IN5320 - Development in Platform Ecosystems

Lecture 8: *Information systems and complexity*

9th of October 2019

Department of Informatics, University of Oslo
Magnus Li - magl@ifi.uio.no

The project - final presentation (graded A - F)

‘Final push’ changed to Friday 15th of November!

Presentations on 18 & 19 (08:30 - 14:00) of November in room ‘Black Box’ (third floor)

20 min for each group (10 min presentation + 10 min discussion)

Presentation

- Brief intro with requirements and app functionality overview
- Live demo of the working app, covering all functionality
- Reflection upon positive/negative aspects with our solution and your choices during implementation
- Reflections upon the project development process (coordination, time management, etc.)
- Self evaluation using grade scale

The project - evaluation criteria

IN5320 fall 2019 - Project evaluation criteria

Group projects will be evaluated based on your final application, and your presentation of it. The application is evaluated on 1) functionality, 2) implementation/code, and 3) design. On your presentation we will also evaluate your reflections upon these aspects and the process of development. In the presentation, you will also be asked to evaluate and grade your own work based on these criteria.

Reflection	- Ability to articulate and reflect on positive and negative aspects of your own solution - Ability to elaborate on functional, implementation and design aspects of your solution - Ability to explain why choices related to these aspects were made - Ability to reflect on the project process (coordination, time management, planning, etc.)
Functionality	- Fully working implementations of the fundamental requirements - Have implemented additional functionality (each assessed based on extensiveness, completeness, and potential usefulness) - Additional functionality implemented seems appropriately related to the case and use-scenarios
Implementation	- Git has been used to coordinate the development throughout the project - The app platform has been utilized (except for the widget case) - Use of DHIS2 data model to store data and configurations (as opposed to hard-coding this into the app) - Efficient use of APIs (e.g., server-side filtering, client-side caching) - Modularity and reusable components - Utilizing React capabilities - Readable and consistent naming conventions for functions, components, etc.
Design	- Use of the DHIS2 core UI library - Use of the DHIS2 UI style guide when UI library lacks components - Overall 'look and feel' appears user-friendly and robust - Appropriate and user-friendly terminology and error messages - Meaningful and intuitive navigation - Meaningful page layouts - UI consistency

Today’s lecture

Aim:

- To provide context to platform concepts
- Gain an fundamental understanding of what we mean by ‘Information Systems’

Today's lecture

Four important concepts

1. Information Systems
2. Complexity
3. Socio-technical complexity
4. Standards
5. Architecture

Final exam

Exam questions

Following is a list of questions to help you practice for the final individual exam. They are divided into the different topics covered throughout the semester. You should be able to answer all by following the lectures and reading the provided course literature. Most of the question on the exam will be selected from this list.

1. Web development

1. Briefly describe the role of the following languages/concepts in front-end development: 1) HTML, 2) CSS, 3) JavaScript, and 4) JavaScript frameworks (such as React)
2. Provide definitions of: front-end development, client-side development, back-end development, and server-side development.
3. What is a JavaScript framework, and why do we use them? Name three examples and explain the differences between these.
4. What is an Application programming interface (API)? Why is it relevant to software platforms?
5. What is AJAX?
6. What is a Design System?

2. Information systems and complexity

1. What is the difference between complicated and complex systems?
2. What do we mean when we say that information systems are socio-technical? Discuss how this perspective can be of benefit when understanding failure, success, and challenges with information technology.
3. Give an example of an information system.
4. What is the role of standards in information systems?
5. If you were to introduce a new software system into a large organization with already existing information systems and practices: are there any possible challenges?
6. What do we mean by system architecture?

The point of research and theory

- Research is typically driven by problems that we need to understand better or ‘solve’
- Within the field of IS, existing research may serve two purposes for us in this:

a) As *related literature* that says something about the problem.

b) As theory that provides us a language / lens to analyze the problem, how to investigate it further, or our findings related to it.

Information Systems

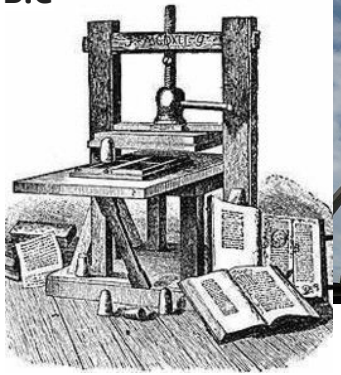
Information Systems

- *Information Systems* ***does not equal*** *information technologies*

- *Information technologies* ***does not equal*** *digital technologies*

ICT

3200 B.C



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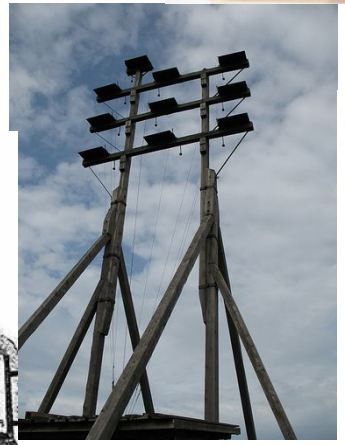

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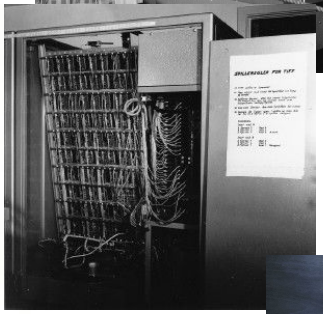
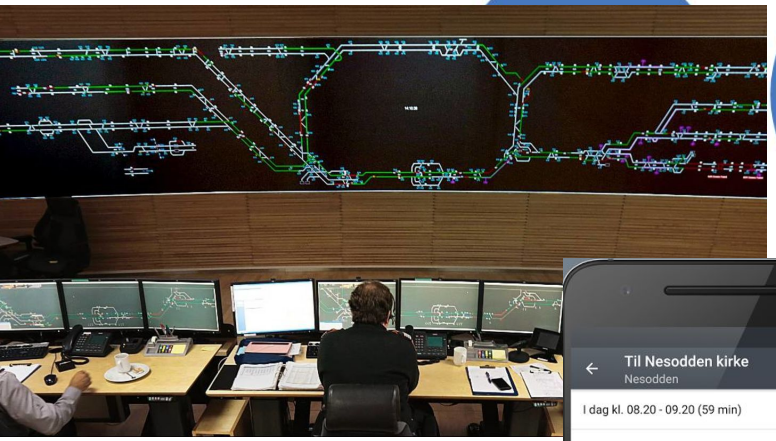
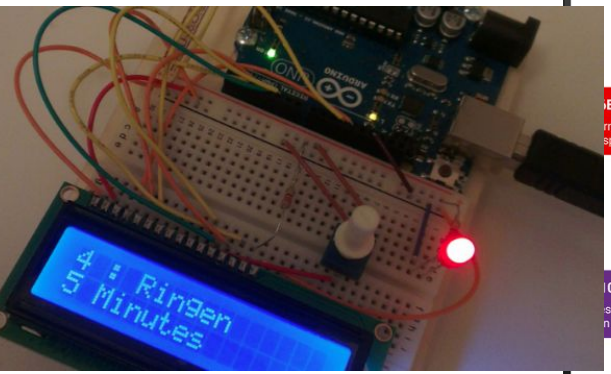


ICT

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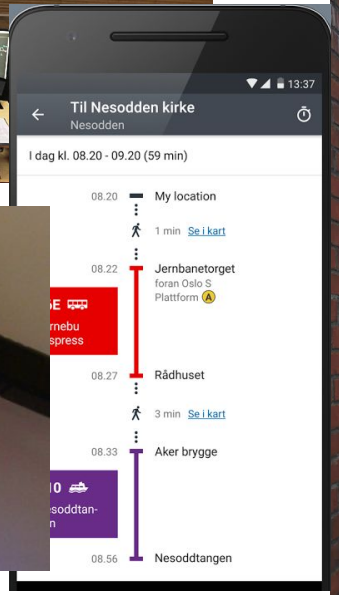
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Til Nesodden kirke
Nesodden
I dag kl. 08.20 - 09.20 (59 min)
08.20
My location
1 min
Se i kart
08.22
Jernbanetorget
foran Oslo S
Plattform A
08.27
Rådhuset
3 min
Se i kart
08.33
Aker brygge
08.56
Nesoddtangen

Forskningsparken
Spor Track 1
Retning sentrum
Direction city centre
4 Bergkrystallen
5 Ringen
13
5 Vestli
Spor Track 2
Retning Sognsvann/Storo
Direction Sognsvann/Storo
4 Vestli
5 Ringen
7
5 Sognsv

18 Ljabru
19 Ljabru 7 min
4 min

41 Sørkedalen
08:26
3 min
Vennerstua
2 min
Røa kirke
Røa T

Information Technology - examples?

Laptops

Smartphones

Tablets

Smartboards

Servers

SMS

Software (email, calendars, snapchat, etc.)

Paper forms

Whiteboards

Notepads

Mail

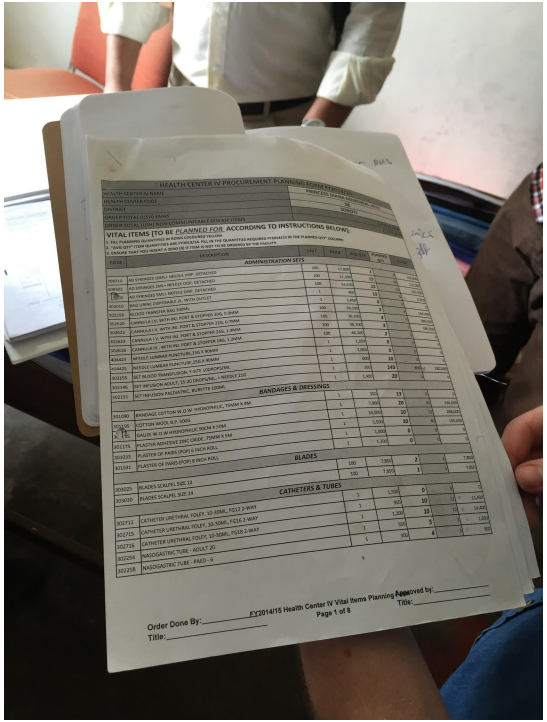
Pneumatic tubes

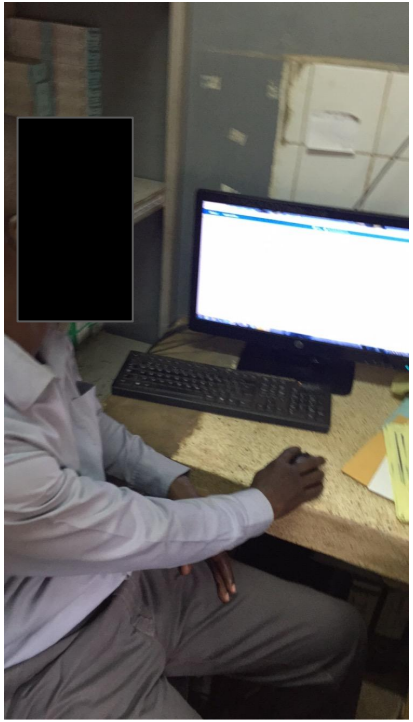
Information Systems

Information Technology - examples?

Information Systems

Information Technology





Information Systems

An information system is not the information technology alone, but the system that emerges from the ***mutually transformational interactions*** *between the* ***information technology*** *and the* ***organization***.

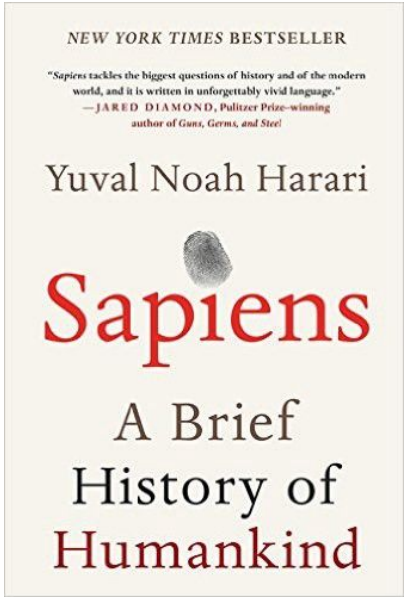
(Allen S. Lee, 2004)

What makes an organization?

Organizations and institutions are, as many social phenomenon, *inter-subjective* entities.

"You could kill every employee and stakeholder in Peugeot, but the corporate entity would still exist. The building isn't Peugeot—it can move offices. Peugeot could make planes rather than cars, so it isn't what they do that defines them. The only thing that makes Peugeot Peugeot is everyone's agreement that Peugeot exists, duly noted in the papers of some lawyer"

Corey Breier, 2016 paraphrasing from "Sapiens" by Yuval Harari



Organization

An organized group of people with a particular purpose, such as a business or government department. (Oxford english dictionary)

Humans

Technologies / artifacts

Routines

Culture

Products

++++

Information Systems

- **‘Practices’** is a fundamental part of organizations

“The customary, habitual, or expected procedure or way of doing of something.”
(Oxford English dictionary)

- Practices often emerge through production and reproduction

- May be *cultivated* towards a desired state, but cannot be strictly designed or controlled.

‘Socio-technical

- We often say that information systems are socio-technical

Socio

Humans
Routines and practices
Hierarchies
Norms
Rules
Politics
Motives
Culture
++

Technical

Physical structures and artifacts
Hardware
Software
Paper-based tools
++

‘Socio-technical

- A socio-technical perspective is relevant to understand why systems fail and succeed, and to design working systems

- Looking just at the technical part will limit our ability to understand how real systems work, and how to design new artifacts that work within them

Example: DHIS2

- DHIS2 is often used within *Health Information Systems*
- Two general trends:
  - Replacing paper-based systems with digital
  - Attempt to integrate systems *vertically*, and *horizontally*

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Logistics management information system

Human resource information system

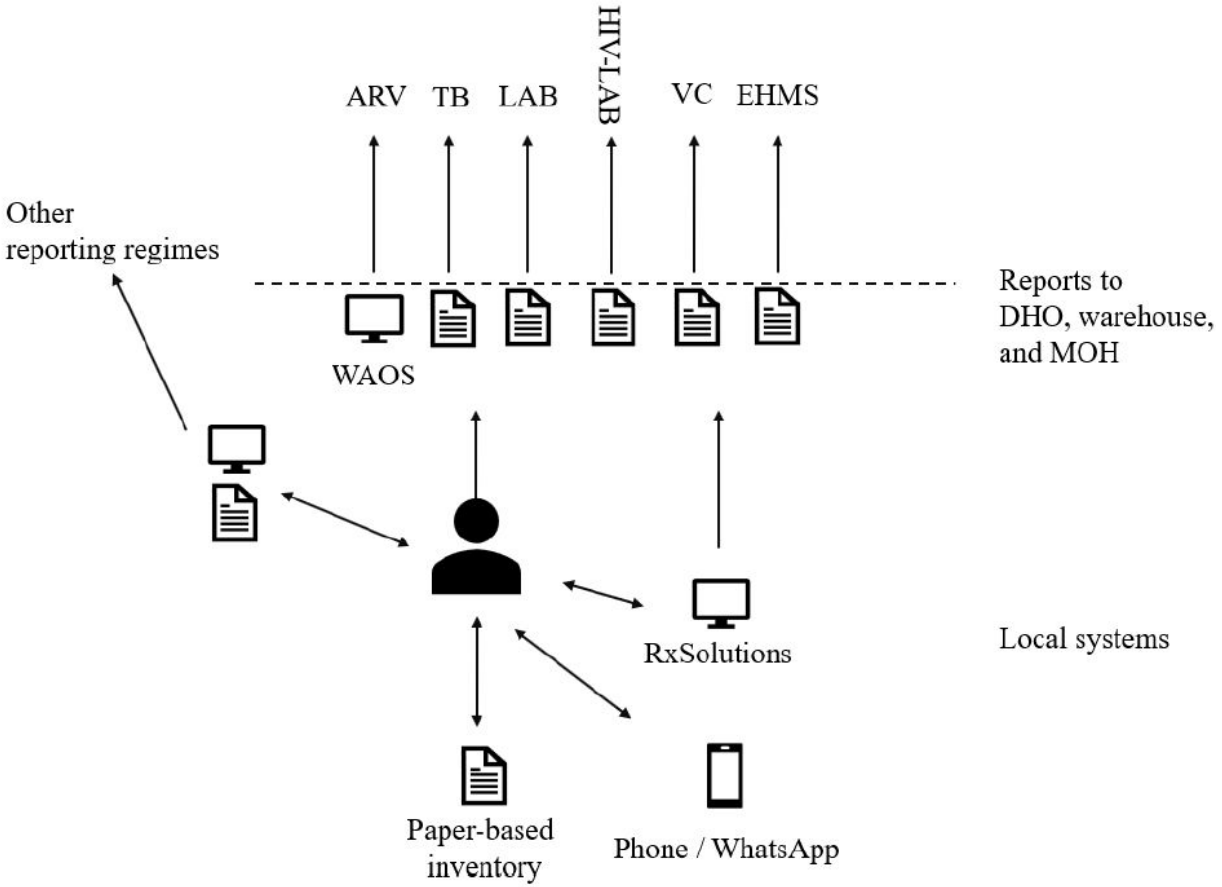
Electronic medical record information system

Health management information systems

Example: Uganda LMIS

- LMIS = logistics management information systems
- Mainly consumption reporting from facilities and ‘upwards’
- To be supported by DHIS2. Thus, DHIS2 becomes a tool or a part within a complex information system
- Roles, culture, terminology, humans, competences, infrastructure, practices, politics, technologies (paper and digital)

Example: Uganda LMIS



Example: Uganda LMIS - many socio-technical, ‘wicked’ problems

- MOH Policy: should look like paper forms
- Users: paper form is familiar
- Scale
- Network and infrastructure
- Paper-based system(s)
- No computers (district data entry / different use-scenarios)
- Has to work in parallel with old system
- Stock-out: WhatsApp and other informal channels
- Many of the health workers preferred their paper-based system
- Complicated approval process (aimed at competence building)

Complexity

Complexity

Complicated systems

Linear behavior

Total is equal to the sum of its parts

Complex systems

Non-linear behavior (change in input is not proportional to new output)

System can not be fully understood by investigating its parts.

“Complexity stems from the number and type of relationships ***between the systems’s components*** *and* ***between the system and its environment***” (Hanseth & Lyytinen, 2010)

Complicated or complex system?

A bike

US politics

One computer

A human (and the human brain)

The internet

Climate and weather

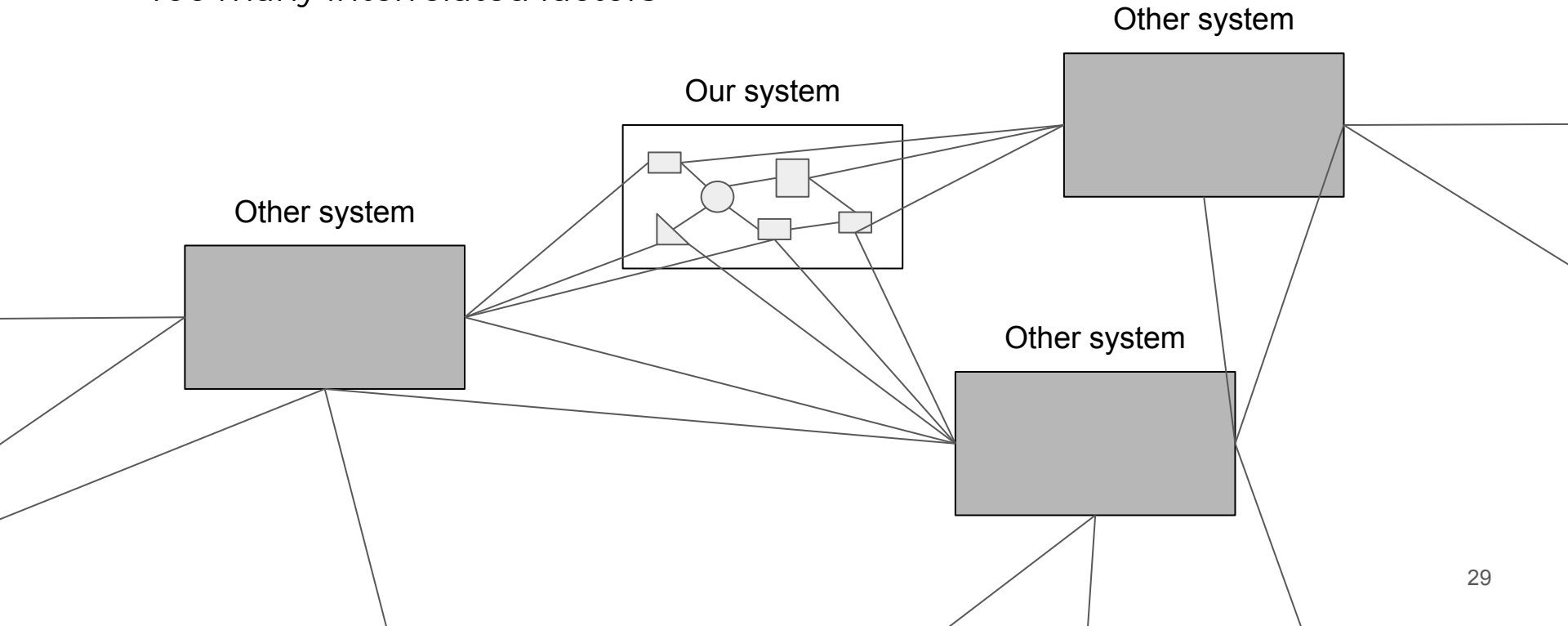
Cosmos (space)

Why is it complex?

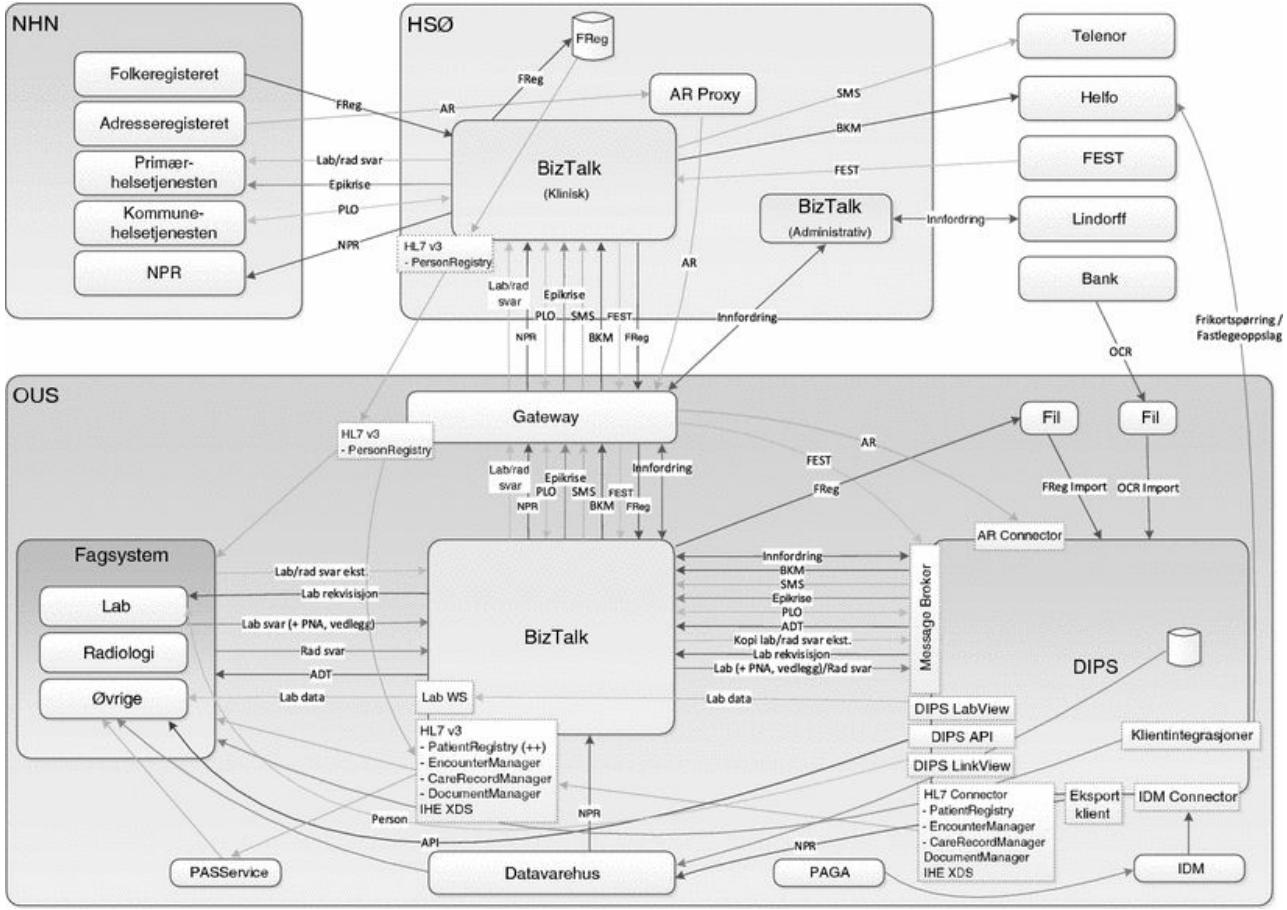
- Too many unknowns
- Too many interrelated factors

Why is it complex?

- Too many unknowns
- Too many interrelated factors



Why is it complex?

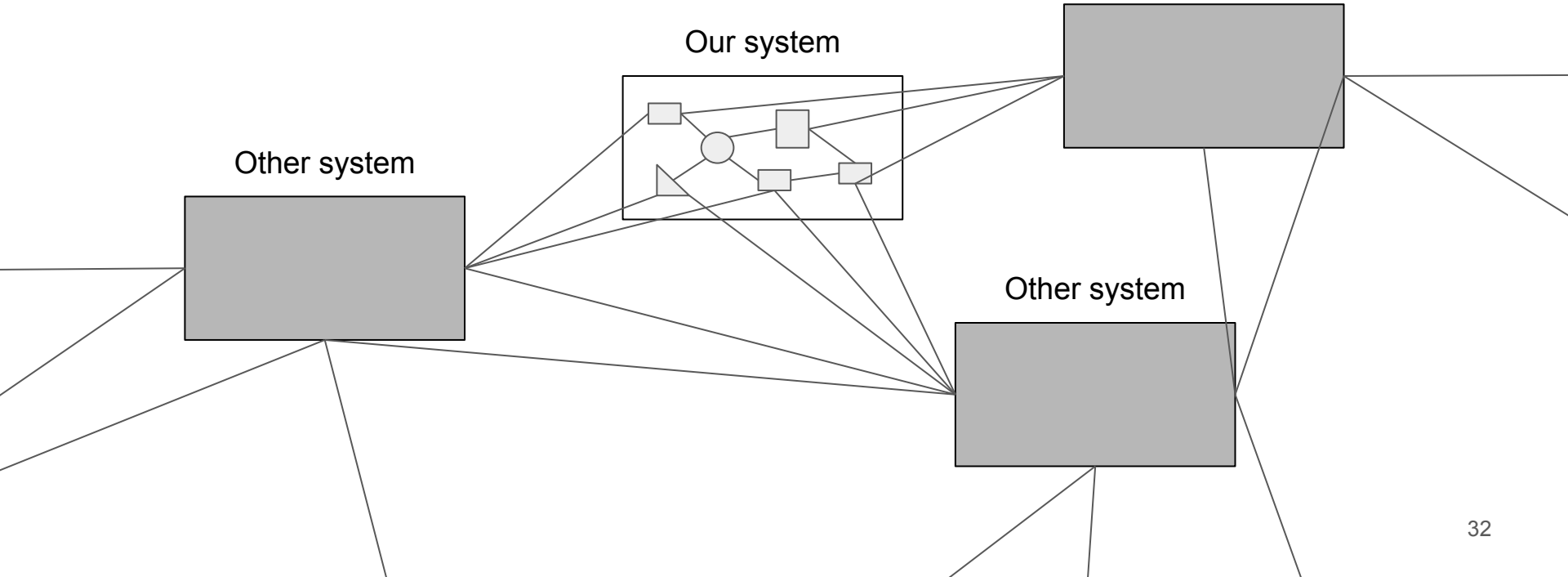


Bygstad (2007)

Socio-technical complexity

Socio-technical complexity

- Information systems do not only consist of technical components.
- They do not exist in a vacuum



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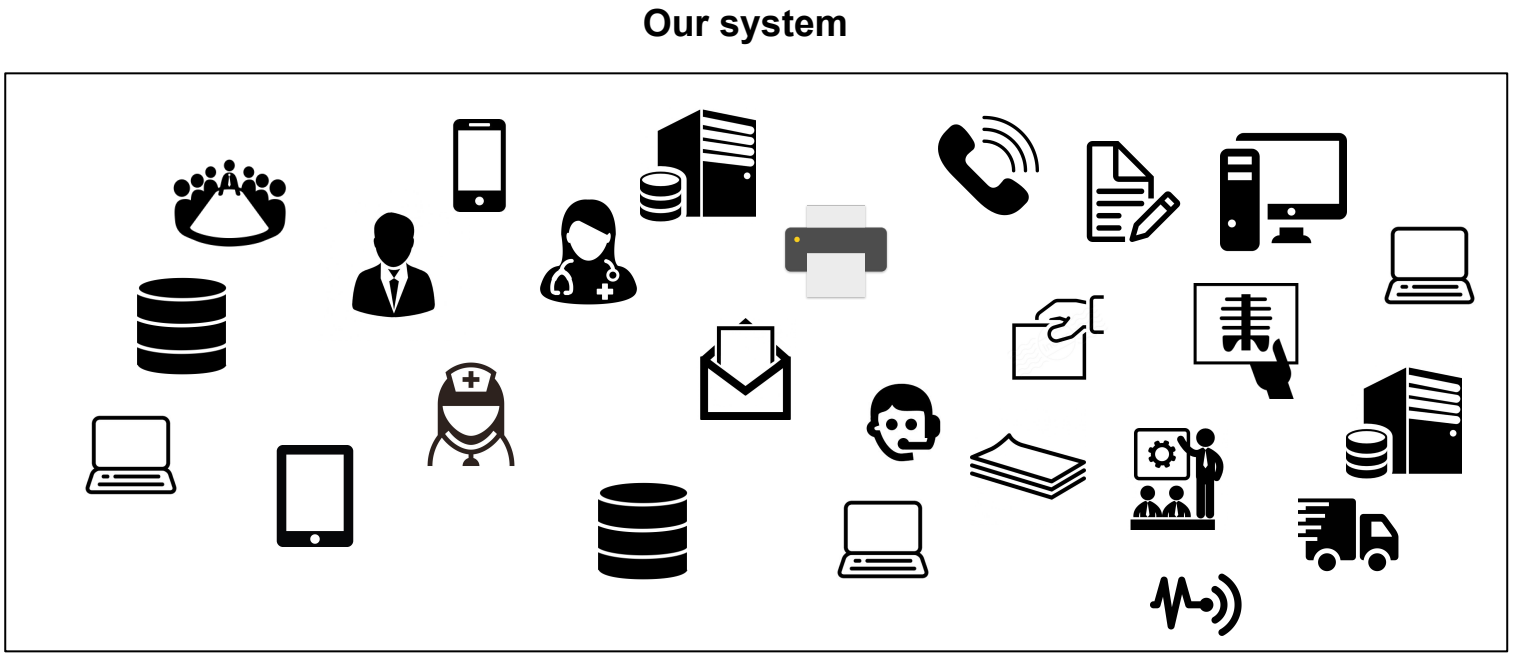

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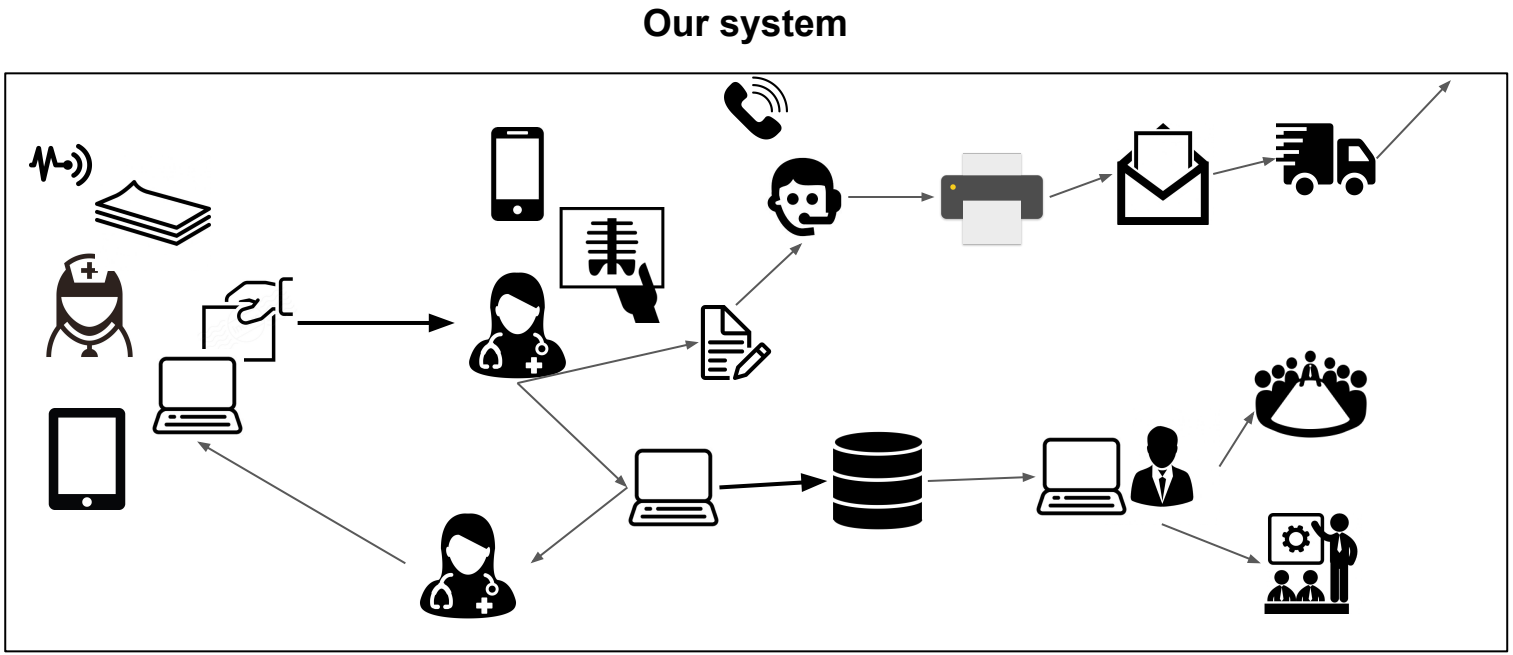

Socio-technical complexity

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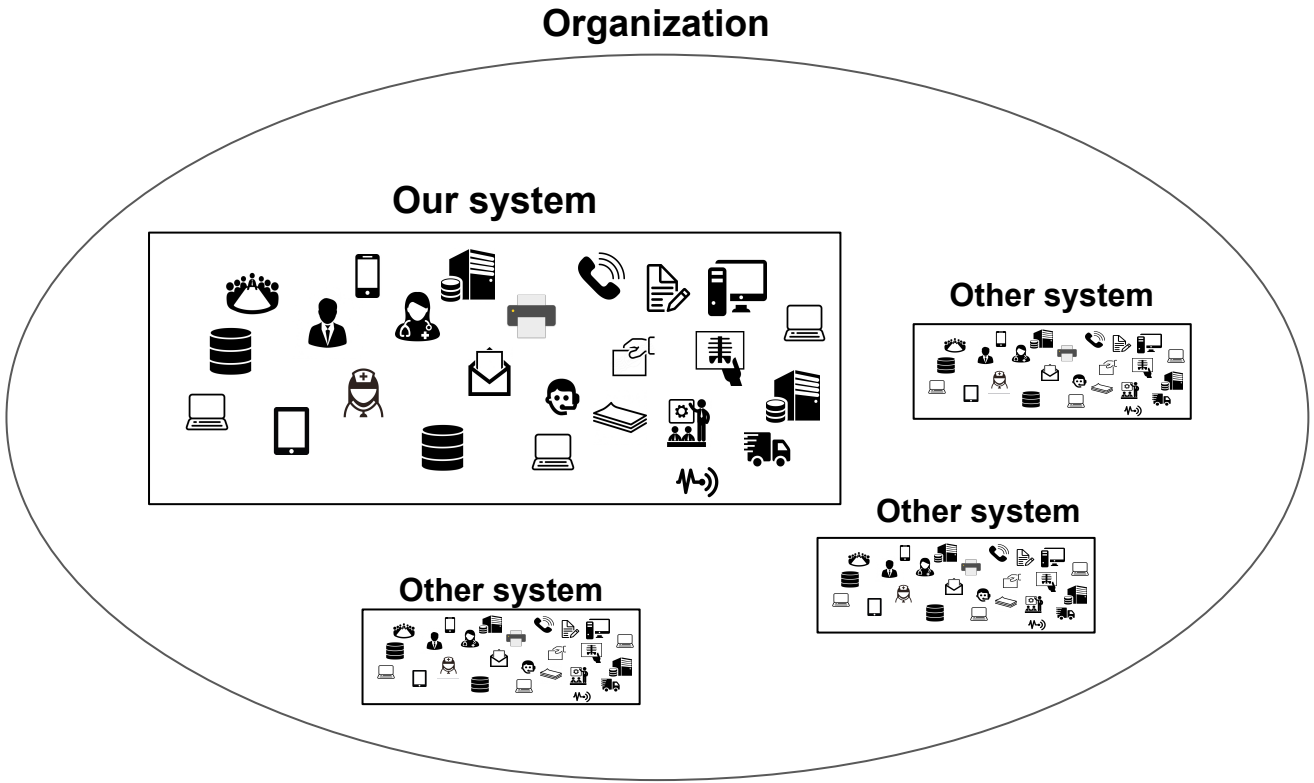

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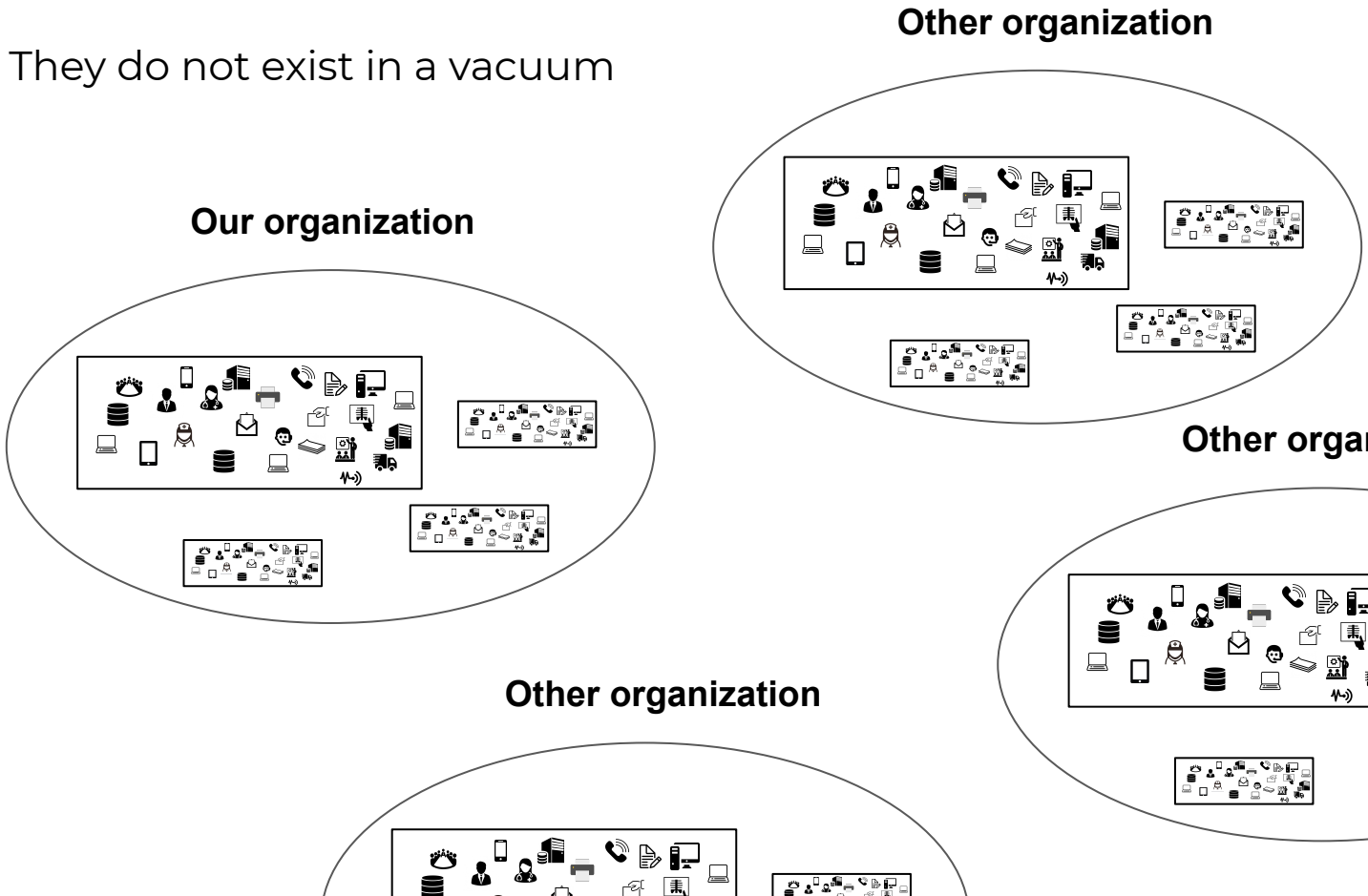

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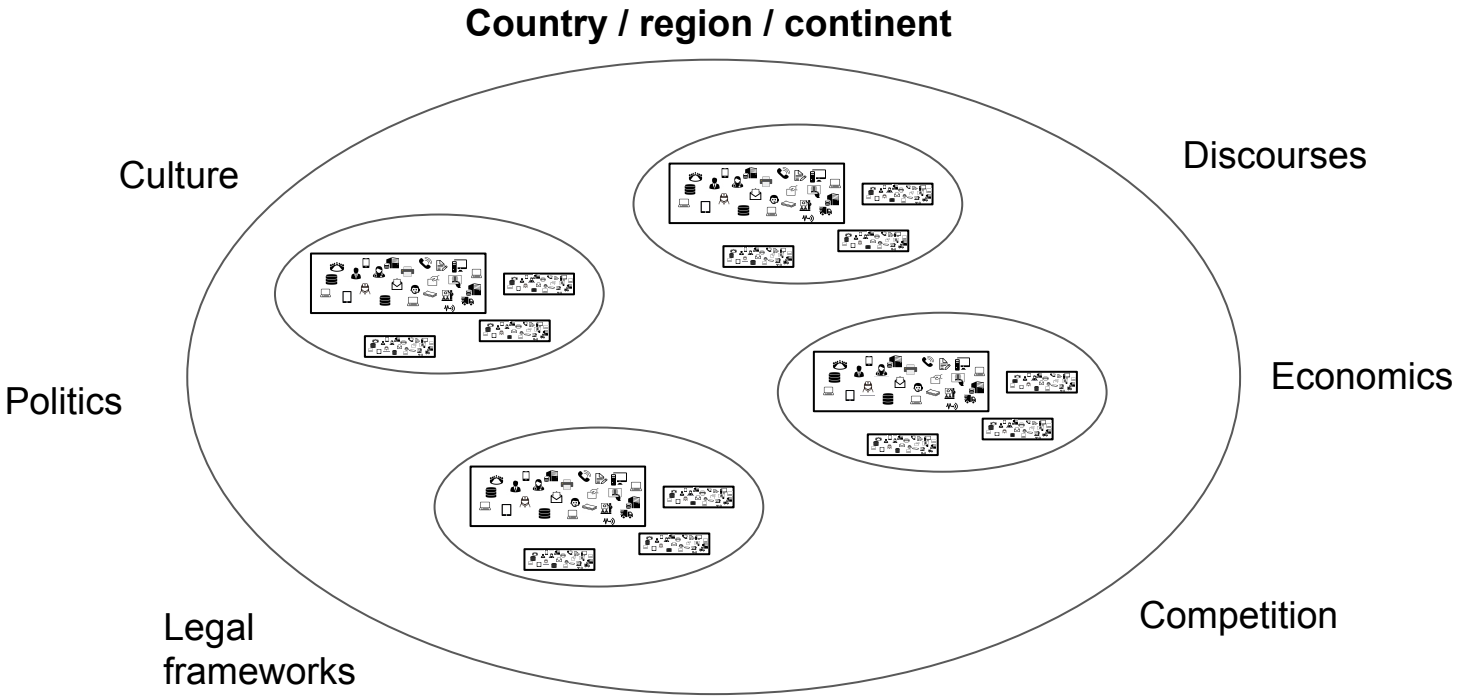


Standards

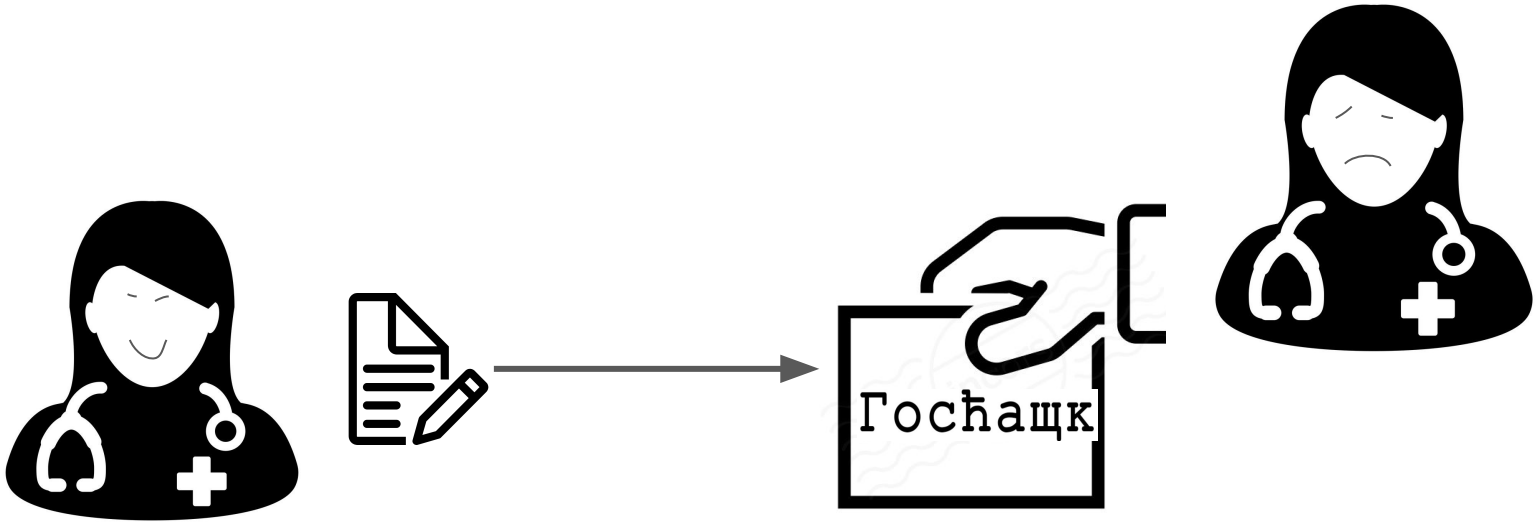
Standards

- How to communicate?

КАТЕГОРИЯ НАПРАВЛЕНИЕ ПРИСТИГА ЗАМИНАВА КОЛОВОЗ ЗАКЪСНЕНИЕ
П СТ. ЗАГОРА-Г. ОРЯХ 1820 ---- 3
М БУКУРЕЩ-Р-СОФИЯ 1828 1833 6
М Г. ОРЯХ-СЗ-ИСТАНБУЛ ---- 1845 4
П КОМУНАРИ-ШУМЕН-ГО 1910 ---- 1
Б СОФИЯ-РУСЕ-РР 1922 1932 5
Б ПЛОВДИВ-СЗ-ВАРНА 1922 1934 1
П РР-РУСЕ-Г. ОРЯХ 2027 ---- 4
П ПЛАЧКОВЦИ-Г. ОРЯХ 2045 ---- 1
Б СОФИЯ-Г. ОРЯХОВИЦА 2138 ---- 1
П Г. ОРЯХ -ГАБРОВО ---- 2150 4

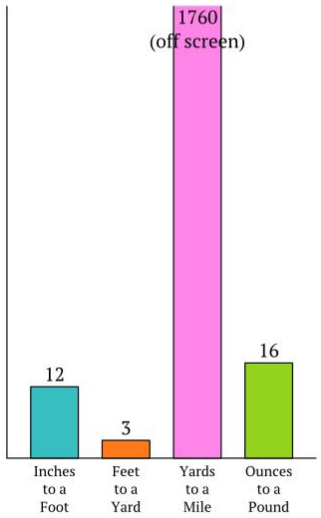
Standards

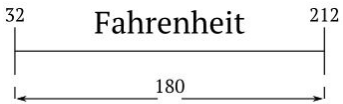
- How to communicate?



United States

Arbitrary Rollercoaster

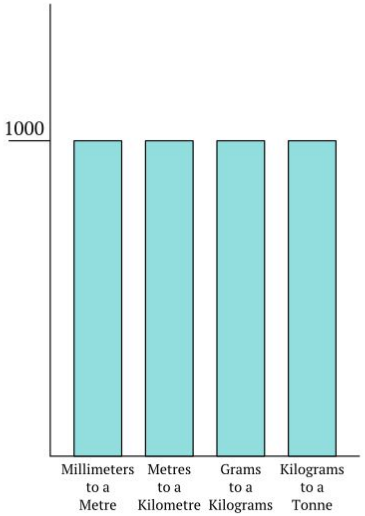


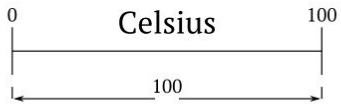


Arbitrary scale at which water freezes?

The Rest of the World

Logical Smooth Sailing





Logical scale at which Zero is the Base level

Stockholm, 3 September 1967

Standards

- How to communicate?

Example: DHIS2

- DHIS2 as part of *health information systems*

Health management information systems

Logistics management information system

Human resource information system

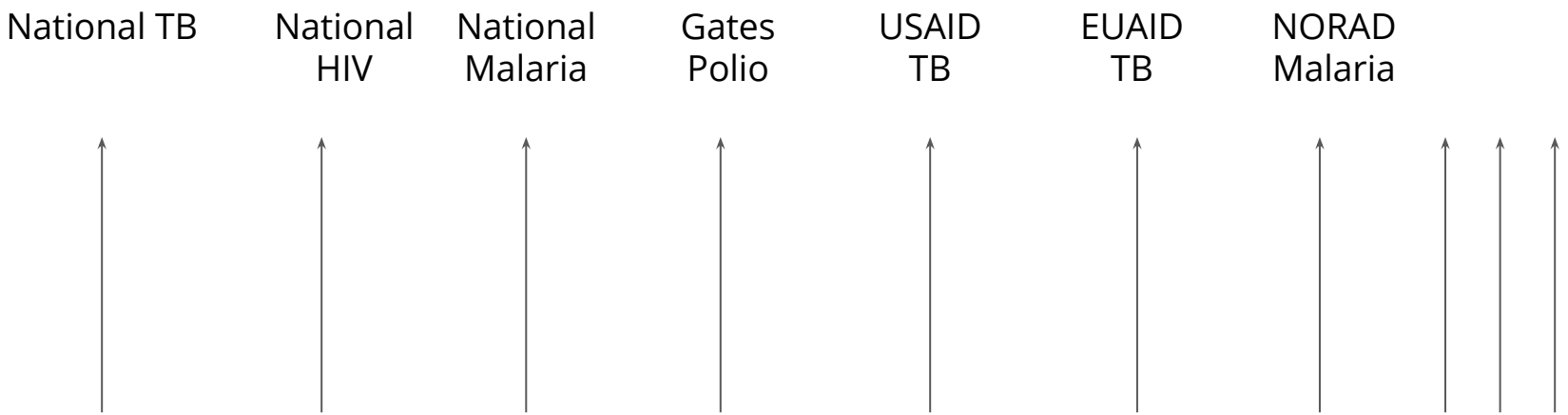
Electronic medical record information system

Patient self-use appliances

Enterprise resource planning systems

Example: DHIS2

- DHIS2 as part of *health information systems*
- In many countries: many ‘silo’ vertical reporting regimes.
- Different technology, terminology, political actors



Standards

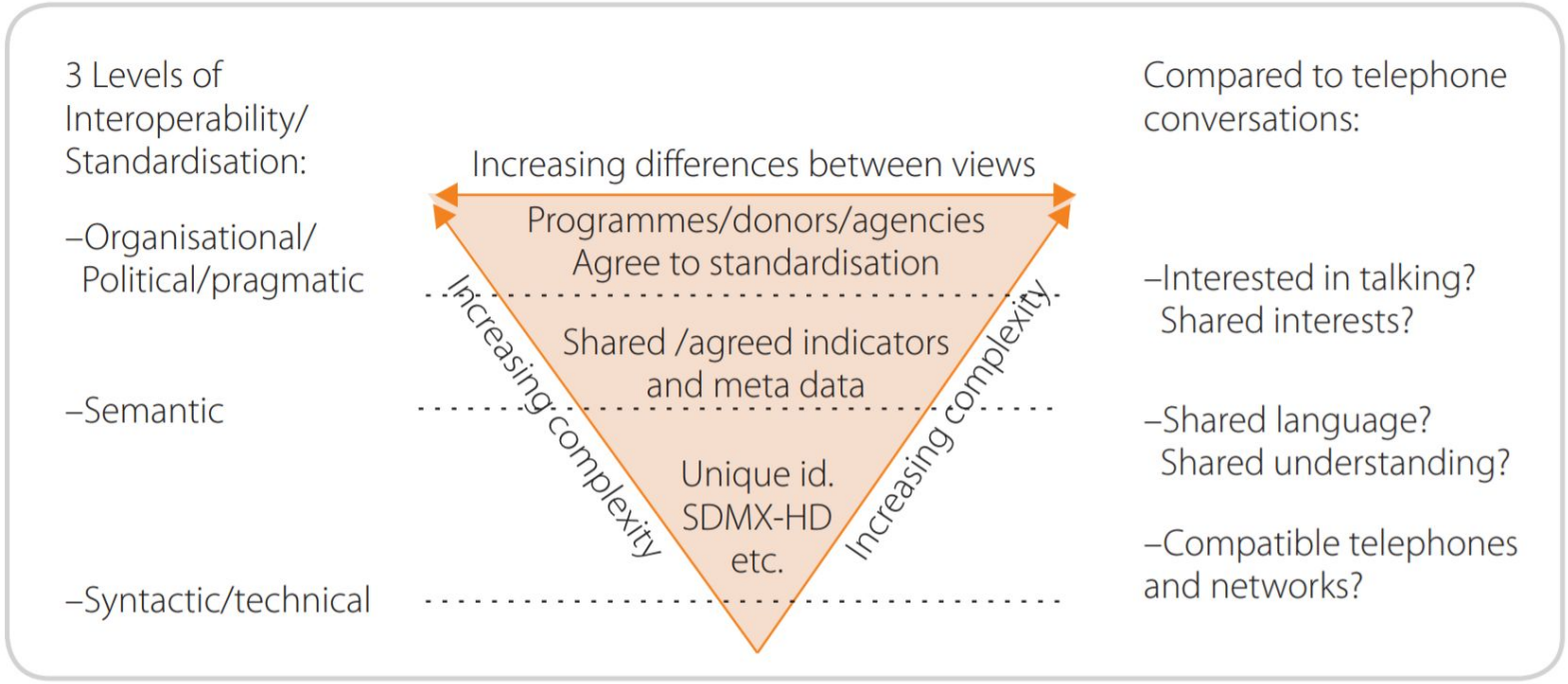
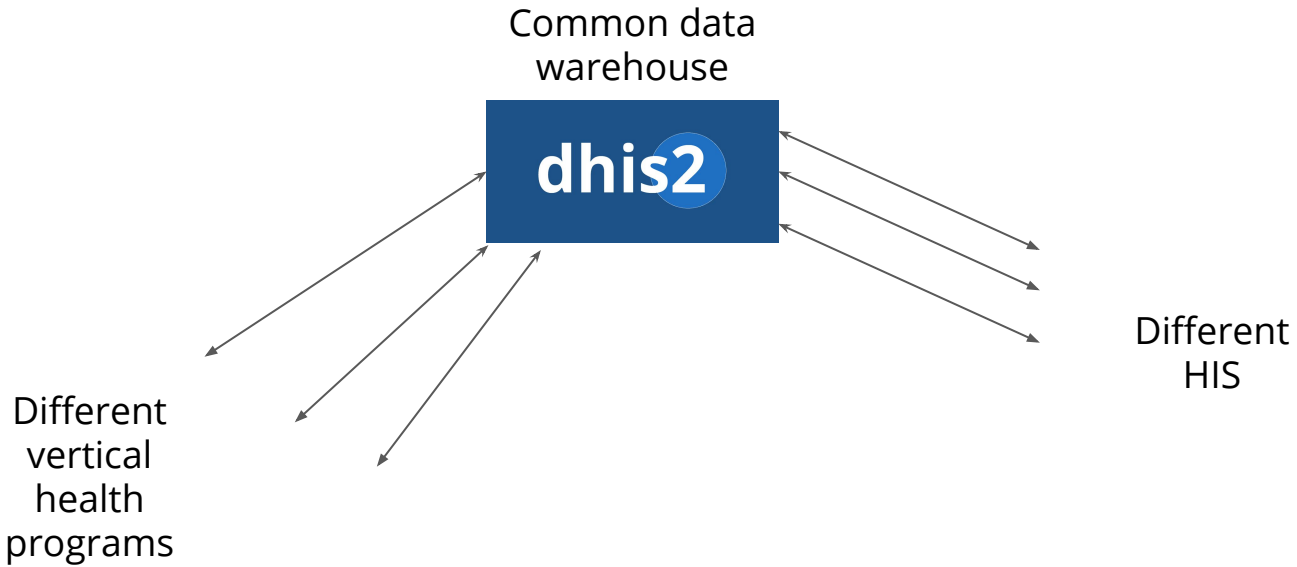


Figure 3.4 Three levels of standardisation of the increasing differences and complexities

Braa & Sahay 2012

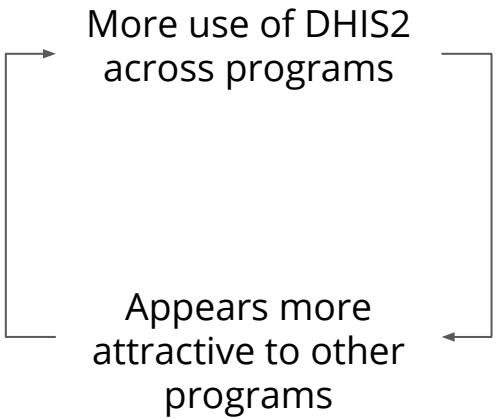
Example: DHIS2 as platform and ‘data warehouse’

- DHIS2 aims at supporting standardization and integration on the **technical and semantic level**



Example: DHIS2 as ‘attractor’

- DHIS2 has enabled some degree of standardization on the **organizational/political level**



Architecture

Architecture

The complex or carefully designed structure of something.

The conceptual structure and logical organization of a computer or computer-based system.

Oxford english dictionary

- A “blueprint” of a systems modules and relations.
- May be technical or/and socio-technical

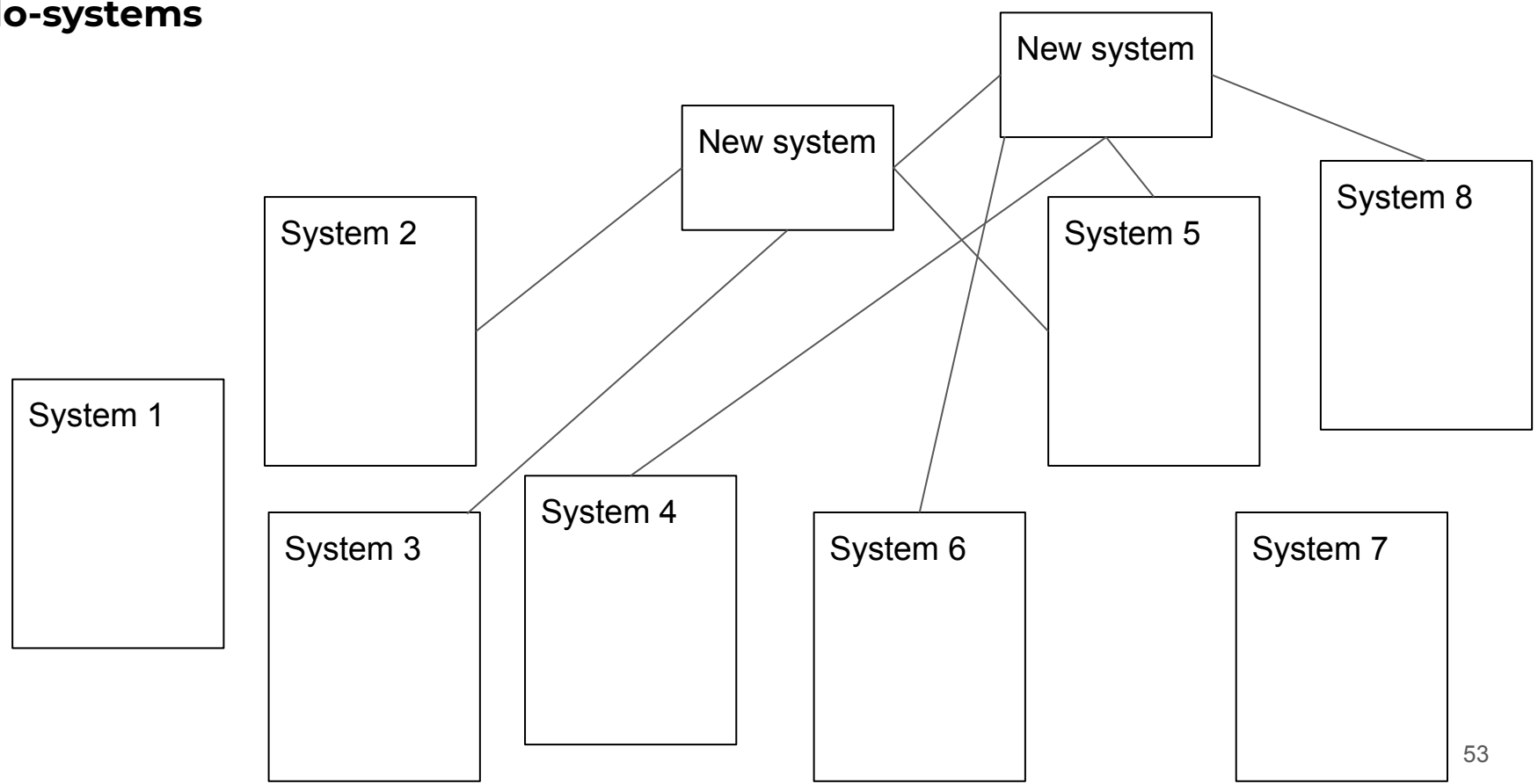
Architecture

A good architecture must exhibit four simple properties that it shares with the architecture of modern cities: simplicity, resilience, maintainability, and evolvability.

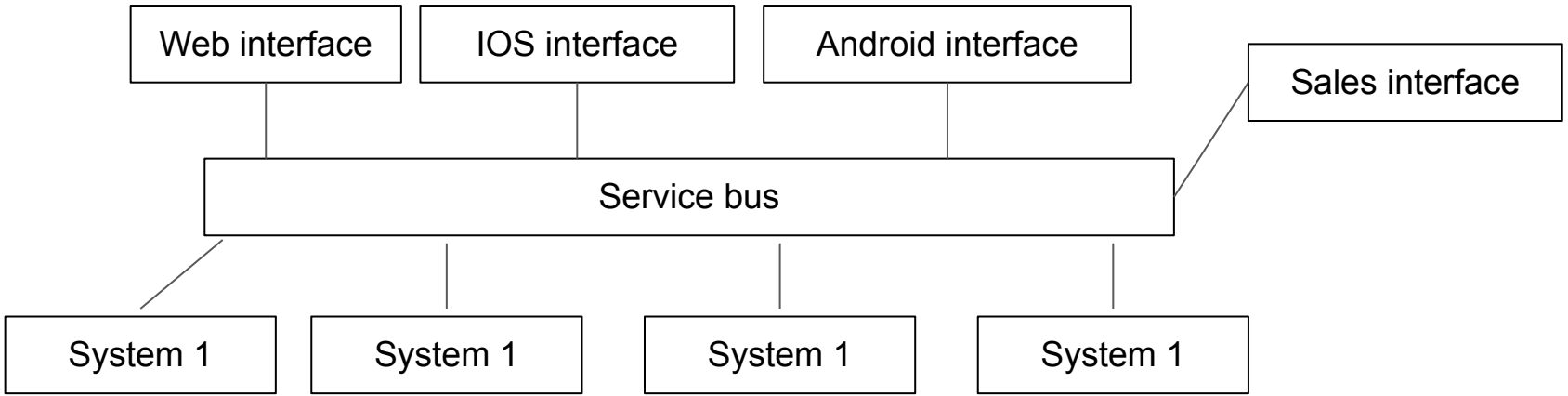
Tiwana 2012 p77

Architecture

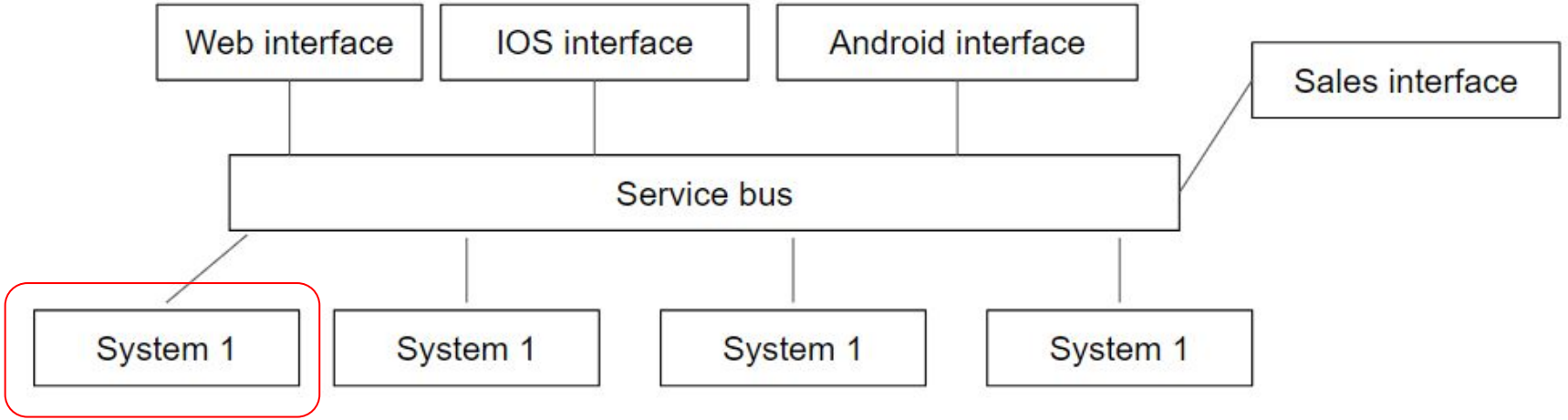
Silo-systems



Service-oriented architectures



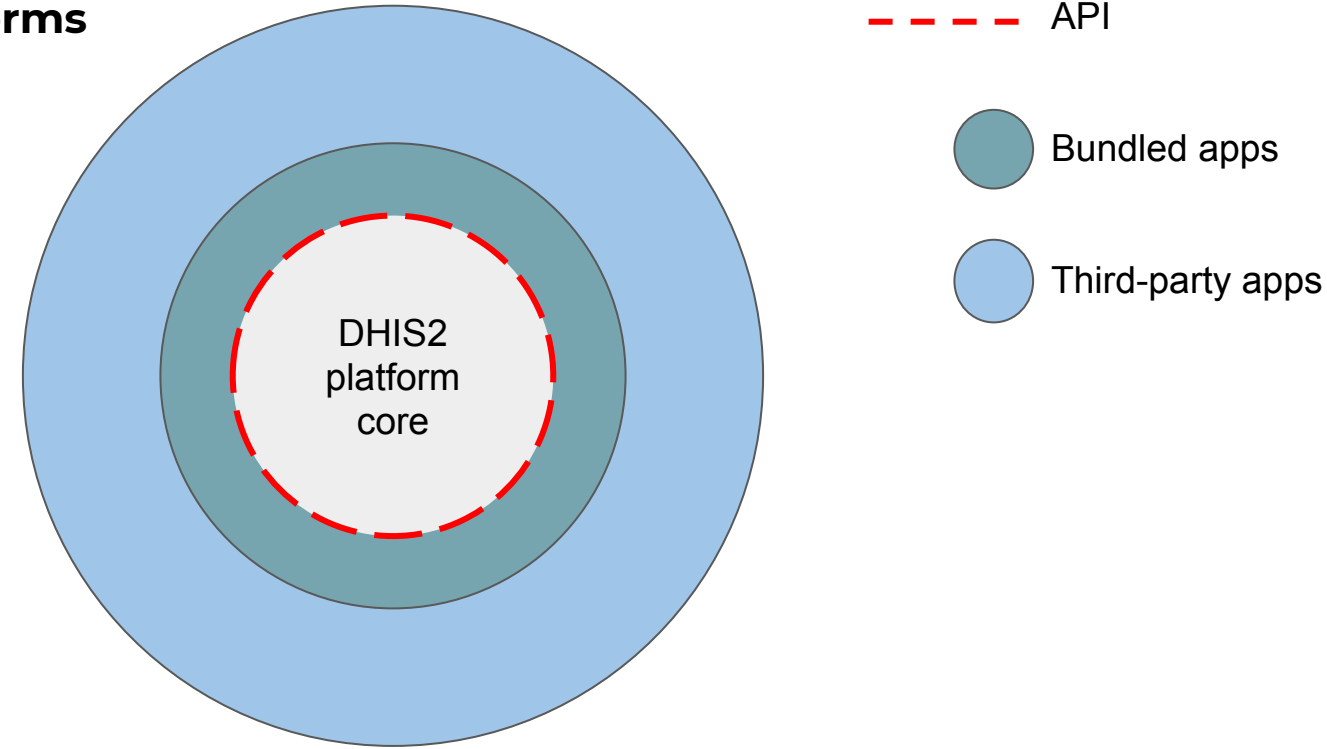
Modularization / partitioning



Module

Architecture

Platforms



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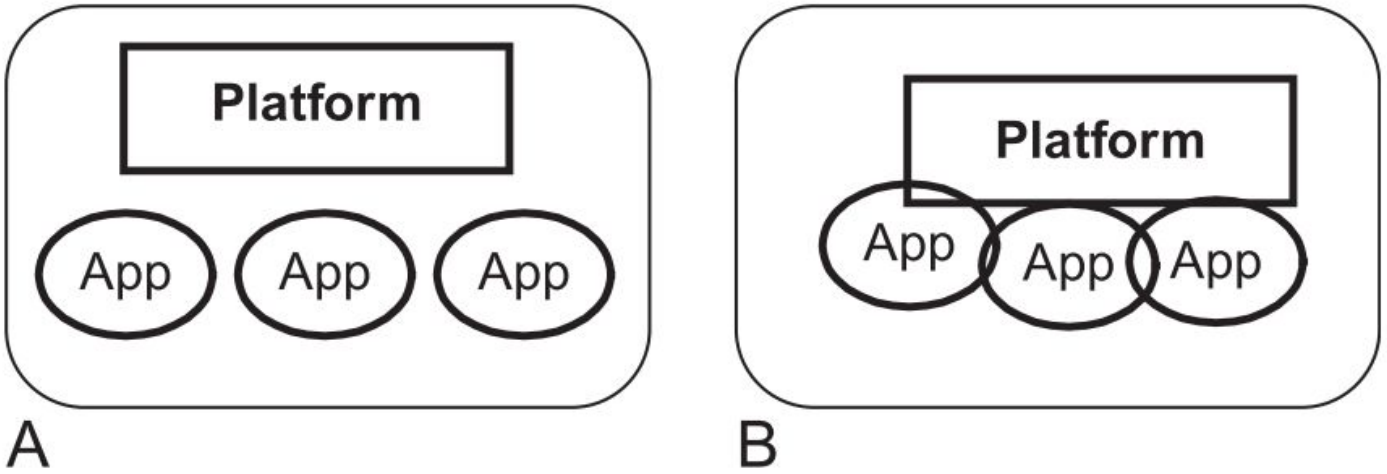
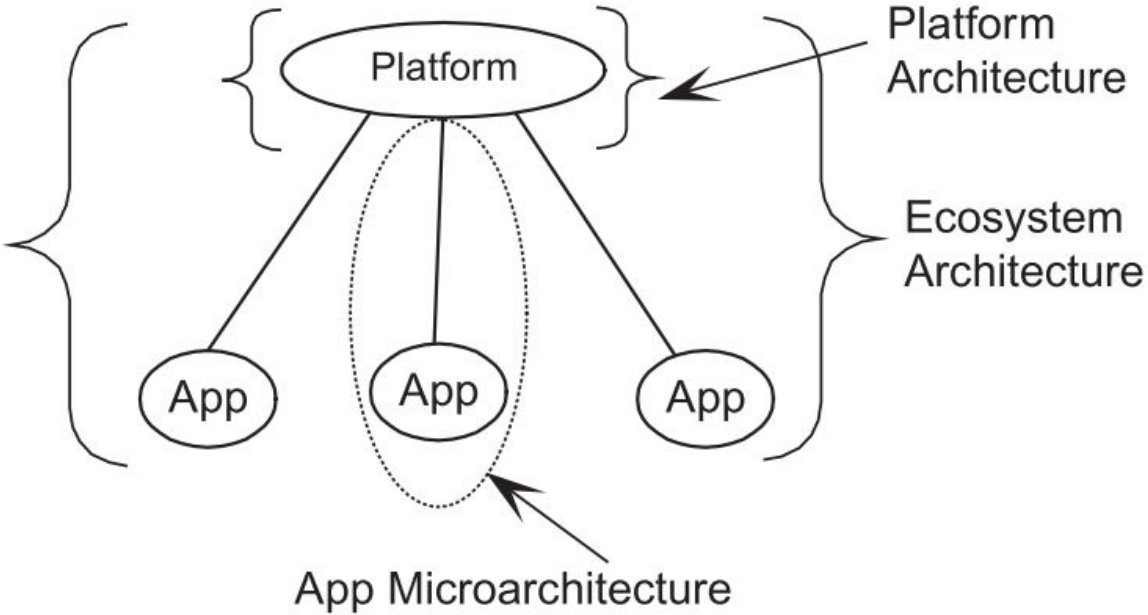


Tiwana 2012 p 80

Platforms



Tiwana 2012 p 85

Summary

Summary

- Platform ecosystems take part in, and may be seen as ***information systems***

- They are thus operating within **socio-technically complex** environments

- **Standards** are essential to information systems, and are an important feature and driver of platforms (e.g., APIs)

- Platforms has certain **architectural traits** that may promote desirable aspects
  - Reducing complexity, promoting innovation, enabling different levels of design, facilitating integration

Forward

- Fundamental platform concepts
- Generic software, platforms, and design
- Platforms and innovation
- Data platforms and AI
- Web services and software licensing.