The concept of architecture in Technology and Organisation studies

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Presentation Overview

- Exploring the Diversity in Research Literature
- Basic Definitions and a Look in Practitioners’ World
- A Framework for Positioning Research
- Questions
Non exhaustive list of research interests related to IS “architecture”

• Qualities of architectures (e.g. generative, resilient, responsive): *what types of arrangements lead to desired qualities (e.g. p2p, modular, layered) – based on analytic approaches or empirical cases*

• Architecting as a process: *roles of actors, path dependencies, emergence – research questions related to influencing the process (how to proceed for architecting) or explaining (why unfolded this way)*

• Architecting as a practice: *learning, coordination, communities – to describe and unpack*

• Architectural representations: *models, notation, standards – to improve/further develop or to investigate impact*

• Architectures as regulatory regimes: *issues of governance, compliance, etc. coherent set of principles and rules that guide design and renewal activities*

• Architectural knowledge: *to make sense and develop architectural arrangements, as a way to approach innovation*
Architecture types and qualities

• e.g. generative, resilient, responsive
• what types of arrangements (e.g. p2p, modular, layered) lead to desired qualities for management purposes, relation between business needs and technology – based on analytic approaches or empirical cases
• Typologies – mapping of architectures

Examples:
• Yichuan, Kung, Byrd 2013- Leveraging event-driven it architecture capability for competitive advantage in healthcare industry: A mediated model, ICIS
  • examining a novel type (EDA) and proposing improvements
  • capabilities of IT architecture (sensing, responding, interoperability, flexibility)
  • competitive advantage for business

• Bidan, Rowe, Truex – 2012 EJIS – An empirical study of IS architectures in French SMEs: integration approaches
  • mapping of resulting IT architecture in SMEs addressing issues of integration and interoperability.
  • taxonomy of three architecture types: (1) silos architecture, (2) partially standardized, (3) mixed architecture
  • explain why architectures were shaped in relation to organizational concerns and history
Architecting as a process

- roles of actors, decision taking, path dependencies, emergence
- how architectures evolve

Examples:
- Aanestad, Sæbø. Grunfeld 2014 – Towards a processual perspective on architecture (NOKOBIT)
  - Describes the emergence of an infrastructure for personalized medicine (GenApp project)
  - Architecture is a process: exploratory at first, learning process
  - Temporality: tension between short term and long term concerns
  - Architecting is ‘organization building’: organizational development part of architecting

  - Proposes to capture and documentation of decisions during architecting process: a decision view
  - “When we explicitly record and document design decisions, new activities arise during the architecting process; this architectural knowledge (AK) constitutes a new crosscutting view”
  - “Architects as knowledge producers and consumers in a social process”
Architecting as a practice

- learning, coordination, communities – to describe and unpack
- The work of architecting
- The role of the architect

Examples:

  - Metaphors used in practice by different stakeholders participating in the creation and use of software architecture
  - Blueprint, language, decision, literature (documentation of past)
  - The metaphors serve to highlight multiple uses of architecture by the different stakeholders

  - How IT architects perform their work in practice
  - Architects as bridges between different actors and knowledge
  - Multiple roles that need to be supported simultaneously

  - Architecturing as sensemaking: human interpretation and understanding of relationships.
  - Focus on how architects carry out their business in an everyday manner, how they make sense and utilize the tools that inhabit their social world in their everyday activities.
Architectural representations

- models, notation, standards, conventions, principles, frameworks – sometimes within a specific domain
- to improve/further develop or to investigate impact

Examples:
Architectures as regulatory regimes

- issues of governance, compliance etc. coherent set of principles and rules that guide design and renewal activities

Examples:


  “project architects are responsible for ensuring that individual projects are compliant with technology standards and that related projects reuse technologies as appropriate. If a project architect feels an exception to the standards is warranted, he or she either seeks approval from one of the assistant vice presidents authorized to grant exceptions or refers the request to the architecture committee”


  “conceptual blueprint that describes how the ecosystem is partitioned into a relatively stable platform and a complementary set of modules that are encouraged to vary, and the design rules binding on both. (…) Design rules refer to the rules that platform owners expect module developers to obey (…) platform owners face a challenge in how to make design rules stable enough to sufficiently constrain developers’ yet versatile enough to not overly constrain them.”
Architectural knowledge

- to make sense and develop architectural arrangements, as a way to approach innovation

Examples:
- “Architectural design, even well documented according to all the good recipes, is only one small part of the Architectural Knowledge that is required to design a system, or that is needed to guide a possibly multisite development team, or that can be exploited out of a system to build the next one, or that is required to successfully evolve a system.”
- Architectural Knowledge as something that can be deposited in a repository and accessed
- Passive users or consumers of Architectural Knowledge: people who need to exploit Architectural Knowledge for their own understanding such as Developers. Active users or producers of architectural knowledge: they add to the Architectural Knowledge repository, integrate it, mature the information in it. Examples include Architects.

- “knowledge developed and enacted in innovation processes of aligning heterogeneous business and technical elements”
- how architectural knowledge may be developed
- four dimensions: technology capability awareness, use context sensitivity, business model understanding, and boundary-spanning competence.
“The notion of an architecture is problematic in part because it seems to be usefully ambiguous and is often used at a high level of abstraction”

Definitions

Dictionary (Merriam-Webster):
• the art or science of building; specifically: the art or practice of designing and building structures and especially habitable ones
• formation or construction resulting from or as if from a conscious act - a unifying or coherent form or structure
• a method or style of building

ISO/IEC/IEEE 42010:2011 (requirements on the description of system, software and enterprise architectures):
• fundamental concepts or properties of a system in its environment embodied in its elements, relationships, and in the principles of its design and evolution

• structure of components, their functions, and their inter-relationships and the principles and guidelines governing their design and evolution over time
Different concerns – different descriptions

ISO/IEC/IEEE 42010:

Concerns can be: developmental, technological, business, operational, organizational, political, economic, legal, regulatory, ecological, social.
Examples of multiple descriptions (Zachman 1987)

- a variety of representations are created at different levels of detail, are different in nature, content and semantics, forming a set of multiple architectural representations depending on different roles

<table>
<thead>
<tr>
<th>If you are:</th>
<th>Then you probably think architecture is:</th>
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<tbody>
<tr>
<td>A programmer</td>
<td>A structure chart</td>
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<tr>
<td>The database administrator</td>
<td>Data design</td>
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<tr>
<td>An analyst</td>
<td>A data flow diagram</td>
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<tr>
<td>A planner</td>
<td>Some combination of entity/relationship diagrams and/or functional flow diagrams</td>
</tr>
<tr>
<td>The communications manager</td>
<td>The business logistics infrastructure and/or the distributed systems architecture</td>
</tr>
<tr>
<td>An operations manager</td>
<td>The system architecture</td>
</tr>
<tr>
<td>A network administrator</td>
<td>The network architecture</td>
</tr>
<tr>
<td>A program support representative</td>
<td>Detailed data and program descriptions</td>
</tr>
<tr>
<td>A computer designer</td>
<td>Machine language (not represented on the summary chart, Figure 2)</td>
</tr>
<tr>
<td>The president</td>
<td>Entity classes, process classes and/or a map</td>
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</tbody>
</table>
Frameworks that combine views

CIMOSA

TOGAF

Zachman

ARIS
Open Group Architecture Framework (TOGAF) : four architecture domains

**Business Architecture.**
Business and operating model, strategy, drivers, goals, policies.
Stakeholders and their roles and relationships.
Functional decompositions and organizational models
Business processes and workflows.
Business rules on authorities and responsibilities

**Data Architecture.**
Logical and physical data models, policies, rules or standards that govern data registration, storage, arrangement, manipulation

**Application Architecture.**
How applications execute business functions and processes by using the data architecture to fulfil business requirements. Interfaces between applications as well as between applications and users and the events that trigger interactions

**Technology Architecture.**
Platforms: hardware, operating systems, and platforms.
Middleware; message-oriented (such as WebSphere MQ), applications-oriented (such as Corba) or data-oriented (such as relational databases).
Hosting of applications on hardware or virtual platforms.
Local and wide area networks.
ARIS: Architecture of Integrated Information Systems

- **Business Architecture**: Business Processes, Workflows, Transactions
- **Application Architecture**: Components and Interrelationships
- **Information Architecture**: Data Models Structures, Exchange Formats, Security and Privacy
- **Infrastructure Architecture**: Hardware, Server, OS, Network

**Program, Project and Portfolio Management**

**Business Strategy & Requirements**
Umbrella term: Enterprise Architecture

• “The enterprise architecture is the organizing logic for business process and IT capabilities reflecting the integration and standardization requirements of the firm's operating model” (Ross, Weill, Robertson, 2006)

• “Enterprise architecture (EA) is a discipline for proactively and holistically leading enterprise responses to disruptive forces by identifying and analyzing the execution of change toward desired business vision and outcomes. (...) EA is used to steer decision making toward the evolution of the future state architecture.” (Gartner glossary).
An initial framework for positioning research

<table>
<thead>
<tr>
<th>Object of study</th>
<th>Research Aim</th>
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<tbody>
<tr>
<td>architecture instantiations and their properties</td>
<td>Qualities of architectures</td>
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<td>(architectures as things)</td>
<td>Architectural representations</td>
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<td>trajectories of architectural development</td>
<td>Architectures as regulatory regimes</td>
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<td>(architectures as socialised processes)</td>
<td>Architecting as a process</td>
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<td>Architecting as a practice</td>
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<td>Architectural knowledge</td>
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Research Interests within our Group

• Concerned with qualities of architectures:
  e.g. work on Norwegian (SOA), work on the Norwegian e-prescription case: Institutional Interface Architecture [INA] and Service Provider Architecture [SPA], work on MinJournal (modularity)

• Concerned with the process of architecting:
  e.g. work on HISP, GenAp, HelseNorge
Questions – Topics to Discuss

• Experiences working with the concept of architecture?
  challenges related to the “useful ambiguity”
  architecting vs infrastructuring
  architecting vs institutionalising

• What kind of research agenda?

• Literature we want to relate with?
  Innovation literature
  Design literature
  IS implementation literature

• Influence practice?