collection

- Intensive, multilevel case study (Greenhalgh et al. 2010) during 2013-2014
- Informants: general managers (12) at different levels, project managers (4) IT architects (11), IT developers (5) medical personnel (12), lab personnel (3) and vendors (3).

Data Analysis

- Construct rich picture: Identify key events and issues in the data material
- Analyse integration issues: Analyse technical solutions, governance, interactions between actors, and problems
- Assess overall complexity: Analyse the number of types of components, types of links, and speed of change

Findings

Topic	Observations
Overall IT solution	The DIPS solution and the regional integration platform may be seen as the lynchpin of the Digital Renewal programme. It was a conscious attempt to deal with the silo problem in a systematic way.
Governance approach	The project was basically a top-down approach, but with many lateral interactions. These interactions were not only a co-ordination mechanism, but also served as a learning arena and a channel for important discourses
Short term and long term	We observed a tension between two perspectives, one focused on vision (the architects) , and one focused on deadlines (the project managers).
The core technical solution	The system strategy was a hybrid between suite and “best-of-breed”, enabled by an advanced enterprise bus solution.
Integration	Integration as a continuous process. New systems and user groups will be integrated more or less continually. The Integration Factory was established to support this.

Technical Integration

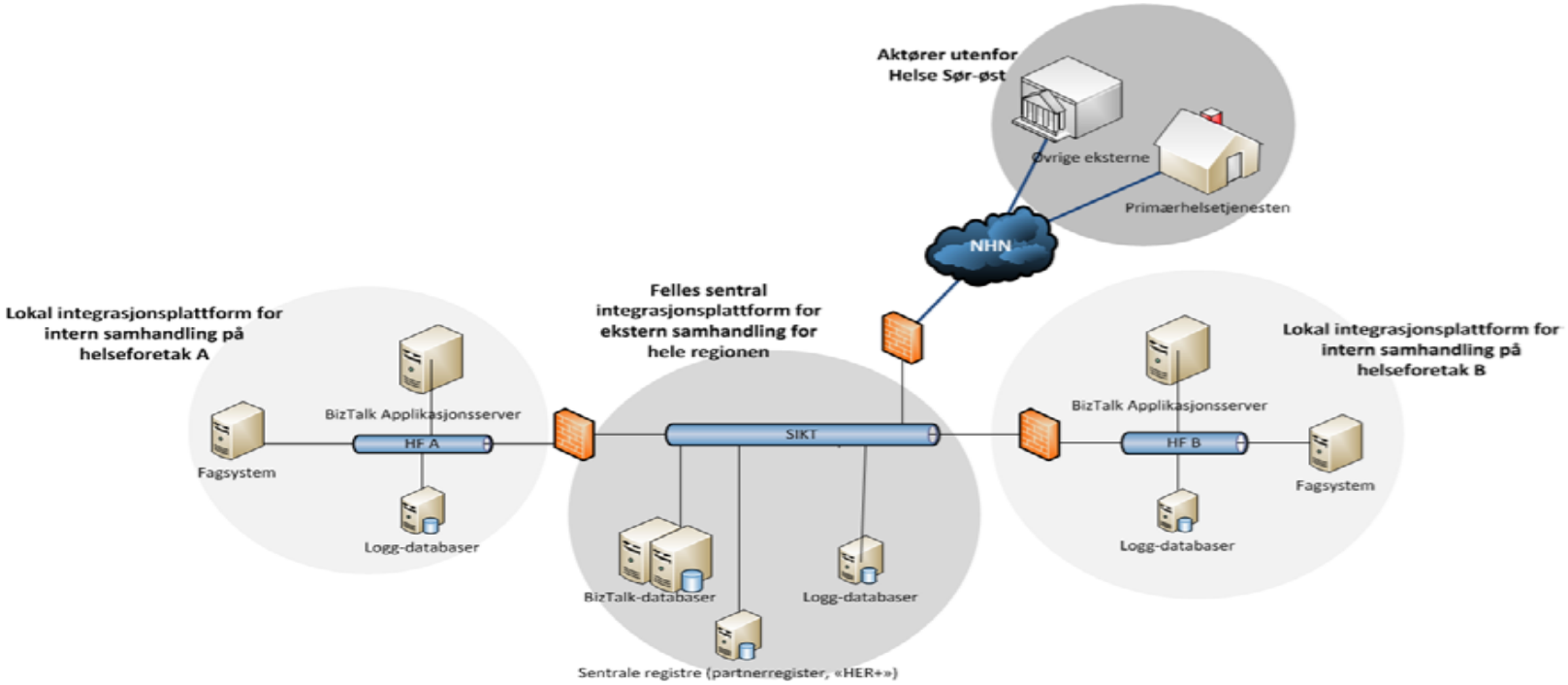
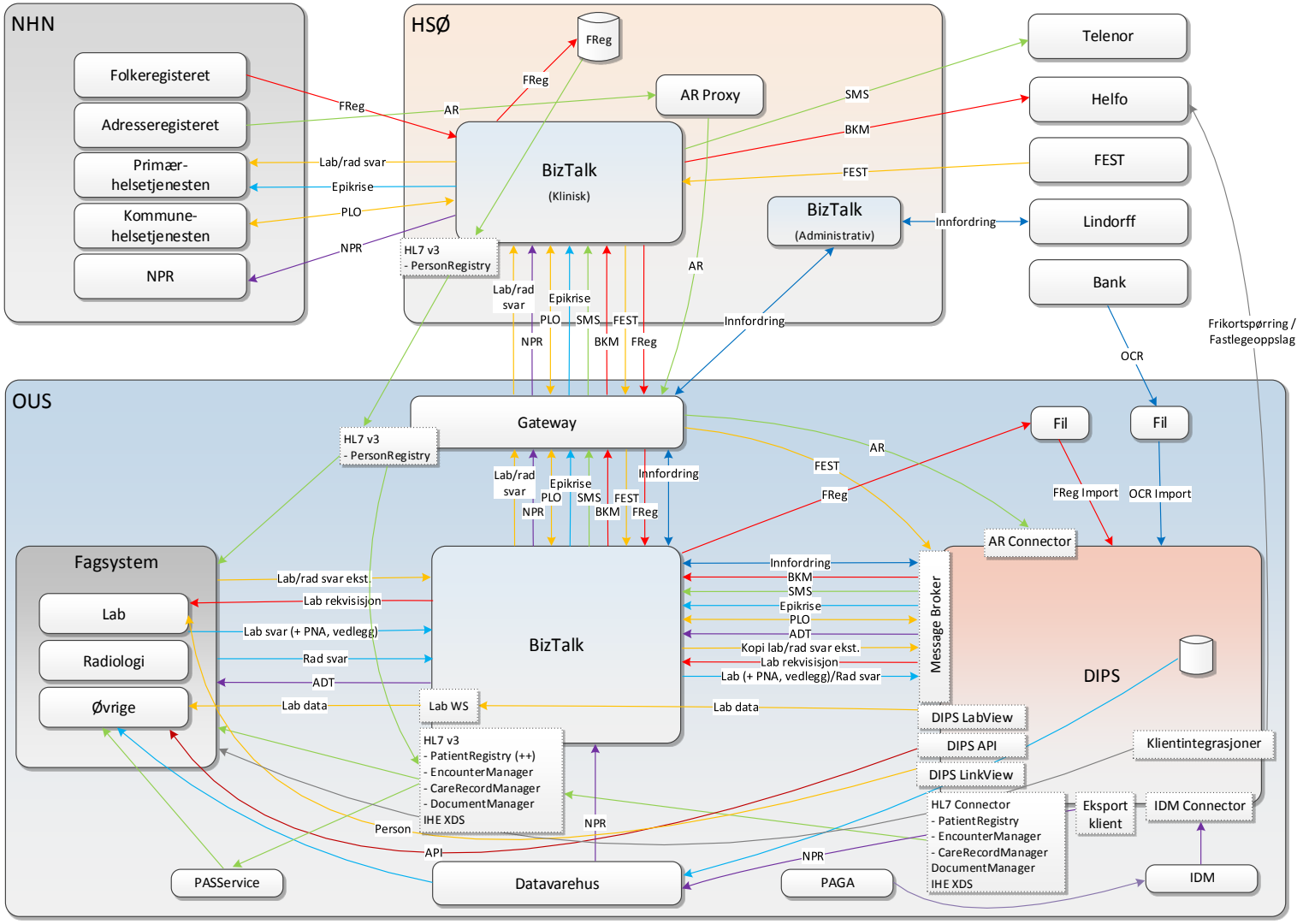


Figure 3. Topology for local and regional BizTalk platforms

Data Flow at Oslo University Hospital



Increasing or decreasing complexity?

Complexity aspect	Implications for complexity
1. The number and variety of components	Complexity was reduced: The number of different systems was reduced through standardisation, and the same applies to the number of system specific user groups.
2. The number and variety of interactions and interdependencies	The number of technical and social links was increasing, in particular in the technical architecture, and in the development environment.
3. The speed of change of the system	The speed of change was high, and integration was becoming a permanent process. Governance put considerable pressure on managers, but there were also many lateral interactions.
Overall assessment	*The overall complexity was decreasing in the short term, but may increase in the longer term.*

Looking ahead…

Further research should investigate complementary and alternative solutions to the IT silo problem.

Strategies for reducing complexity typically include *modularizing* and *loose coupling* (Parnas, 1972), or, in other terms, trying to make it simple by reducing the number of relationships.

- Can we rethink the silo problem by a looser coupling between clinical systems and work process support? (Christensen et al. 2009)
- Can we rethink the silo problem by a division of labour between heavyweight and lightweight IT? (Bygstad, 2015).

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“Architecture”

	Plan	Built
Process	Modeling	Architecting
Product	Blueprint	Architecture