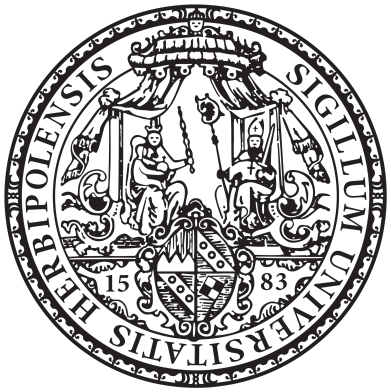
Seeing Through Data: A Systematic Literature Review on the Role of Visualization and Interface Design in the Organizational Use of Data Objects

Linus Schärmann

2910412



Exposé

Lehrstuhl für Wirtschaftsinformatik
und Systementwicklung
Universität Würzburg

Betreuer: Tim Thorwart-Gumpert

Würzburg, den 08.11.2025

Contents

List of Abbreviations

BO Boundary Object

DO Data Object

IS Information Systems

ML Machine Learning

SLR Systematic Literature Review

1 Research Topic

In recent years, the integration of Machine Learning (ML) technologies into organizational processes has become increasingly prevalent. These technologies generate and utilize vast amounts of data, which serve as critical components in decision-making and operational workflows.

The concept of Data Objects (DOs), as a specific development within the broader category of Boundary Objects (BOs) introduced by Star and Griesemer (1989) as artifacts facilitating a shared but differently interpreted understanding, emerged in the context of datafication, algorithmic governance, and the rise of machine learning systems. As long as data is involved into organizational processes, DOs play a crucial role in enabling communication and collaboration among various stakeholders (Alaimo & Kallinikos, 2022, p. 29).

Expanding on this the visualization and interface design of these DOs are essential factors that influence how effectively managers and other organizational actors utilize the data presented to their benefit (Alaimo & Kallinikos, 2022, p. 22). Effective visualization techniques can enhance comprehension, facilitate insights and support decision making processes (Hjelle et al., 2024, p. 2).

2 Motivation

The motivation for this thesis stems from the growing integration of machine learning and artificial intelligence in organizational processes. As organizations increasingly rely on data-driven desicion making, managers have to be able to understand and interpret complex data objects via various visualizations and interfaces (mostly dashboards) (Alaimo and Kallinikos, 2022, p. 22; Hjelle et al., 2024, p. 2).

However, the effective use of these data objects is often hindered by challenges related to their design and presentation. Poorly designed visualizations can lead to misinterpretations, reduced trust in data, and ultimately suboptimal decision-making which leads to negative impacts on the company's economic development (Hjelle et al., 2024, p. 2). Therefore, understanding how visualization and interface design impact the usability and effectiveness of data objects in organizational contexts is crucial for improving data-driven practices.

The main goal of this thesis is to systematically review existing literature to identify best practises and the challenges, as mentioned before, in designing data objects and their visualizations for managerial use.

3 Methodology

The research will follow a Systematic Literature Review (SLR) according to Okoli (2015). This method is used to identify, evaluate and interpret the available research relevant to a particular research question, topic area or domain of interest and is designed to be used in Information Systems (IS) research (Okoli, 2015, p. 884).

A SLR is particularly suitable for this thesis as it allows to systematically gather and analyze existing knowledge on the topic of data objects in machine learning contexts in general and above all, organizational contexts. With this approach, it is possible to identify research gaps and provide a solid foundation for future research directions. Even though the methodology is designed mostly for research teams, but with some minor adjustments, it can also be used for individual research.

Overall it simplifies the process of conducting a literature review due to the lack of risks associated with incorrect team communication and cooperation.

4 Preliminary Outline

Lastly the following outline should give an overview of the planned sections of the thesis. Changes may appear during the research process but as an entry point it should help to structure the work.

1. Introduction
2. Theoretical Background
   2.1. Boundary Objects
   2.2. Data Objects as Epistemic Artifacts
3. Methodology
4. Structured Literature Review Results
   4.1. Overview of Identified Literature
   4.2. Technical Origin of Data Objects in ML Contexts
   4.3. Data Objects as Boundary Objects in Organizational Contexts
   4.4. Visualization and Interface Design as Epistemic Factors
5. Discussion
6. Future Research Directions
7. Conclusion

References

Alaimo, C., & Kallinikos, J. (2022). Organizations decenterded: Data objects, technology and knowledge. *Organization Science*, *33*(1), 19–37.

Hjelle, S., Mikalef, P., Altwaijry, N., & Parida, V. (2024). Organizational decision making and analytics: An experimental study on dashboard visualizations. *Information & Management*, *61*(6), 104011.

Okoli, C. (2015). A guide to conducting a standalone systematic literature review. *Communications of the Association for Information Systems*, *37*, 879–910.

Star, S. L., & Griesemer, J. R. (1989). Institutional ecology, 'translations' and boundary objects: Amateurs and professionals in berkeley's museum of vertebrate zoology, 1907-39. *Social Studies of Science*, *19*(3), 387–420.

Eidesstattliche Erklärung

Hiermit versichere ich, die vorliegende Arbeit selbstständig verfasst und keine anderen als die angegebenen Quellen und Hilfsmittel benutzt sowie die Zitate deutlich kenntlich gemacht zu haben.
Ich erkläre weiterhin, dass die vorliegende Arbeit in gleicher oder ähnlicher Form noch nicht im Rahmen eines anderen Prüfungsverfahrens eingereicht wurde.

Würzburg, den 7. Dezember 2025 Linus Schärmann