

Motivation and research question

Industrial Internet of Things (IIoT)-based systems connect physical objects and digital technologies to provide services for companies' manufacturing processes (Zysman and Kenney 2018; Sissini et al. 2018).

IIoT-based systems constitute heterogeneous and complex **digital innovation**:

- Loosely coupled digital and physical components, characterized by generativity (Yoo et al. 2010; Zittrain 2006)
- Distributed innovation agency, with decision-making power and action dispersed among actors with diverse backgrounds (Yoo et al. 2012; Jackson et al. 2006)
- IIoT-based systems integrate infrastructural components, making them inherently incomplete, underspecified, and evolving (Tilson et al. 2010; Hansetz and Modol, 2021)

← → Limited understanding of the socio-technical process of IIoT-based systems' emergence and actors' involvement in the discovery and realization of digital innovation

RQ1: What are the processes that underlie the emergence of complex IIoT-based systems?

RQ2: What is the role of the diverse group of stakeholders for IIoT emergence?

Findings and Contribution

The emergence of an IIoT-based system is characterized by the interaction of bottom-up and top-down dynamics: Different actors within the organization work together to discover and realize functionalities and components of the system in the form of digital options.

The iterative process of discovery and investment in digital options combined with feedback mechanisms, leads to a continuous cycle of digital innovation within the IIoT-based system.

Actors taking over the role of gatekeepers and champion play essential roles for IIoT emergence, e.g., the realization of digital options depends upon the approval or prioritization of the IT development team, who acts as a gatekeeper

→ **Theorization** of the the complex and non-linear dynamics and mechanisms underlying the emergence of IIoT-based systems

→ Explanation of IIoT emergence from **socio-technical perspective** by building an understanding of strategic considerations and investment decisions of organizational actor

Publications

Drechsler, K., Grisold, T, Seidel, S. (2022). Evolution of Infrastructures through Digital Options: The Case of the Industrial Internet of Things. Proceedings of the 43rd International Conference on Information Systems, Copenhagen, Denmark.

Drechsler, K., Grisold, T, Seidel, S., Gau, M. (2022). Studying Digital Infrastructure Evolution with Digital Trace Data. Proceedings of the 43rd International Conference on Information Systems, Copenhagen, Denmark

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Research method

Computationally intensive theory construction combining human and machine pattern recognition (Miranda et al. 2022; Lindberg 2020)

Single, longitudinal case study: A large European manufacturing company developing an IIoT-based system

Data from 27 semi-structured interviews and trace data from software and issue-tracking repositories

Summary of Data Analysis Process:

