Industry and Innovation

Special Issue Call for Papers

Challenging fundamentals of innovation dynamics in the age of AI

Guest editors

Daniel Hain (Aalborg University)
Jacob Rubæk Holm (Aalborg University)
Roman Jurowetzki (Aalborg University)
Edward Lorenz (Aalborg University)

Background and Objective

Artificial intelligence (AI) is currently one of the most important technologies reshaping business and economics, and is often suggested as a candidate for a future general-purpose technology (Trajtenberg, 2018). After decades of slow development and limited practical applications, recent breakthroughs in the field of machine learning (ML) and particularly deep learning (DL) have led to a renewed attention in industry, academia, and by policymakers, while countries are developing AI technologies and exploring applications in a race for global leadership. Deep learning enabled the reliable application of predictive algorithms to complex data enabling the automatization of tasks previously relying on human intelligence and perceptual skills, such as audio-visual and language understanding (Brynjolfsson & Mitchell, 2017).

Consequently, modern AI techniques based on machine learning are already today applied much more broadly than previous automation technologies such as robotics, and its use has a broader scope than just industrial automation (Furman & Seamans, 2019). The most important impacts are not observed where AI is used to automate discrete tasks but where AI is used innovatively to alter existing processes or enable completely new tasks. AI techniques found their way into products or services (e.g., recommender systems, noise-cancelling systems, computer vision enhanced photography) but also “back-office” processes (e.g., fraud detection, predictive maintenance, customer churn prediction).

The discussion around the impact of AI on the industry has been often framed around the acceleration of automation while less attention has been attributed to the quality of the

potential alterations. Particularly, only a few contributions (e.g., Rammer, Czarnitzki, & Fernández, 2021) explicitly account for the fundamental differences introduced by DL and modern AI as compared to traditional automation that relies on hard-coded logic. Acknowledging and exploring these differences immediately challenges many of the fundamental concepts found in the literature on industrial dynamics and the economics and management of innovation (Haefner, Wincent, Parida, & Gassmann, 2021). When trying to understand the consequences of AI diffusion for companies and industries, it is key to explore the consequences of modern AI for core innovation studies concepts such as knowledge codification and transfer – where AI calls for a re-re-vision of the concepts continuing the work of Balconi, Pozzali, & Viale (2007) –, openness (Enkel, Bogers, & Chesbrough, 2020), diversity, interactive learning, and organizational learning. One of the first attempts to develop a taxonomy that can help to relate different types of AI-driven innovation to effects on firms' capabilities can be found in Paschen, Pitt, & Kietzmann (2020). This is building on the seminal contribution of (Tushman & Anderson, 1986), distinguishing between AI-enabled product and process innovation that is competence destroying or competence building.

The objective of the special issue is to revisit the fundamentals of industrial and innovation dynamics in the age of AI. Modern AI techniques in the form of ML (DL) enable algorithms to "encode" knowledge that has been considered tacit thus allowing for the automation of tasks that depend on perceptual and pattern recognition skills. This considerably extends the scope of automation technologies and has major implications for the evolution of jobs, skills, and learning dynamics within organizations. AI challenges us to revisit conceptually and empirically our established frameworks for understanding openness, knowledge absorption, and accumulation and the processes of exploration & exploitation as they relate to organizational learning. While we do not think that one special issue is enough to address this challenge, we find it important to facilitate a discussion within the innovation studies community. The editors of the Special Issue invite both conceptual and applied contributions providing new insights into the implications of AI for industrial and innovation dynamics.

Research Topics

Potential themes to be addressed in the special issue include:

- Revisiting and challenging fundamental frameworks and concepts of industrial dynamics, such as the role of tacit and codified knowledge, user-producer interaction, exploration and exploitation, and open innovation.
- Conceptual work and case studies on the effects of AI adoption on organizational learning and innovation.
- Effects on innovation management arising from e.g. the shifts in the scope for the codification of knowledge and capabilities created by advances in AI & ML
- The effects of AI on innovation capabilities of firms.
- Case studies of successful and of failed AI adoption and use in established firms or entrepreneurship.

- Consequences for work organization of AI use. This also includes changes in work organization before actual AI adoption, such that may be needed in order to unbundle those tasks in a job that are susceptible to automation by AI/ML.
- Contrasting how ML may both substitute for existing skills and be used to enhance or complement existing skills. A possible contribution could focus on this issue and explore whether there are differences across occupational categories (high skilled, middling, and low) in these differing skill effects of ML.
- Case studies of how firms deal with the challenge that supervised learning models bring in terms of collecting and manually labeling the data sets used to train the models. What are the implications in terms of the firm's skills needs and under what circumstance can manual labeling be outsourced?"
- Similarities and differences in the impact of AI on industries and the economy as compared to previous waves of technological change and automation.

In particular, the special issue is open to contributions addressing the following non-exhaustive list of research questions:

- Is Absorptive Capacity less relevant in the age of AI - Can companies use and recombine "sophisticated" components into innovative products without the need to absorb the knowledge or perhaps even interact with an "advanced" supplier?
- How does the relationship between competitiveness and AI use affect models and concepts in industrial dynamics?
- How does AI affect the use of offshoring/outsourcing of administrative tasks?
- What are the implications for openness in the innovation process of the increasing use of AI?
- What are the implications for user-producer interaction of AI use?
- What are the effects of AI adoption and task automation on skill formation, competence building, and employee learning?
- What are the differences in AI impacts on the jobs of high, middling, and low occupational groups and how is AI affecting occupational earnings inequality within firms?

Important deadlines

- Submissions to the Special Issue due by **31. October 2021**
- Publication of the Special Issue planned in **early 2023.**

Related events

The special issue is related – although not exclusively – to a planned Professional Development Workshop (PDW) at the upcoming DRUID 2021 conference in Copenhagen, conditional to acceptance of the PWD. Therefore, the optimal submission of the paper draft to the DRUID 2021 conference is encouraged.

Submission Process

Paper submissions will undergo rigorous editorial screening and double-blind peer review by a minimum of two recognized scholars. The standard requirements of ***Industry and Innovation*** for submissions apply. Please consult the journal submission guidelines available at http://www.industryandinnovation.net.

References

Balconi, M., Pozzali, A., & Viale, R. (2007). The "codification debate" revisited: A conceptual framework to analyze the role of tacit knowledge in economics. *Industrial and Corporate Change, 16*(5), 823-849.

Brynjolfsson, E., & Mitchell, T. (2017). What can machine learning do? workforce implications. *Science, 358*(6370), 1530-1534.

Enkel, E., Bogers, M., & Chesbrough, H. (2020). Exploring open innovation in the digital age: A maturity model and future research directions. *R & D Management, 50*(1), 161-168. doi:10.1111/radm.12397

Furman, J., & Seamans, R. (2019). AI and the economy. *Innovation Policy and the Economy, 19*(1), 161-191.

Haefner, N., Wincent, J., Parida, V., & Gassmann, O. (2021). Artificial intelligence and innovation management: A review, framework, and research agenda☆. *Technological Forecasting and Social Change, 162*, 120392.

Paschen, U., Pitt, C., & Kietzmann, J. (2020). Artificial intelligence: Building blocks and an innovation typology. *Business Horizons, 63*(2), 147-155.

Rammer, C., Czarnitzki, D., & Fernández, G. P. (2021). Artificial intelligence and industrial innovation: Evidence from firm-level data. *ZEW-Centre for European Economic Research Discussion Paper,* (21-036)

Trajtenberg, M. (2018). *AI as the next GPT: A political-economy perspective.* (). Cambridge, Mass: National Bureau of Economic Research. doi:10.3386/w24245 Retrieved from http://www.nber.org/papers/w24245

Tushman, M. L., & Anderson, P. (1986). Technological discontinuities and organizational environments. *Administrative Science Quarterly,* 439-465.