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# Meeting report: "DiTraRe Symposium on Digitalization of Research". Conference, 2025, Karlsruhe, DE

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In recent years, the rapid development of digital technologies has profoundly reshaped the way scientific knowledge is produced, communicated, and assessed. At the center of these developments stands generative artificial intelligence (AI), which is increasingly intertwined with established and emerging research practices. These transformations raise fundamental questions about scientific quality assurance, and the future role of research infrastructures. Within this broader transformation, the DiTraRe Symposium (Digital Transformation of Research), held on 2nd and 3rd December 2025 at the Center for Arts and Media (ZKM) in Karlsruhe, provided an important platform for reflecting on the implications of digital and AI-supported research practices. The symposium addressed not only the technological dimensions of this shift but also the associated institutional and normative consequences, including issues of transparency, reproducibility, and accountability in AI-assisted research environments. The program combined a keynote lecture with presentations structured along the four analytical dimensions of the DiTraRe project, complemented by a poster session that facilitated interdisciplinary dialogue. These contributions highlighted both the opportunities and tensions arising from the increasing integration of generative AI into scientific workflows.

## Bringing the human back into science

The symposium opened with the keynote lecture delivered by Mieke Boon (University of Twente), who reflected on the tension between human research strategies and increasingly algorithm-driven forms of research. Boon highlighted the epistemological differences between human-driven research strategies and algorithmically shaped approaches, noting that these differences have direct implications for trust in science and for the normative expectations placed on scientific inquiry. Using examples from experimental and empirical (data generating) practices in the natural, engineering and social sciences, she demonstrated how scientific thinking is generated and scientific knowledge is acquired.

## Knowledge representation and AI

In the first session, the speakers addressed AI as an additional dimension to the digital transformation using the examples of patent data, federated infrastructures, and data infrastructures. Hidir Aras (FIZ Karlsruhe) focused on how AI is transforming the use of patent data as a resource for scientific research, highlighting opportunities and risks for knowledge discovery and exploration. We are on the way to human computer collaboration. He also discussed agentic AI, in which multiple agents work collaboratively to resolve complex goals. Torsten Schrade (University of Applied Science, Mainz) explored the role of federated infrastructures, knowledge representation and AI in the humanities. Core competences of the (digital) humanities such as close reading, archival work and hermeneutics are still essential but are being changed and expanded by the use of generative AI with computational text processing and annotation, historical network analysis, computer vision, interactive visualization and digital knowledge representation. Sonja Schimmler (Fraunhofer FOKUS, Technical University of Berlin) addressed data infrastructures as a foundation for AI projects. She spoke about the need for a robust, machine-interpretable data infrastructure that supports every stage of the data lifecycle. Taken together, the presentations demonstrated how AI technologies are reshaping knowledge representation across scientific domains and underscored the need for interdisciplinary reflection on the infrastructural, epistemic, and governance-related implications of these developments.

## Legal and ethical challenges

The second session addressed the law and ethics in digitalization of research with regard to regulating dynamic processes with ancient orders. Fruzsina Molnár-Gabór (University of Heidelberg) addressed the legal challenges and fundamental conflict between data protection of data subjects versus freedom of research, innovation and competencies. Another challenge, she addressed, is the handling of research data, especially with regard to compliance with data protection. Dara Hallinan (FIZ Karlsruhe) examined the relationship between law and ethics in the digitalization of research. He emphasized the connection between ethical principles and the legal situation for guiding responsible innovation. Both talks highlighted the need for coherent regulatory and normative frameworks that support responsible innovation by aligning data protection, ethical reflection, and practical research requirements.

## Interdisciplinary perspectives on the digital transformation of science

The poster session with 21 poster pitches at the DiTraRe symposium presented a broad spectrum of current research work

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on digital research infrastructures, data-intensive science and domain-specific research data management from historical, clinical, chemical, materials and sports science data spaces to issues of data security, and ontology development. At the same time, the focus was on the use, potential and challenges of generative and applied AI in science, technology assessment and policy advice, supplemented by contributions on transparency, trustworthiness, knowledge representation and AI-supported analysis methods.

*The presentations demonstrated how AI technologies are reshaping knowledge representation across scientific domains.*

## Research infrastructures

On the second day, the symposium began with Session 3 on the topic of research infrastructures with regard to trusted digital research workflows across disciplines for the age of data and AI. Christoph Steinbeck (Friedrich-Schiller-University, Jena) presented the role of Machine Learning in chemistry through open and large-scale data initiatives. Superhuman capabilities could develop deep neutral networks if they are provided with accurate information about the problem and a large amount of training data. In addition, big data enables natural product cheminformatics. Jos van Wezel (KIT/SCC, Karlsruhe) discussed how established e-Infrastructures can strengthen research data management and EOSC integration, for example in terms of cooperation, economy, security and trust, and legal and ethical aspects. Peter Wittenburg (GWDG, Göttingen) focused on data sovereignty, transparency, accountability, persistence in AI times and trust relationship between creators, stewards, managers, networkers and consumers. The session concluded with a panel discussion on pathways and barriers to implementing open data and open science practices. Participants highlighted the need for incentive structures that reward data sharing, as well as persistent challenges such as ensuring data findability, tracking data citations, establishing interdisciplinary reusability, and developing metadata standards that reach beyond disciplinary boundaries.

## Impact on science and society

Session 4 on impact on science and society dealt with the role of generative AI in transforming research practices, publishing and policy advice. Anne Krüger and Ingmar Mundt (both Weizenbaum Institute, Berlin) presented the role of generative AI tools for changes in research practice and knowledge production. They asked how scientific practice and knowledge production are changing through generative AI tools and examined the question using comparative statistical analysis. In this analysis, they compared attitudes and use of generative AI across four disciplines: computer science, natural science/medicine, social science and humanities. First insights of the project are a high rejection when creative or innovative work is evaluated, contradictions between personal use and accepted use cases, discipline has limited impact on the generative AI participants. In summary, it can be said that social sciences and humanities are more critical of the use of generative AI than computer science and natural sciences/medicine. Markus Braun (Springer Nature, Heidelberg) addressed how generative AI can support the entire scholarly production process from the perspective of an academic publisher in the following steps: designing the book, outlining the table of contents, shaping the chapters, checking the references, writing the first draft, revising the manuscript and finalizing the manuscript. It requires human involvement and collaboration between the author, editor and AI assistant. Steffen Albrecht (KIT/ITAS, Karlsruhe; TAB, Berlin) examined the potentials and challenges of generative AI in scientific policy advice. He presented tasks and use cases from TAB in which generative AI has an impact, and TAB then reflects on its use. Opportunities such as integration of various perspectives, feedback and quality checks were offset by risks such as cognitive biases and long-term consequences. Dana Mahr (KIT/ITAS, Karlsruhe) concluded the session with a reflection on the science society interface of generative AI. She highlighted three perspectives of the presentations: research practices, scientific publishing and scientific policy advice, with the common theme of transformation in the three areas through generative AI as an enabler and driver of change. She emphasized the necessary shift from transformation to translation in order to involve society in co-creation, rather than having the transformation process imposed on society and thus being unable to have a say in it.

## Building bridges through interdisciplinarity

The symposium concluded with the presentation of Jens Hahn's visual recording, which provided a summary of the keynote speech and presentations from the four sessions. The symposium ended with the goal of building bridges: achieving digitalization of research through interdisciplinarity.

### Further information

Symposium homepage

https://www.ditrare.de/en/symposium-2025



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