Information Infrastructure, Digital Innovation and Platforms

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Agenda and learning outcome

- Learn more about three different streams of research within IS
- A suggestion on how they can be compared
- Reflect on what is a ecosystem, and how these stream can be understood in relation to that
- Some thoughts about how Digital infrastructures can be transformed towards platforms.





Stream 1: Information infrastructures

Established in the early 1990's: Interconnected networks (Internet)

- Practical inspirations: Gore/Clinton (National Information Infrastructure (NII), or "information superhighway), Bangemann (Europe and the Global Information Society)
- Theoretical inspirations and ambitions
  - Iis as large-heterogenous actor-networks (Callon, Latour)
  - Inspired by sociology of knowledge and scot (Thomas Hughes Networks of Power)
  - Strong inspiration from Star and Ruhleders «Ecology of Infrastructure» and its relational perspective
  - Complexity theory
- The result: From system and tools to networks, from single organizations to organizational networks, from systems to infrastructures.

Characteristics of Infrastructures

- Open
- Shared
- Heterogenous
- Enabling
- Installed base
- Cultivation

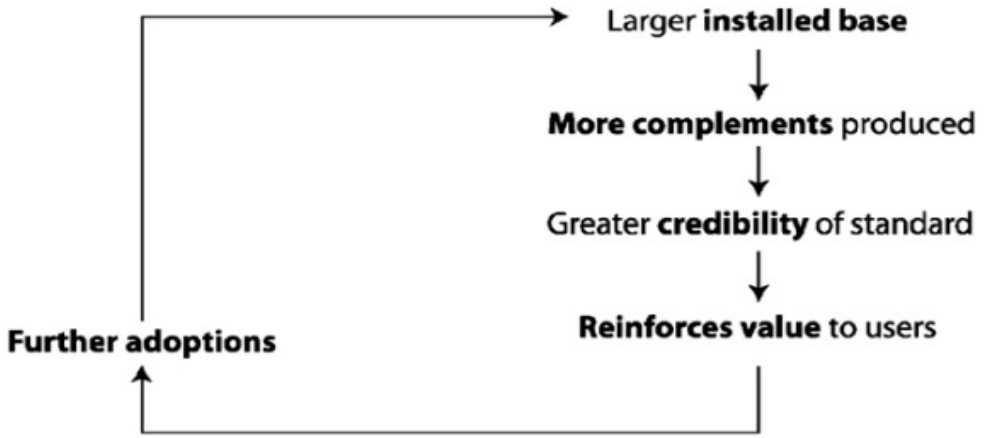
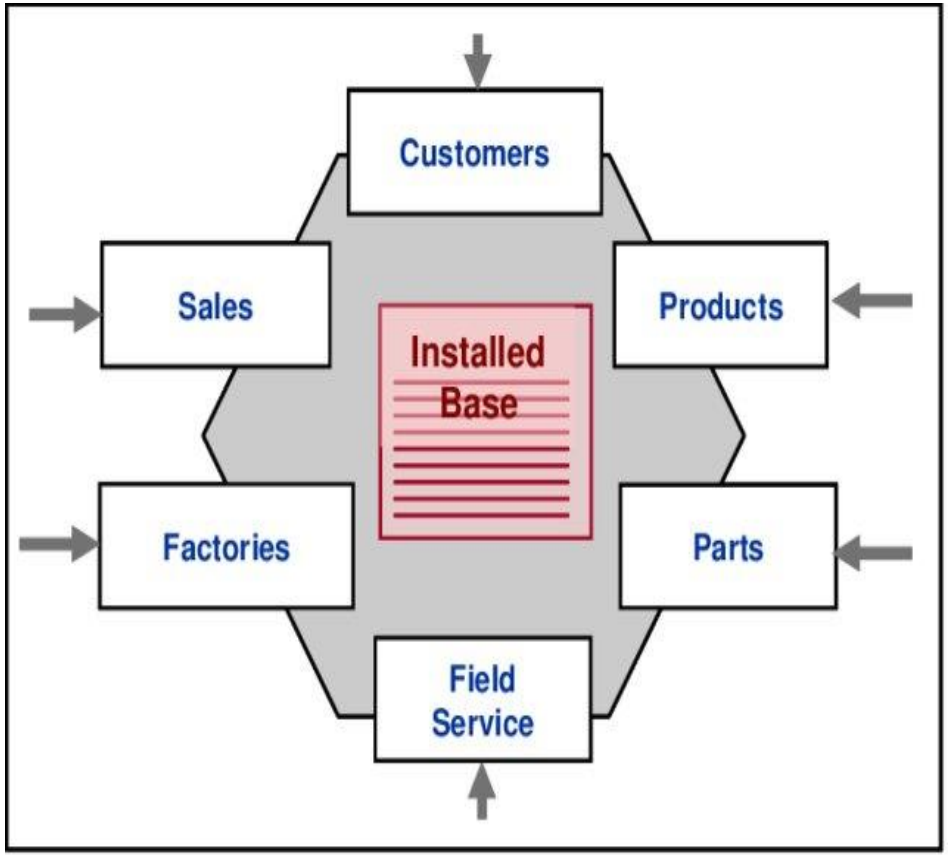


Fig. 1. Grindley's standards reinforcement mechanism. (Grindley, 1995).

- Huge amount of empirical studies within health (Aanestad et al., 2017) but also telecom (Nielsen and Aanestad 2006), and other commercial businesses (Ciborra et al 2000, Henfridsson and Bygstad 2013)

The adaptability and the bootstrap problem

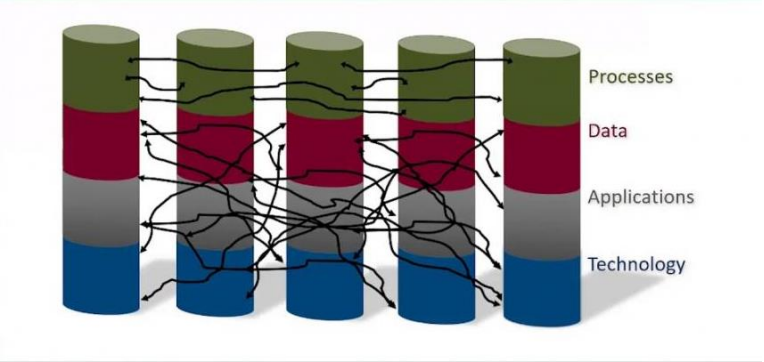
- II's evolutionary path is unpredictable: adapt and bootstrap
- The adaptability problem: "local designs need to recognize II's unbounded scale and functional uncertainty" (Hanseth and Lyytinen 2010, p. 1).
- Bootstrapping user needs (Hanseth 2002, Hanseth and Lyytinen 2010)



A Data Warehouse Approach for Estimating and Characterizing the Installed Base of Industrial Products (researchgate.net)

Transition towards governance, architecture and mechanisms

- Hanseth and Lyttinen (2010) introduce platforms and architecture into II theory
- Architecture and modularity (Aanestad and Blegind Jensen 2011), architecture and governance (Bygstad and Hanseth 2016, Hanseth and Rodon 2020)
- And business: Henfridsson og Bygstad 2013 propose that infrastructure evolution is more centrally managed and business oriented that earlier II have acknowleged
- Also extentions towards discourse and process innovation (Øvrelid og Bygstad 2019 , Bygstad og Øvrelid 2020)
- But, II theory retain its focus on heterogenity, complexity and its radical governance (Hanseth and Rodon 2020)





Stream 2: Digital innovation stream «Gøteborg-school» ++

- Attention: This is a particular stream within a more extensive research stream in IS.
- Car industry: concerned with the transition from physical to electric cars/digital equipment (Henfridsson and Lind 2014, Henfridsson et al., 2014, Svahn et al 2017)
- Inspirations
  - Schumpeters theories of markets and competition (1934)
  - Langlois (2003) (from Chandlers «visible hand» (industrial state- Galbraith) to vanishing hand (small scale firm)
  - Simons (Architecture of complexity 1962) and its focus on «Decomposition and loose coupling»
  - Henderson and Clark (1990) on Architectural knowledge based on exisiting structures

Examples and tendencies

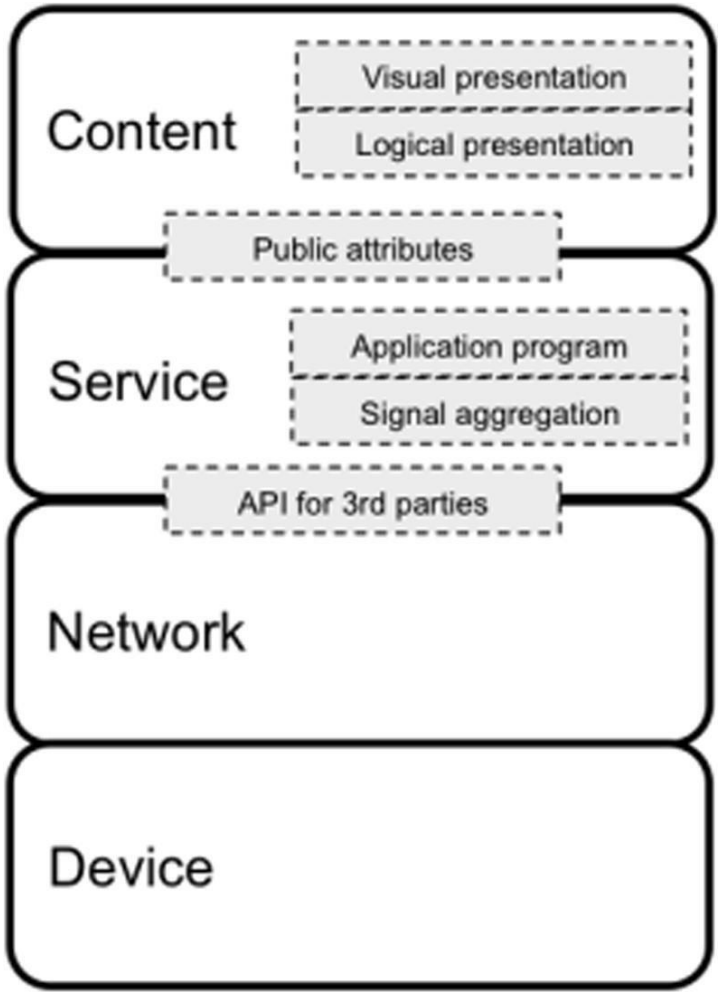
- Incumbent firms digitalization (Svahn, Mathiassen and Lindgren 2017)
  - 4 competing concerns in incumbent org digitalization- «joint emergence» must be governed balanced
- Artefact-oriented (Henfridsson et al 2014, Hylving og Schultze 2020) or more organizationally oriented (Svahn et al 2017, Andersson et al 2008)
- This way of studying organizations and digital innovation is transfered to other cases (Rapidly scaling the user base (Huang et al 2017, Huang et al 2021)

Ambition

- Tendency: Speed-up the development speed compared to Henderson and Clark
- «From hierarchy as parts to networks of patterns (Henfridsson et al., 2014)
- Three unique characteristics of the digital: (1) the reprogrammability, (2) the homogenization of data, and (3) the self-referential nature of digital technology (Yoo et al 2010)
- Kallinikos et al (2013) – occupied with an ontological shift in the transition between product innovation and digital innovation

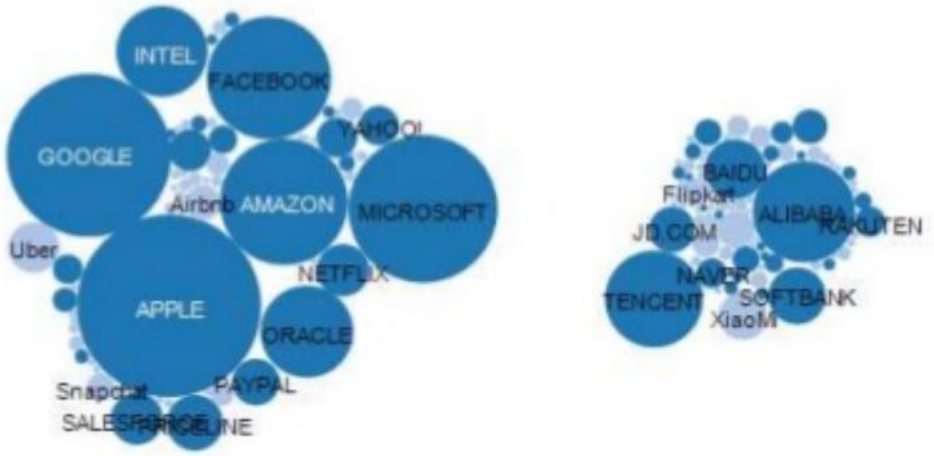
Towards architectures and platforms

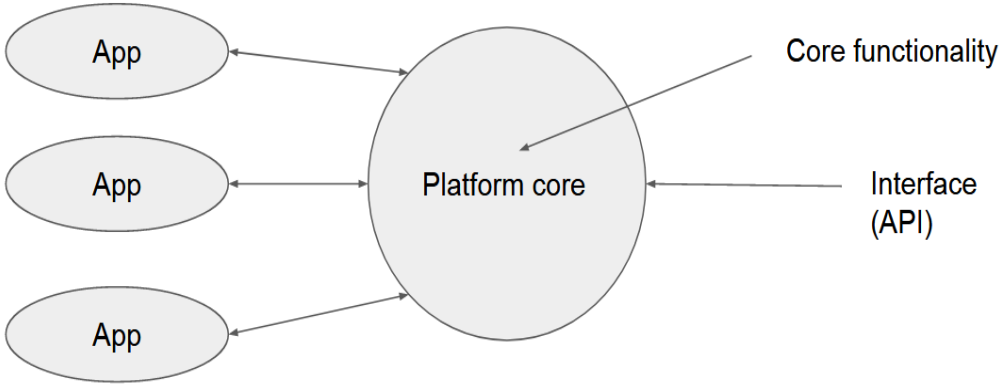
- Layered modular architecture (Yoo et al 2010)
- Boundary resources (Ghazwaneh and Henfridsson 2013)
- Architecture for enabling recombination – Value paths (Henfridsson et al 2018)
- Reality-orientation (Hylving and Schultze 2020). Extend this very generic structure to become more real.



Stream 3: Platform ecosystems and architecture

- Large-scale platforms like Google, Amazon and Facebook
- Transition from value chains to ecosystems
- Fra Pipelines til Plattformer (Van Alstyr et al 2016)
  - From resource control to resource orchestration. - spread resources into the ecosystem
  - From internal optimization to external interaction – enable interaction between core and complementaries
  - From a focus on customer value to a focus on ecosystem value - relate adaptively to developments in the ecosystem (feedback)





Platform architecture

- Has enabled dramatic innovations in organizations and markets
- Collaborative and balanced governance
  - Standards and variety (Wareham et al 2014)
  - Modularity, interaction and complementaries to ensure innovation (Tiwana 2014)
  - Three-level architectural blueprint that facilitates silo-transformation (Tiwana 2014, Ross et al 2020)
- Modularity facilitates loose coupling between organization and modules

Comparison between the three streams

	Central challenge	**Main object**	**Ambition**	**Main strategy**	**Literature**
Infrastructure literature	Heterogenity (variety) and complexity	Installed base	Cultivate decentralized innovation	Adapt and bootstrap	Hanseth and Lyytinen (2010), Aanestad et al (2017), Ciborra et al (2000)
Digital Innovation «Gøteborg-school»	From value-chains to value paths through digital innovation	Digital technology	Business disruption	Decoupling and modularizatio n	Henfridsson et al (2014), Yoo et al (2010), Henfridsson et al. (2018), Svahn et al (2017), Huang et al 2017,
Platform ecosystems	Enable interaction between platform core and complementar ies	Ecosystem	Create new interactive business models	Three-level architecture	Baldwin and Woodward (2008), Tiwana (2014), Wareham et al (2014)

2. Jacobides et al (2018) on Ecosystems

- Existing views:
  - Business ecosystems – community of organisations/firm and their market share. The firm is the point of departure
  - Innovation ecosystems – new value propositions and the surrounding actors. The product is the point of departure
  - Platform ecosystems – semiregulated markedsplaces. The relation between the platform core and the complementors is central
- Three important elements: Modularity, Interaction/Coordination and Complementaries
- But the literature is too wide, need a more precise understanding of ecosystems

Jacobides (with help from Powell og Adner)

Modularity, coordination and complementaries may happen within a range of different organizational forms

- Organisation – The business relations as an aspect to describe and organization and its markedsshare
- Supply chain – Production chains that is transformed when going from physical to digital production
- Ecosystem- economical structures where buyers can choose standardized products from different complementors
- Network – heterogenous open-ended relational ecosystems
- Market – various ecosystems that cooperate and competes

Stream	Organizational form	Description
Infrastructure literature	Network	Describes the development of heterogenous networks, but lacks the homogenized structure of platforms
Digital Innovation	From supply-chain towards platforms	Describes the transition from value chains to value paths (in ecosystems)
Platform ecosystem stream	Ecosystem	Commercial ecosystems with a central platform owner. Less on collaborative ideal or public sector platforms

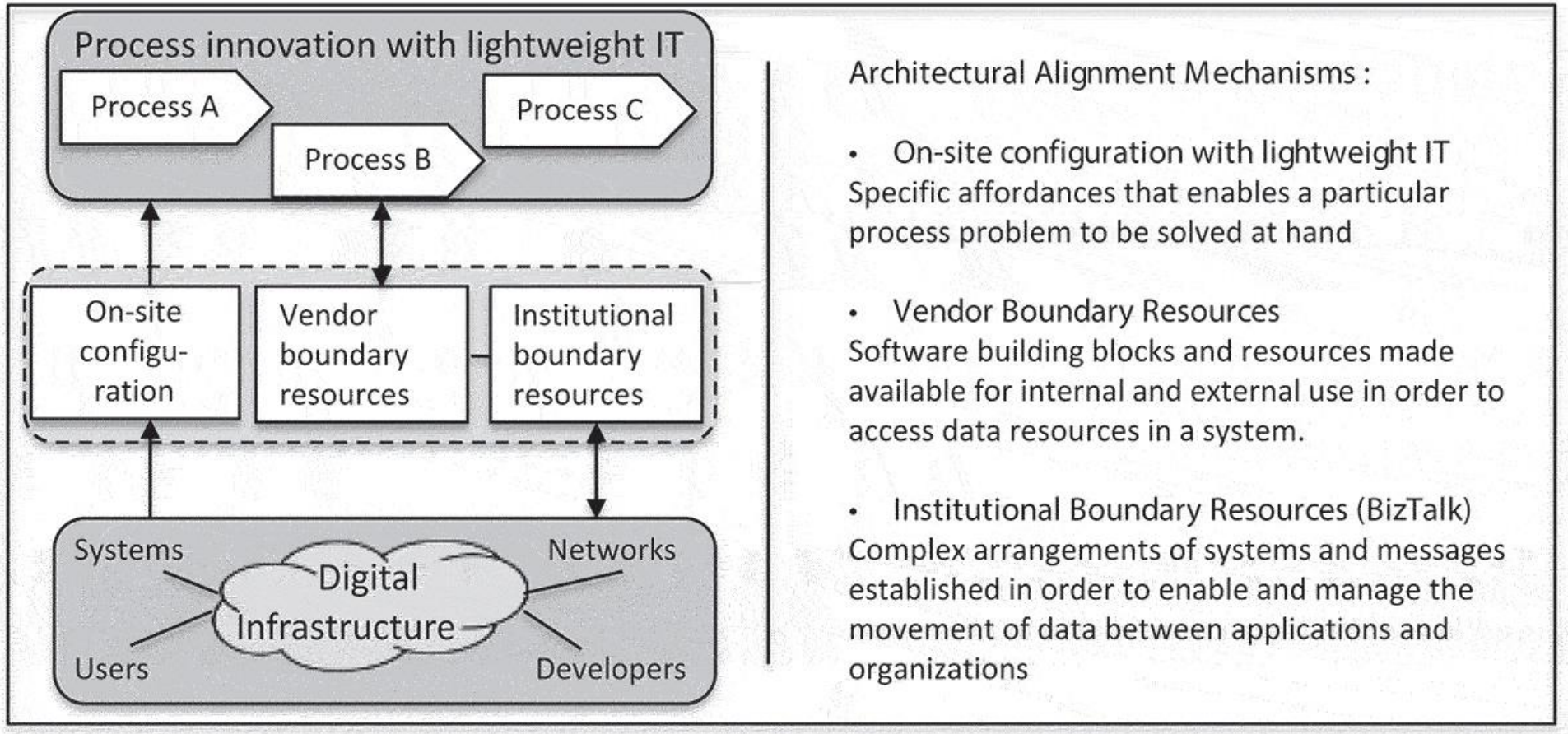
3. Enabling two-speed innvation: Transformation of Infrastructures towards Platforms

- Cases from health sector
- Incumbent and complex organizations
- One-speed innovation
- How can they be transformed towards platform



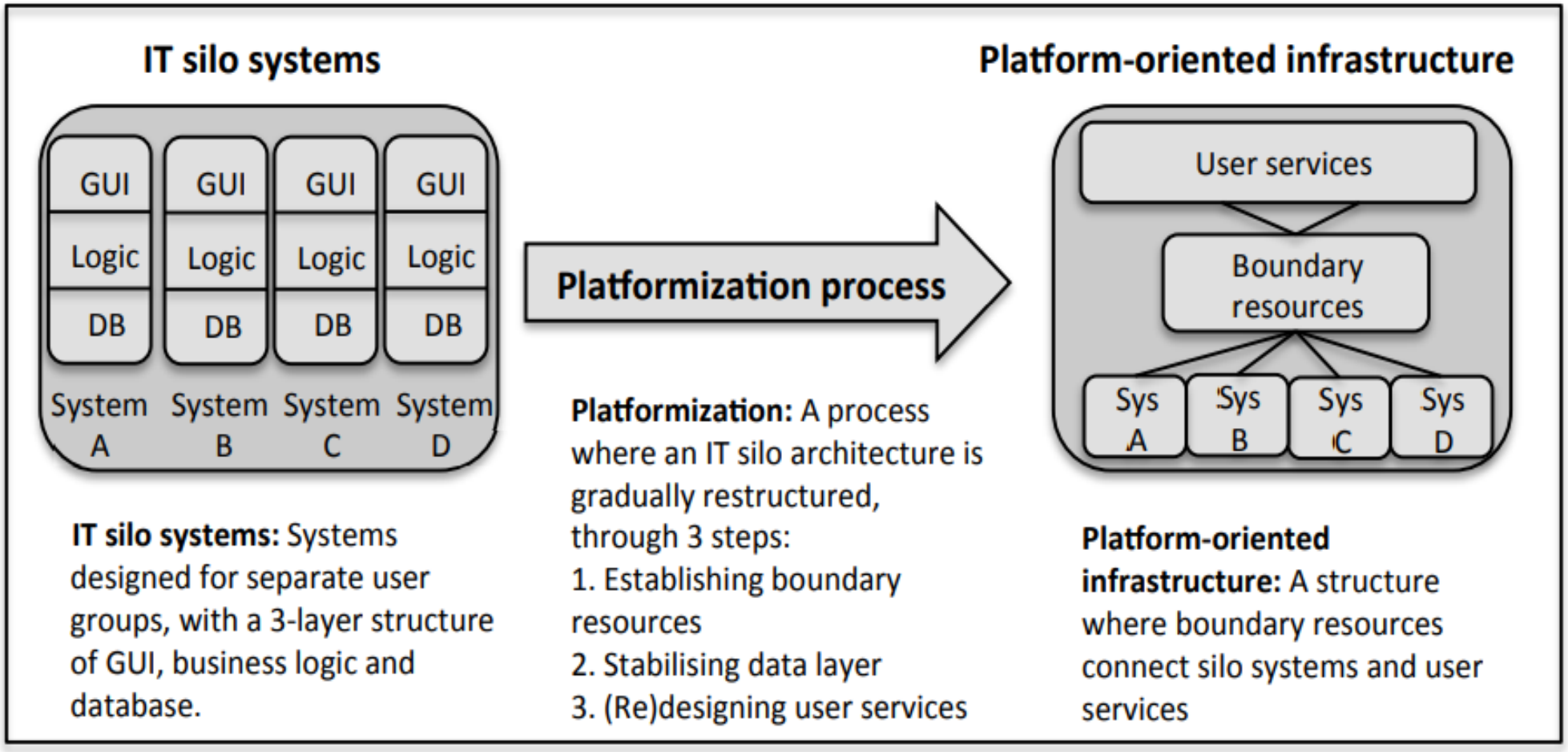


Architectural alignment



Bygstad and Øvrelid 2020

Platformization requires modularization



Bygstad and Hanseth 2018

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