Enterprise-level IS Research – Challenges and Potentials of Looking Beyond Enterprise Solutions

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Enterprise-level IS Research

1. Enterprise Information Systems - Where it all Started
2. Enterprise IS Level vs. Org Level of Analysis
3. Unique Themes of Enterprise-level IS Research
   - Integration Management
   - Architectural Coordination
   - Harnessing Complexity
4. Exemplary Domains of Enterprise-level IS Research
   - Context Large Enterprise IS
   - Context Digital Platforms
5. IS Research Methodology on Enterprise-level
Enterprise Information Systems
– Where it all Started
Enterprise systems became widely adopted in the 1980ies...
Enterprise systems research & teaching have been successfully established

Unique and important IS phenomenona such as
- Cross-functional integration, collaboration and coordination
- End-to-end business processes, process modelling support (EPC)
- Large-scale software solutions
- Reference solutions, configuration
- Large-scale technochange

Inspired by (and inspiring) ERP industry as well as user companies
- Meeting important business needs
- Relevant research and education contributions

Foundation / application field for quite a few methodological IS research innovations
- Reference modelling
- Enterprise modelling
- Process modelling and mining
- IT enabled transformation management
However...the field became broader - and more diverse

From a **focus on ERP** functionalities, introduction and adoption, to...

- Extended enterprise, managing supply chains and customer relations
- Integration with supplier- and customer-side processes/devices
- Enterprise- (and even network- or industry-) wide data management
- Business analysis, business modelling
- Enterprise architecture and its management
- Business ecosystems and digital platforms
- Organizational routines, managing operational change and transformation
- Transforming from on-prem to cloud-based
- Technology-enabled business (model) innovation
“To enterprise and beyond” - The integration journey

- Internal operative functions
  - + Data
  - + Wider scope of functions and data
  - + Business logic / process management
  - + Activities and devices along supply chain
  - + Customer activities and devices
  - + Operational analytics
  - + Activities and data of (platform) complementors and ecosystem actors
Enterprise Level vs. Org Level of Analysis
People vs. Organization vs. Business Technology

https://hranalytics.live/organisational-network-analysis-competition/

https://www.dragon1.com/demo/process-mapping-template

[Murer et al. 2010]
Strategic vs. operational vs. technical (fundamental) change cadences

- **Strategy Layer**: 1-2 years
  - Strategy design & change
    - Business networks
    - Customer processes
    - Outputs (products, services)
    - Performance metrics

- **Organization Layer**: 3-6 months
  - Operations design & change
    - Value streams
    - Process models
    - Organisational structure
    - Information models

- **Alignment Layer**: 6-10 years
  - Alignment
    - Domains
    - Applications
    - Business capabilities

- **Software Infrastructure Layer**: 6-10 years
  - Software design & change
    - Software systems
    - Software services
    - Data models

- **Technical Infrastructure Layer**: 6-10 years
  - IT infrastructure design & change
    - IT platform infrastructure
    - IT network infrastructure
In complex, dynamic systems, alignment models are essential.
Enterprise-level characteristics in IS

All relevant layers (Business-to-IT)

All relevant components (system of systems)

All relevant evolution stages (managed evolution)
Unique Themes of Enterprise-level IS Research
What **themes** are **unique** to the IS enterprise-level?

<table>
<thead>
<tr>
<th>Theme</th>
<th>Relevance</th>
<th>Coordination Need</th>
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<tbody>
<tr>
<td>System of systems: <strong>Relevance for “global” perspective</strong></td>
<td>- Coordination need for reaching enterprise-level objectives (flexibility, efficiency, …)</td>
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<tr>
<td>Business-to-IT: <strong>Relevance for boundary spanning</strong></td>
<td>- Coordination need for (re-)alignment</td>
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<tr>
<td>Managed evolution: <strong>Relevance for managing dependencies and side effects</strong></td>
<td>- Coordination need for managing innovation and change projects on portfolio level</td>
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### (1) Integration management
- Leveraging synergies and alleviating redundancies
- Integration always covers all layers
- Complex projects, long lifecycle, intended to reduce dependencies and side effects

### (2) Architectural coordination
- Avoiding over-complexity, preserving flexibility
- Providing stable foundation for decoupling
- Architectural principles, roadmaps, project coordination

### (3) Harnessing complexity (housekeeping)
- Actively reducing overcomplexity, creating flexibility potentials
- Business and IT complexity interrelated
- Cleaning up damage created by “local” thinking
Exemplary Domains of Enterprise-level IS Research
Domain = Theme X Context

- **Large enterprise** context
  - Structural and dynamic complexity
  - Technical debt
  - Decentral decision making
  - Heterogeneity of outputs, channels, processes, platforms, ...

- **Digital platform** context
  - Orchestration of complementary resources
  - Transaction or innovation focus
  - Limited guidance due to novelty of model

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<td>1. Integration patterns and scoping</td>
<td>2. Complementing formal with informal coordination interventions</td>
<td>4. Transformation management (“Managed evolution”)</td>
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<td>3. Business/IT alignment models</td>
<td>5. IS-related Org-level maturity models</td>
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<td>6. Designing platform governance for ambidexterity (generativity &amp; control)</td>
<td>7. Understanding complexity effects on platform performance</td>
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Institute of Information Management
Example 1: Integration patterns and scoping

[Diagram: Integration patterns and scoping]

[Aier und Winter, 2010]
Example 2: Complementing formal with informal coordination interventions

Social Legitimacy (LEG)
Efficiency (EFF)
Organizational Grounding (GRO)
Trust (TRU)
Governance (GOV)
Goal Alignment (GOA)
Enforcement (ENF)

Response (RES) towards EAM
EA Consistency (CON)
Benefits (BEN) through EAM

R²=0.632
R²=0.288
R²=0.578

[Weiss, Aier and Winter 2013]

****: α<0.001
**: α<0.01
*: α<0.05
*: α<0.1
Example 2: Complementing formal with informal coordination interventions

Social Norms
Rules and standards that guide and/or constrain social behavior without the force of laws.

X% of the BU heads have opted for adopting the existing system.

Anchoring
In case of lacking information, estimation is done based on an individual starting point.

How frequently will you evaluate architectural conformance? ... On a monthly or quarterly basis?

Decoupling
Not all costs or effects of decisions are considered when taking a decision.

Offering financing and deferred payment options for preferred solutions.

Example 3: Business/IT alignment models

Strategy Layer
(1-3 Levels)
e.g. Business models

Organization Layer
Back-stage (multi-level) vs. Front-stage (federated) vs. Data exploration (federated)

Alignment Layer
(1-3 Levels)
e.g. Capability map

Infrastructure Layer
e.g. Application Map

[Auerbach 2011]

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Example 4: Transformation management (“Managed evolution”)

[Benbya, Leidner and Preston 2019]

[Marer et al., 2010]
Example 5: IS-related Org-level maturity models

### Agile Capabilities

**Level 1**
- 1.1. Continuous revising of Corporate Strategy
- 1.2. Predicting far-future changes
- 1.3. Testing new business ideas/models

**Level 2**
- 1.5. Timing for continuous improvement
- 1.6. Promoting enterprise-wide digitalization

**Level 3**
- 1.4. Integrating new business ideas/models into organization
- 1.8. Integrating into business Ecosystem

**Level 4**
- 1.7. Prioritizing innovation portfolio

**Level 5**
- 2.1. Flexible IT architecture
- 2.3. Dynamic scalability enhancement
- 2.5. Integrating Big Data analytics with BI systems

### Agility KPIs

- **Level 1**
  - 1.1. Continuous revising of Corporate Strategy
  - 1.2. Predicting far-future changes
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- **Level 2**
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- **Level 4**
  - 2.3. Dynamic scalability enhancement
  - 2.5. Integrating Big Data analytics with BI systems

- **Level 5**
  - 2.1. Flexible IT architecture

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[1] Klimenko and Winter, 2022

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Example 6: Designing platform governance for ambidexterity (generativity & control)

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<tr>
<th>Pillar</th>
<th>Mechanism</th>
<th>Generativity</th>
<th>Control</th>
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| Platform boundary resources           | Interfaces    | • Standardize access and connection  
• Facilitate data exchange         | • Retain fine-grained control over complementor activities  
• Influence community behavior  
• Prevent platform exploitation   |
| Programming resources                 |               | • Lower the threshold for complementor participation  
• Support complementors with the provision of tools and knowledge  
• Help complementors overcome knowledge boundaries | • Facilitate tight control over development quality through software tools and regulations  
• Increase complementor focus on selected app functionalities |
| Platform rules                        | Gatekeeping   | • Facilitate connection of complementors to the platform  
• Increase the diversity in offered apps and functionalities | • Restrict access to ensure quality and attractiveness for complementors and users (e.g., levels of access rights)  
• Prevent uncontrolled variance in the platform’s innovation output |
| Decision rights                       |               | • Ensure decision-making autonomy of complementors to increase their innovation output | • Define the complementors’ amount of freedom (e.g., regarding their goals and task types) |
| Intellectual property sharing         |               | • Attract more complementors by expanding their intellectual property rights (particularly important in early stages of platform evolution) | • Encourage complementors to not build a superior solution  
• Increase control through agreements with different complementor groups  
• Structure relations to complementors |
| Pricing                               |               | • Subsidize one side to reach critical mass of complementors and users  
• Enhance platform adoption by complementors and users (particularly in platform markets with fierce competition) | • N/A |
| Revenue sharing                       |               | • Maintain complementor motivation while extracting an appropriate share of profits | • N/A |
| Ecosystem identity                    | Relational    | • Increase complementor motivation and commitment through community building  
• Facilitate clans to enhance complementor performance and minimize errors | • Align platform and complementor strategy  
• Benefit from rather inexpensive, community-driven self-control |

[Staub et al., 2023]
Example 7: Understanding complexity effects on platform performance

1a) Profitability

1b) Generativity

Low Complexity

Medium Complexity

High Complexity

[Schmid et al., 2021]
IS Research Methodology on Enterprise-level
Beyond micro, meso, macro

− Specific practical and research challenges – and specific insights and designs.
− Relevant perspective in practice and teaching, increasingly found in research.

− **Looking at large, complex systems does not necessarily enforce taking a macroscopic perspective** – like much of traditional, descriptive IS research does.

− Legitimate approaches other than descriptive include
  
  − Design Science Research (models, methods, typologies, architectures, …)
  − Simulation (e.g., agent-based)
  − and many others…
Conclusions
Enterprise systems focus should be extended to Enterprise-level IS

- Clear positioning on a “system of systems” level of analysis, integrating people, task and technology aspects
- **Unique themes** include “global” perspective, boundary spanning (business and technology) and managing dependencies / side effects
- Many relevant contexts such as **integration management, architectural coordination, transformation and complexity management**
- Suitable for methodological diversity (descriptive, design, data-driven)
- Embracing various “related” domains such as EAM, Enterprise Modelling, IS management / governance, …
- Creation of (even more) relevant findings and skills, in particular in the context of platform economy, data sharing/sovereignty, customer self-service, IoT, cloud transformation, digital transformation, etc.
Q&A

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References