Towards Standard-Based (Healthcare) Ecosystems of Systems

Konstantinos Manikas


(Work presented in collaboration with Klaus Marius Hansen, Henrik Bærbak Christensen, Morten Kyng, Jens Knodel)
Overview

Investigate intersection of software ecosystems and systems of systems

Propose: Standard-based ecosystem of systems
Facilitated by

Reference architecture

Explicit orchestration (governance, certification)

Standards only means to value creation
Background

PhD thesis on software ecosystems for telemedicine services

Problem:
Low incentives for TM development although potential benefits
High requirements on interoperability
Data sharing
“Silo” solution

Telemedicine domain:
Mission-critical nature
regulated requirements on safety, security, privacy
Approach of Software Ecosystems

“the interaction of a set of actors on top of a common technological platform that results in a number of software solutions or services”

where:

symbiotic relations btw actors & ecosystem

incentive/motivation for each actor
Resulted in

Build Net4Care platform -&gt; common platform

“Health” of a software ecosystem

Ecosystems need actors (actor network)

Actors need incentives (i.e. business model)

Governance/Orchestration

Input to 4S organization – ecosystem orchestrator platform owner
(Towards) Telemedicine ecosystem

A common (technological) platform

A set of actors

Out of which an orchestrator

Set of business models serving the actors
New Project: Implantable Cardioverter-Defibrilator

Shortly:

Means of patient-clinician co-detection of condition “worsening”

Thought patient feedback
AI-machine learning

Architecture for

Regulation approval

Modularity

safety, security, privacy
What can we use in healthcare from telemedicine?

Healthcare

Mission-critical, safety, privacy, regulation compliance

Many, independent, specialized systems VS one central platform (operational independency)

Many separate, specialized actors managing their systems (management independence)

Usually lack of one dominating actor

Systems put together of function more complex than the mere sum of functions

Thus:

More a System of Systems than an Ecosystem
A Software Ecosystem

Requires:

“Common technological platform”

actor & software interaction (symbiosis)

actor incentives

Possibly orchestrating (set of) actor
The missing platform

Challenging the definitions:

Software Ecosystems around more than “just” a platform

Cornerstone ecosystems

Standard-based

Protocol

Infrastructure
Standard-based ecosystems

Product development where commitment to standards is central

Usually:

- Run as a consortium – organization
- Slow to change but thorough
- Long term actor commitment and benefits
- Orchestration easier reflected in architecture - development

Examples in
- Design software standards
- Agriculture
- Healthcare
Standard-based ecosystems

The case of the Danish EMR

5 healthcare regions
Funding independent -> technologically variable
4 different EMRs

Standardization in communication initiative
MedCom
  Standard issuer
  System approval

Result: standard commitment across systems but also internally
Pitfalls

Ecosystem Health:
- Potentially low (actor/software) diversity
- Low(er) actor incentive – value proposition
- Commitment to standards Vs. unique selling points

Standard evolution cumbersome
- Each actor influences towards own agenda

Thus orchestration is challenging
Towards a Standard-based ecosystem of systems

Reference architecture:
  Alignment of actors (parallel to certification)
  Lower actor startup time – easier involvement

Explicit and defined:
  orchestration
  ecosystem evolution
  decision-making strategies

Important: Commitment to standards NOT value proposition
  – USP per se
  but means to that
Generalizability

Adoptions of standard-based ecosystems of systems where:

No strong actor to dominate decisions

Lack of/non possible a common technological platform

Domain of many independent systems

Need for (quality) control

Orchestration is challenging
Generalizability

Benefits:

Product control/regulation easier

Orchestration more efficient, less effort (but slower)

Supports/allows actor equality

Supports specialized (niche) solution
Summary

Investigate intersection of software ecosystems and systems of systems

Propose: Standard-based ecosystem of systems
Facilitated by

Reference architecture

Explicit orchestration (governance, certification)

Standards only means to value creation
For at ændre "Enhedens navn" og "Sted og dato":

Klik i menulinjen, vælg "Indsæt" > "Sidehoved / Sidefod".
Indføj "Sted og dato" i feltet for dato og "Enhedens navn" i Sidefod.

Byt billede:

Ny slide og klik på ikon, indsæt billede.
References