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### An inference-interpretation dyadic approach to algorithmic language processing in organizations

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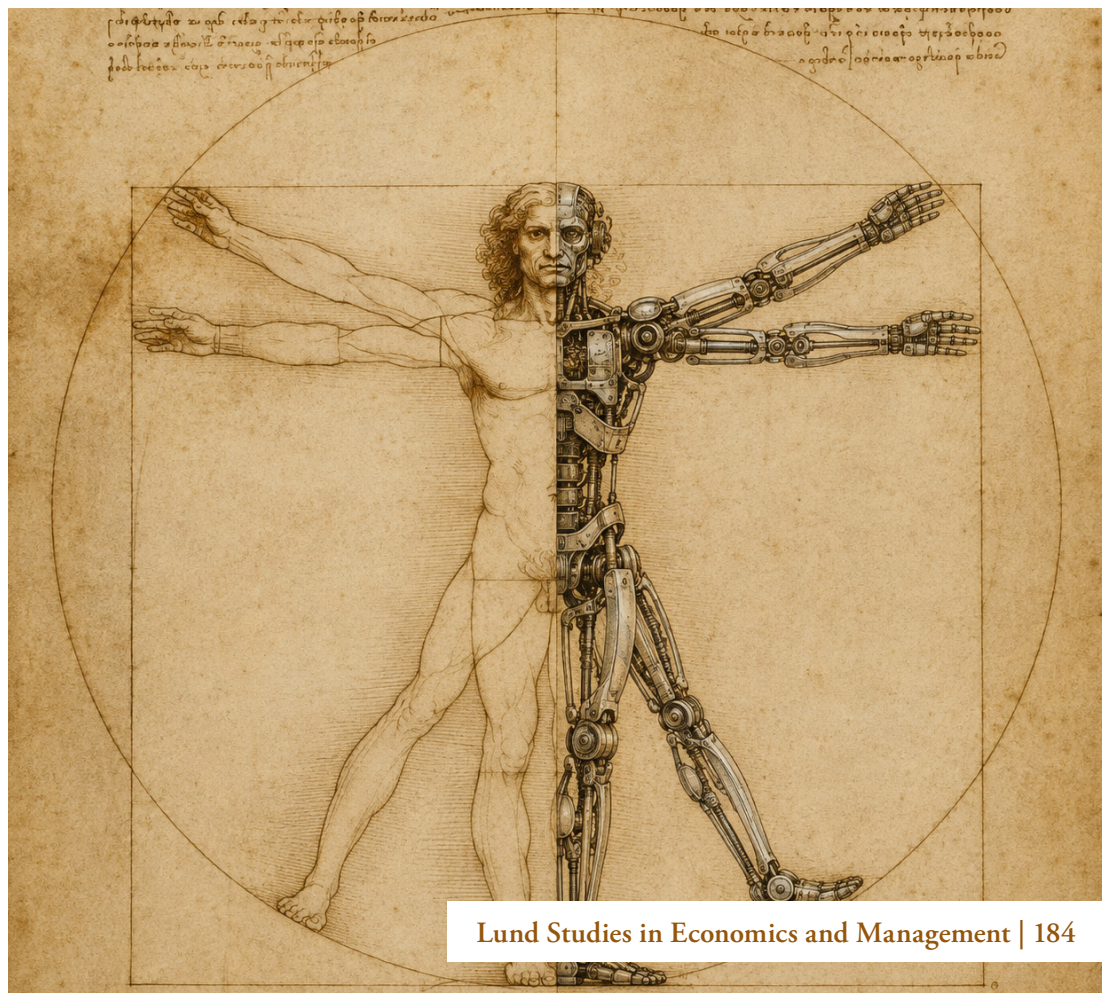
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# Mainly-Human Essays on Artificial Intelligence

An Inference-Interpretation Dyadic Approach to Algorithmic  
Language Processing in Organizations

HASSAN HAMADI | DEPARTMENT OF BUSINESS ADMINISTRATION





## Mainly-Human Essays on Artificial Intelligence



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An Inference-Interpretation Dyadic Approach to  
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Hassan Hamadi



**LUND**  
UNIVERSITY

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**Abstract:**

Despite growing interest in human-AI collaboration, existing approaches tend to treat AI as a tool for task automation, prediction, or optimization of decomposable analytical activities. This view overlooks the epistemic and methodological complexity that arises when humans and algorithms jointly infer and interpret ambiguous, language-based phenomena. This creates a set of fundamental problems for organizational inquiry: how can organizational actors, as well as researchers, exploit rather than suppress, the asymmetries, discontinuities, biases, and competing processing rationalities between human and algorithmic ways of knowing? How can humans and algorithms navigate complex problems, and generate insights that neither can produce independently? This dissertation therefore addresses the need for a process-oriented, micro-level account of human-AI collaboration that explains how exploiting irreducible human-AI asymmetries can create new inferential, interpretive, and theory-building capabilities across the continuum of computational language analysis.

Through a compilation thesis of four independent papers, this dissertation addresses two interrelated analytical units in human-AI collaboration in the context of inquiry: inference and interpretation. Drawing on literatures of hybrid problem-solving, algorithmic organizing, Science and Technology Studies, and organizational methodological innovation, this dissertation demonstrates how asymmetrical processing capabilities, and the corresponding epistemic discontinuities they create, can generate meta-analytical capabilities that reside in neither human nor algorithmic reasoning alone. The resulting insights are fundamental for understanding human-AI augmentation as an emergent organizational capability and for designing analytical processes that harness human and algorithmic differences to improve overall language-mediated reasoning aptitude.

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An Inference-Interpretation Dyadic Approach to  
Algorithmic Language Processing in Organizations

Hassan Hamadi



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**MADE IN SWEDEN** 

*To my father, Mohamad, to my mother Sabah, and to my  
sisters Amira, Zeinab, and Tala.*

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# List of Papers

## *Paper I*

Hamadi, H. M. (2026). Navigating distorted search spaces through structured flexibility: The case of “qualitative” hybrid problem-solving (Manuscript Unpublished).

## *Paper II*

Hamadi, H. M. (2026). Interpretation across ambiguous discontinuities: Topic modeling as epistemic boundary crossing (Manuscript Unpublished)

## *Paper III*

Hamadi, H. M. and Brattström, A. (2026). Augmented inference making: Organizing the chain of thought trials from perception to conception. In *Academy of Management Proceedings* (Vol. 2025, No. 1, p. 19276). Valhalla, NY 10595: Academy of Management.

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# 1 Introduction

*“Inference is always an invasion of the unknown, a leap from the known.”*  
(John Dewey)

*“The soul, fortunately, has an interpreter – often an unconscious but still faithful interpreter – in the eye.”* (Charlotte Brontë in Jane Eyre)

## Preface

Humans, as well as algorithms, can be seen as prediction engines (Parr, Pezzulo, & Friston, 2022; Agrawal, Goldfarb, & Gans, 2018). Both are, or can be set to, process their environment by recognizing patterns and making associations to familiar territories; they make *inferences* and *interpretations*. Inference and interpretation are often used interchangeably, yet they emphasize different aspects of meaning-making: inference refers to drawing conclusions from available information, whereas interpretation involves assigning meaning to those conclusions within a broader and situated context (Goldberg & Singell, 2024). At the same time, the two overlap because interpretation is typically informed by inferential processes, and inferences are shaped by the interpretive frameworks through which information is understood.

Consequently, much of the complex and dynamic world is subject to a compression exercise in order to making it more manageable. Such compression rests on the active (re)classifications of information following different - and most likely tacit rather than traceable - logics or rules. Making inferences and interpretations, in this account, is what mediates the relationship between the agent (human or algorithmic), the environment (or the data that supposedly reflects it), prior knowledge, and provisional conjectures that precedes the termination of this objective-directed process.

Making inferences and interpretations, for the large part of the previous century at least, and prior to the digitalization of society and the expansive

waves of Big Data, has been chiefly human-centric (Goldberg & Singell, 2024; March, Sproull, & Tamuz, 1991; March & Simon, 1958). Much of the human limitations constituted the boundary conditions within which individuals, groups, and organizations, can achieve their objectives.

Artificial Intelligence (AI), the grandiose moving paradigm of algorithms and computer systems that aims at mimicking human intelligence, as well as the views of people who design it, deploy it, implement it, rely on it, and study it, promise that it can augment what humans can achieve collectively (Raisch & Krakowski, 2021), notably in solving problems (Raisch & Fomina, 2025a). However, much of that promise resides on questions of authority and agency, such as, who is doing what and at what cost. This has led the discussion around AI use into a categorical view: automation, versus, augmentation. While automation is readily distinguished, augmentation has come to be ill-defined with generic terms such as keeping human in the loop, or relationally defined as the antidote of automation. How AI augments humans, rather than automate their tasks, is simplified to doing more – in terms of scale, scope, and speed – under the assumption that existing cognitive infrastructures remains unchanged.

The central issue, which I address in this thesis, is what this view misses. The major dimensions of this issue concern the transformative rather than additive effects of AI (Stelmaszak, Joshi, & Constantiou, 2026) leading to new epistemic regimes (Sergeeva, Leonardi, & Faraj, 2026; Chalmers, Hunt, Pachidi, Potočník, & Townsend, 2026), that apparently organization theories may have missed (see Phillips, 2026). To theoretically capture how such epistemic regimes manifest, to understand and to configure them, I address the foundational substrata of knowing: (1) how humans and algorithms come to recognize and explain patterns, and mutually influence each other in this process, i.e., how they make *inferences* and *interpretations*, and (2) the mediating role of natural language in this process “as a kind of triggering cognitive technology” (Clark, 2003: 59). Since recognizing patterns and explaining them is set to be primary, I shall focus on *predictive* and *generative* AI’s use for language problems. Predictive AI represent the sort of algorithms that “rely on pattern recognition to forecast outcomes, classify entities, or detect anomalies in large datasets”, and which “depend on the emotional, cognitive, and behavioural response they elicit from humans” (Chalmers et al., 2026: 294-300). Parallely, Generative AI distinguishes “systems [that can] generate synthetic text, images, code and other multimodal artefacts” (Chalmers et al., 2026: 294).

# Overview of AI in Organizations

Artificial Intelligence (AI) is persistently reshaping the social landscape. Given the generality and differential urgency of the matter, AI discussions span everything from informal discussions over social media (Hamadi & Brattström, in press) to reports of national security (U.S. Department of Homeland Security, 2025). The generality of such technology inhabits multiple social layers of objectives and concerns, which is addressed in diverse streams of scholarly discussions. The large part of academic research on AI have examined human-AI collaboration (Choudhary, Marchetti, Shrestha, & Puranam, 2025), AI effects on work and knowledge (Raisch & Krakowski, 2021; Boussioux, Lang, Zhang, Jacimovic, & Lakahni, 2024; Pachidi, Berends, Faraj, & Huysman, 2021), and AI-enabled surveillance and control (Kellogg, Valentine, & Christin, 2020).

That said, human-AI collaboration has become central to how humans in organization achieve their objectives (Raisch & Fomina, 2025). Earlier research on AI suggests that such collaboration can be effective when “AI complements or augments employee skills rather than replaces or automates them” (Chalmers et al., 2026: 288; Raisch & Krakowski, 2021). However, when collaboration takes place in knowledge intensive contexts, what can be automated or augmented often blurs in practice (Einola & Khoreva, 2023). How AI augments humans resides at the contours of the collaboration outcome in terms what can be achieved with AI, with respect to what humans may have achieved alone. For instance, the literature covers the tradeoffs involved in exploiting AI positive effects on reducing cognitive fatigue, improving creativity and innovative behavior (e.g., Qiu, Li, Bai, Wang, & Li, 2022; Verma & Singh, 2022), as well as the moderating factors that inhibit the realization of superior outcome and capabilities (e.g., Allen & Choudhury, 2022; Kawaguchi, 2021; Luo, Qin, Fang, & Qu, 2021).

From this vantage point, the discussion retains the assumption of a clearly defined taxonomy of organizational tasks and responsibilities, where AI is integrated at different stages and objectives of problem-solving (Raisch & Fomina, 2025a). In this account, augmentation is thus achieved by an ongoing optimization of tasks performance and task delegation as discrete and additive partition between humans and AI. This assumption “risks conveying an image of near-mechanical adjustment to existing practices: either technology as an add-on that supports human expertise without fundamentally altering it or technology as performing mundane tasks that involve little to no knowledge.” (Sergeeva et al., 2026: 470). This thesis problematizes this assumption.

# General Problematization and Research Objectives

The automation-augmentation paradigm (on the basis of task delegation suitability, outcome optimization, and authority) falls short in explaining how human-AI collaboration realizes its transformative superior capabilities. Despite the central role of intelligent technologies in organizations, “they remain almost invisible in the theoretical streams of [organization theory] research like institutional theory, organizational identity, and sensemaking” (Phillips, 2026: 3). The agential boundary between human and AI, reinforced the consideration of technology as adjacent to organization research as well as subject of inquiry (Phillips, 2026; Sergeeva et al., 2026). This is problematic for two complementary reasons.

First, AI research suffers from a prevailing conceptual flattening (see Chalmers et al., 2026). This does not only concern how studies relate to AI in definitional terms, but also neglect the different decisive boundary conditions that surrounds AI’s application. Much of the human-AI collaboration research and notions of augmentation reside in the quantitative tradition that favors prediction accuracy and error minimization (e.g., Choudhary et al., 2025; Raisch & Fomina, 2025; Raisch & Krakowski, 2021). These assumptions are implicit and become context-agnostic, ignoring the very nature of organizing. This flattens the relationship between data and existing knowledge (and by substitution, the environment and the sense-maker), by assuming both represent a stable geometry that can be readily contrasted, coupled, and integrated. Much of these assumptions do not hold when AI is set to deal with text for the simple reason that how human extract meaning from text and how AI does so are epistemologically asymmetrical, and this asymmetry is irreducible. Neglecting this asymmetry obscures the foundational epistemic transformation in organizations.

Second, much of the social interactions happen in the online realm, and the boundary between offline and online organizing is progressively blurred (Barros, Alcadiyani, Coupland, & Brown, 2023). This transformed sociality is producing large quantities of textual data (and other forms, but mainly text) that fundamentally change how organizations perceive their environment and relate to it, and attending to such large volumes of data is essential to understand new forms of organizing. Usually, researchers rely on explorative (building rather than deducing theories) approaches to theorize novel phenomenological grounds. However, traditional methods of explorative inquiry, though not intended, became heavily associated with the nature of data: qualitative means inductive, and quantitative means deductive. Hence,

human-AI collaboration in analyzing large sets of textual data does follow traditional or mainstream methodological and epistemological distinctions, therefore requiring new considerations to the inquiry process.

This research focuses on the irreducible asymmetry between humans and algorithms that manifests preeminent in context of language analysis. Attending to this asymmetry holds a critical micro-level dimension of human-AI collaboration organizations, that may help explaining the nature of the emerging epistemological regimes they mutually give rise to. First, Paper I seeks to problematize this asymmetry as a meta-problem that organizational actors have to deal with on top of the problem at hand. It proposes a hybrid framework in which structured human guidance exploits and guide AI capabilities while preserving the flexibility needed for exploration, enabling outcomes that exceed the inferential capabilities of either humans or AI alone. Second, Paper II seeks to define these meta-analytical capabilities that results from human-AI interaction across their foundational asymmetry when making interpretations. It supports redefining the very language-mediated meaning-making that organizational actors engage in. Third, Paper III attempts to project these implication to approaches of inquiry as an inseparable aspect of understanding the emerging epistemological regime. It highlights the possible means of exploiting the asymmetrical capabilities of human and algorithmic text analysis for the betterment of theory building. Lastly, Paper IV provides a first-hand empirical account of how human-AI collaboration over text analysis exploits their asymmetrical differences to produce new knowledge.

## Disposition of The Thesis

The four papers reflect an interrelated inquiry process that spanned over more than four years on how human-AI realizes superior inferential and interpretive capabilities that emerge from their interactions. One study leverages the multimodality of language and experimentation (Paper I), another takes a relational perspective of emerging interpretative capabilities through human-algorithms interactions (Paper II), and one that exemplifies the implications of Paper I and II to inquiry (Paper III). Distinctively, Paper IV is the only one that plays a dual role in this compilation: (1) being the practical and cognitive experimental space for all the thoughts behind Papers I-III and (2) manifesting the relevance of AI-enabled requisite complexity (Ashby, 1991) in inference and interpretation to study AI-enabled complex societies.

## 2 Theoretical Background

*“The line between biological self and technological world was, in fact, never very firm. [...] The story I tell overlaps some familiar territory, touching on our skills as language-users, toolmakers and tool-users.”* (Andy Clark in Natural-Born Cyborgs).

### Conceptual Limitation of the Automation-Augmentation Framework

AI technologies are persistently reshaping the social landscape. Particularly, organizational actors are constantly designing interactions between human and artificial agents, notably addressed in the literatures on human-AI collaboration in decision-making tasks (e.g., Choudhary et al., 2025), algorithmic management of employees (Kellogg et al., 2020), and more recently, in contexts of creativity (e.g., Boussieux et al., 2024).

It is generally understood that augmenting human intelligence and/or performance through AI are initially achieved by recognizing their respective strengths and weaknesses (Huang & Rust, 2022; Raisch & Krakowski, 2021). Explicitly, reaping the benefits of intelligent technologies and the “potential to augment human knowledge-based activities through AI resides in compensating their mutual strengths and weaknesses, which results in increased productivity” (see Simón, Revilla, & Sáenz, 2024: 9). Promises of augmentation are generally translated in terms of performance efficiency, ideal resource allocation, and process optimization (Davenport & Kirby, 2016). Albeit targeting essential aspects of organizational practices, augmentation as it is approached in the literature holds several embedded associations, that distort understanding of organizational processes (Chalmers et al., 2026; Sergeeva et al., 2026; Phillips, 2026).

First, it pertains to an assumed implicit hierarchy of tasks’ importance. To illustrate, managers and employees are expected to delegate routine tasks to AI

algorithms, so they can focus on activities of higher-level problem solving (see Jia, Luo, Fang, & Liao, 2024: 8) – i.e., “tasks that matter.” Humans rely on AI agents in well-codified tasks to save time and cognitive resources. Practically, and although critical for optimal resource allocation, this presumption of task discernment and isolation is inadequate to explorative endeavors, and to contexts characterized with little to no previous knowledge (Raisch & Fomina, 2025a; von Krogh, 2018). Conceptually, this instrumental view on augmentation undermines the micro-level interactions between human and AI in explorative and creative tasks, through which they come to understand and make sense of their environment (Weick, 1995). Notably, it is less understood how augmentation becomes an emergent characteristic of the system (human and AI) (Simón et al., 2024) – i.e., a symbiotic human-AI collaboration (e.g., Cao, Duan, Edwards, & Dwivedi, 2021:1; Hillebrand, Raisch, & Schad, 2025) – outside the sum of performances over patched tasks.

Second, what augmentation stands for in theory and practice is understood in close proximity to automation – the full delegation of tasks to AI agents. The relationship between augmentation and automation in organizations can exhibit a complex relationship, contingent to situational factors related to purpose fulfillment and decision-making. Raisch and Krakowski (2021) suggest that balancing augmentation and automation displays a potential paradoxical nature, especially, when organizations are constantly seeking the codification of new knowledge as means of performance optimization. This perspective concerns a relatively longer span of constant learning, where tasks requiring augmentation today will eventually be automated later upon enough knowledge accumulation (see Raisch & Krakowski, 2021). In practice, managing the paradoxical nature of the augmentation-automation interrelationship resides in contexts where organizations constantly balance associated tradeoffs, as means of achieving their objectives. Put simply, augmentation is viewed as essential to improve automation and vice versa, as ongoing negotiations of resource allocation and decision-making. This perspective treats knowledge as a stable, pre-existing resource that AI either accesses on behalf of humans or helps humans access more efficiently. What it fundamentally misses is that human-AI collaboration doesn’t merely redistribute cognitive labor, rather, it reconfigures the epistemic infrastructure through which organizational knowledge is produced and legitimized (Sergeeva et al., 2026). By focusing on outputs – productivity gains, decision speed, error reduction – assumptions of automation and augmentation addresses who does the work, but not to the nature of knowing itself. Consequently, while automation is readily understood and demarcated, the social and cognitive dynamics involved in augmentation makes it more

complex to be theoretically delimited. It is likely that augmentation is defined as the antithesis of automation, or reduced to broad conceptualizations of mutual human-AI learning given their complementary strengths.

Lastly, augmentation is ostensibly associated with the remarkable data processing scale, particularly, in terms of time and volume. Given the wealth of digital data, it is often that organizations are acquiring knowledge from a relatively small fraction of available information (Shrestha, Krishna, von Krogh, 2021). Therefore, advanced algorithms are expected to expand the informational scope that organizations can process, and thus make use of “untapped resources” (Shrestha et al., 2021b: 589). Moreover, algorithms provide the means for “real-time” insight acquisition (Antons, Breidbach, Joshi, & Salge, 2023: 109). Accordingly, augmentation is realized through the emergent capability of rapid sensing at scale. This capability is deemed vital for organization to adapt to their environment and make better-informed decisions (Jarrahi, 2018). Although this capability reflects a beneficial aspect that result from human-AI collaboration in contexts of adaptation and short cycles of processing and acting, it does not fit contexts requiring delayed judgements. Specifically, this promise of processing larger empirical scopes, quickly constitutes a partial view. When extending this view to contexts necessitating thought-through explanatory efforts (see Lindebaum & Flemming, 2024), such a promise overshadows the opposite, and perhaps contextually more valuable, aspect of augmentation of delaying or challenging immediate insights and premature conclusions – i.e., processing larger empirical scopes thoughtfully.

## AI’s Boundary Conditions

The thesis mainly focuses on predictive AI, algorithms that “rely on pattern recognition to forecast outcomes, classify entities, or detect anomalies, [...] and] depend on the emotional, cognitive, and behavioural responses they elicit from humans” (Chalmers et al., 2026: 294-300). It does so for two main reasons. First, it establishes a unified frame of analysis between algorithmic sensemaking and human sensemaking: recognizing cues, interpreting them, and acting accordingly (Weick, 1995). Second, it speaks to contexts of high environmental complexity where defining the problem is a complex task, and existing knowledge cannot be readily evoked. Thus, focusing on predictive AI in a context of ex-ante indeterminacy, establishes the context where “augmented” sensemaking can be explored and theorized. Whether other

forms of AI (see Chalmers et al., 2026), notably generative AI (e.g., ChatGPT) are involved in the process or not does not fundamentally change the validity of the propositions hereafter. The role of generative AI is positioned to be secondary with respect to predictive AI, as the former depends on the structure and set of patterns uncovered by the latter. Generative AI can be thus used to produce additional variation in the interpretation process (Cornelissen, Höllerer, Boxenbaum, Faraj, & Gehman, 2024; Cornelissen, 2006)

Broadly, all forms of AI still retain the asymmetries with respect to humans' meaning-making. Second, this thesis observes the analytical process irrespective of participants, and the use of predictive AI alone makes the argumentation more straightforward. To illustrate, Paper II observes the interpretation process as an ongoing categorization, association, and validation of social cues (Goldberg & Singell, 2024; Timmermans & Tavory, 2012) and the meta-analytical capabilities that makes it comparatively traceable process. The study theorizes the meta-analytical capabilities in *relational* terms, to conserve human-AI asymmetries and negate human-human or AI-AI asymmetries. The nature of AI involved does not change these capabilities, but influence the range of their manifestations (e.g., the diversity of possible associations, and the generative tension from their differential ability to provide satisfactory valid knowledge or surfacing surprising cue that exerts recursive pressure on the association itself, see Paper II).

## Overview of AI in Text Analysis

### Computational Text Analysis

Computational text analysis refers to the set of methods that treat textual data – organizational documents, earnings calls, employee reviews, patent, news coverage, social media – as data that can be systematically coded, counted, and modeled to answer organizational and social questions (Grimmer & Stewart, 2013). The approach has a long tradition in management science, where scholars have relied on computer-aided text analysis (CATA) to operationalize psychological and strategic constructs from archival text, extending construct-validation logic long used with survey instruments to unobtrusive textual traces of organizational life (Short, Broberg, Cogliser, & Brigham, 2010). A parallel line of development from the broader social sciences and digital humanities, where the introduction of *topic modeling* offered a scalable way to discover

latent thematic structure in large text corpora without extensive a priori coding schemes (Mohr & Bogdanov, 2013). More recently, as organizational and strategy scholars have gained access to ever-larger corpora and more powerful language processing technologies, methods' scholars have elaborated on algorithmic processing of textual data with increased rigor and clarity of measurements (e.g., Kobayashi, Mol, Berkers, Kismihok, & Den Hartog, 2018). Parallely, management and organization scholars mapped how topic modeling specifically has diffused across management subfields and proposed standards for its flexible use (Hannigan et al., 2019). Together, this nested body of work establishes computational text analysis as a mature but still rapidly evolving methodological tradition.

### **Predictive AI in Computational Text Analysis**

Predictive AI contributes to computational text analysis primarily by learning statistical patterns from text in order to classify, cluster, or forecast outcomes at a scale infeasible for manual human coding. Foundational unsupervised techniques such as Latent Dirichlet Allocation treats documents as mixtures of latent topics, allowing researchers to inductively surface themes across thousands of documents while preserving a probabilistic, replicable measurement procedure (Blei, Ng, & Jordan, 2003). Distributed word-embedding methods advanced this agenda further by representing words as vectors in continuous semantic space, enabling researchers to capture nuanced meaning, semantic similarity, and even shifts in cultural or organizational discourse over time. Supervised approaches, including transformer-based language models such as BERT (Devlin, Chang, Lee, & Toutanova, 2019), extended predictive capability by allowing context-sensitive classification of sentiment, stance, or topic with far greater accuracy than earlier bag-of-words classifiers (Bonikowski et al., 2021). In management research specifically, these predictive tools have been used to measure constructs such as organizational identity, strategic change, or market categories from text (Hannigan et al., 2019).

### **Generative AI in Computational Text Analysis**

Generative AI, most visibly instantiated in Large Language Models (LLMs), contributes to computational text analysis in a qualitatively different way: rather than only detecting patterns in existing text, it can produce, transform, and reason over text, opening new possibilities for measurement, annotation,

and even simulation. The development of large-scale generative language models demonstrated that a single pretrained model could perform a wide range of language tasks – summarization, translation, question answering – with little or no task-specific training, simply by conditioning on natural language prompts (Brown et al., 2020). Subsequent work showed that aligning these models with human instructions and feedback substantially improved their ability to follow nuanced, open-ended analytical tasks (Ouyang et al., 2022). This generative capacity has been leveraged for zero-shot (no intervention) and few-shot text annotation (few intervention showing human annotation examples) for remarkable performance (Törnberg, 2023), and even to simulate plausible human responses for hypothesis generation and pretesting (Argyle et al., 2023).

## **Predictive and Generative AI Configuration**

Predictive AI plays the foundational role in early-stage inquiry into any phenomenon: by detecting recurring patterns, clusters, and associations across large volumes of text, it allows researchers to first establish *what* is happening – which categories, topics, or relationships reliably structure the data – before any claims about meaning or mechanism can be made (Grimmer & Stewart, 2013; Hannigan et al., 2019). This pattern-detection capacity is what allows predictive AI to help define the problem itself: topic models and embeddings surface the empirical regularities that give a phenomenon its shape, and it is against this shape that subsequent theorizing must be anchored (Blei et al., 2023; Kobayashi et al., 2018). Generative AI, by contrast, is better suited to a secondary, interpretive role at this stage – elaborating on ambiguous cases or patterns, generating alternative readings of a passage, or stress-testing coding decisions once the underlying patterns are already known (Törnberg, 2023).

## **Human-AI Asymmetrical rationalities**

While codified knowledge from previously explored situations can serve well in prediction tasks (Raisch & Fomina, 2025a; von Krogh, 2018), this condition falls short in contexts where the problem and its possible solutions are unknown (March & Simon, 1958: 160; Winter, 2003). Such problems resonate with the broad phenomena that management and organization theorists attempt to tackle. These problems are characterized by causal complexity, representing phenomena “where multiple explanatory factors combine in complex and, at times, contradictory ways, and where there is ‘equifinality’, or multiple

alternative paths to an outcome” (Furnari, Crilly, Misangyi, Greckhamer, Fiss, & Aguilera, 2021: 778; Meyer, Tsui, & Hinings, 1993; Misangyi, Greckhamer, Furnari, Fiss, Crilly, & Aguilera, 2017; Tsoukas, 2017). Precisely, these alternative paths may be downgraded when committing to formal rationality alone – what is “predicated on universalism and calculation with reference to formal rules and regulations” (Lindebaum, Vesa, & Den Hond, 2020: 253) – the kind that reflects AI.

To illustrate, formal rationality alone, may leave the process of inquiry to multiple plausible pitfalls. First, attempting to solve societal problems should attend to the “interplay of structure and meaning in networks and of its methodological implications”– actors, cultural contexts, and spatial and temporal stamps (Fuhse, 2009: 51). The cross-relationships between these levels of analysis, creates a plethora of relevant explanatory features – inherently qualitative – that cannot be captured by assessments of power relationships alone (Furnari et al., 2021: 779; Fuhse, 2009; Doty & Glick, 1994). Specifically, reducing qualitative inquiry to one level of analysis (see the assumption of “general linear reality”, Abbott, 1998: 169), is likely to “focus on the unique contribution of a particular explanatory attribute [which] gets in the way of understanding how multiple attributes may combine in complex ways.” (Furnari et al., 2021: 779). In theory, this is of ample interest to management and organization research, where theories are language dependent (verbal theories), and may consist of a process or trajectory (Bliese, Certo, Smith, & Wang, 2024: 895).

Second, formal rationality imposes rigid boundaries on interpretation (Weick, 2005; Thompson, 1967), at least in the range of possible solutions. Formal rationality excludes relevant outliers that may constitute “extreme cases [...] where theories [may] add their value” (Powell, 2003: 83). This could be clarified by distinguishing statistical significance from relevance (i.e., social significance, Hannigan et al., 2019). Albeit providing an appealing enticement, statistical significance establishes a categorical relationship to relevance, where statistically insignificant insights or patterns are automatically considered as irrelevant (Lindebaum et al., 2020). In a 2 by 2 matrix, where statistical significance is on one axis, and relevance on the other, the *insignificant* (or “statistically rare”, Boussieux et al., 2024) *yet relevant* square comprises the candidate opportunities for creative problem-solving or theory building (see Cornelissen, Höllerer, Boxenbaum, Faraj, & Gehman, 2024). Specifically, solving (theorizing) complex phenomena is at most times searching for “few great ideas” rather than many average ones (Girotra, Terwiesch, & Ulrich, 2010: 591; Boussieux et al., 2024). Means of assessing

statistical significance, and excluding insignificance, accordingly, treat any deviation – relevant or irrelevant – as an error term. Accordingly, there is a higher opportunity cost that results in ignored thought-provoking heterogeneities, subpopulations of opposite correlation, or at least a nuanced refinement of empirical boundary conditions around significant relationships (Bliese et al., 2024: 897; Hymer & Smith, 2024).

Third, when working with large sets of textual data, an overlooked facet of the identified significant patterns, is their thought-stimulating aspect (see Antons et al., 2023: 125). While quantitative results in the context of correlational theoretical models are easier to be conceived (in categorical terms of p-values and confidence intervals of significant effects), interpreting, for instance, topic models is subject to “substantial interpretative uncertainty” (Hannigan et al., 2019: 594; DiMaggio, 2015), where mathematical accuracy does not imply improved interpretation of meaning (Lindstedt, 2019; Chang et al., 2009). Therefore, significant patterns in text, constitute informational stimuli (Antons et al., 2023) that become the “target of explanation” (Shrestha, He, Puranam, & von Krogh, 2021). This combination of structured stimuli (as in patterns independently classified by a topic modelling algorithm for instance) and creative explanatory attempts (human interpretation) helps creating the generative tension necessary for novelty (cf., Brown & Duguid, 2001: 93; Smith & Besharov, 2019: 3).

## Inference and Interpretation as the Foundational Epistemological Units

Tackling the theoretical problem advanced in this thesis focuses on inference and interpretation as the foundational epistemological units. It highlights the epistemic asymmetries between humans and algorithms to set the conditions for the overall frame of analysis. Taking a relational view on inference and interpretation reconfigures the process as a shared one rather than divided based on human versus algorithm distinction. Instead, it helps shift the focus from how different epistemic agents do inferences and interpretations differently, to how epistemic differences among agents influence the shared process – which that can be hindered or augmented. This stance allows us to view superior capabilities that AI enable, as emerging from “the configurations

of relations through which humans and algorithms analyse, learn, and act together in pursuit of organizational goals” (Stelmaszak et al., 2026: 8).

As a central cognitive process, inference represents the mental operation through which humans come to understand environmental cues. Humans try to minimize uncertainty, recognize patterns, and generate expectations based on prior knowledge (Parr et al., 2022). The term itself, “inference”, is a term broad enough to be invoked in multiple contexts for different purposes, such as cognitive science (Parr et al., 2022), methods of inquiry (Cornelissen, 2025; Lipton, 2004), statistical analysis (Casella & Berger, 2024), interpretation (Goldberg & Singell, 2024: 91), and computation (Vapnik, 1995). This thesis is concerned with inference as a shared process between humans and algorithms over language stimuli (or textual data).

While both hold cognitive underpinnings, speaking of interpretation shifts the frame from the individual mind to the social and hermeneutic conditions under which meaning is made. The definition of interpretation intersects with that of inference as both relate to “the association of a stimulus with a cognitively represented concept” (Goldberg & Singell, 2024: 88; Parr et al., 2022).

However, inference as a computational process (one that defines algorithmic processes best) is the mechanism by which a model generalizes from observed data to unobserved cases, mapping patterns in the known toward predictions about the unknown (Vapnik, 1995).

Inference and interpretation are recognized as the central feature of asymmetry in how humans and algorithms “process” their environment. Interpretation moves inward, associating external stimuli with internally held conceptual structures. Inference moves outward, projecting from observed patterns toward unobserved cases. In the interpretative account, prior conceptual structures are culturally and historically constituted. In the inferential account, prior knowledge is typically encoded as set of statistical rules, model architecture and hyperparameters, training data, or prior probability. Interpretation succeeds when meaning is coherent, intersubjectively transmissible, and contextually adequate. Inference succeeds when generalization is accurate, stable, and achieves minimal error.

Despite systemic differences, these two accounts describe the same process in principle. Both accounts entail recursiveness (the influence of prior knowledge on new knowledge), mutual constraint (prior knowledge constrains recognizable evidence and new evidence constrain which prior knowledge is stable or changing), and seek generalization as the ultimate goal (the defensible-enough leap from the known to the unknown).

In relational terms, therefore, inference and interpretation can be seen as the nested process of back and forth triadic movement (A-B-C) from existing knowledge to data (A to B), possible new knowledge and existing knowledge (C to A), and possible new knowledge and data (C to B). This process can be summarized as an ongoing categorization (pattern recognition and explanation), an association (coupling with exiting bodies of knowledge), and tradeoffs of validity and/or satisfactory explanation (Goldberg & Singell, 2024). In human alone or algorithm alone, this process is locally intertwined. It is their asymmetries over this process, though incongruent, that make the inference and interpretation processes disentangled (the intertwining between categorization and association breaks down), thus, becoming a relationally structured configuration that can be investigated (see Paper II).

## Inference and Interpretation: Process and Outcome

In organizations, solving problems, or making sense of environmental cues with algorithms involves several decisions about the process of doing so. For instance, deciding how meaning should be “measured” is the most notable among them (Mohr & Bogdanov, 2013), since it requires the human awareness of the epistemological asymmetry in treating meaning as measurement and vice versa. Humans do not only make inferences about the problem, but also make inferences about the inferencing process, such as how alternatives are generated, tested, and what constitutes the rules of satisfaction and validity (Simon, 1988; 1996). The asymmetrical differences between humans and AI make the delimitation between the analytical level (inferences about the problem) and meta-analytical level (inferences about the inferencing process) more visible. This delimitation does not imply a detachment in the overall process, but generates the reflective space where tensions between inferences and interpretation (outcome) and the process of doing so, becomes apparent, and assumptions about either become traceable (e.g., how setting certain parameters and text preprocessing strategies influence what gets prioritized as an empirical regularity, and in turn, how certain representation logics of empirical regularities activated different bodies of existing knowledge).

## Summary of Theoretical Problem and Approach

AI transforms the mainly-human traditional process of knowing, and promises to improve it. However, algorithms and humans have irreducible epistemic asymmetries that cannot be neglected. These asymmetries are largely apparent in how they process language, making it a relevant theoretical instantiation to theorize the emerging epistemological regime. Dealing with these asymmetries while attempting to achieve organizational objectives reveal the interplay between ongoing inferences (interpretations) about the problem at hand, and inferences (interpretations) about the inferencing (interpreting) process. Unpacking this analytical and meta-analytical interplay, as this thesis argues, reveal relevant building blocks and contours of the emerging epistemological regime in organizations that resides at the foundational substrata of knowing: inferences, interpretation, language, and their interplay across human-AI asymmetries.

## Context-Sensitive Considerations of Agency

Questions of agency are central to understanding human-AI interactions and emerging capabilities. It is not uncommon to assume that all problem-solving is hybrid, since humans rarely solve problems on their own (Clark, 1989; Clark & Chalmers, 1998). However, the sophistication of language-mediated interactions in natural language complicates the user-designer dichotomy (Glaser, Pollock, & D’Adderio, 2021) given that humans are “[1] language-users, [2] toolmakers, and [3] tool-users” (Clark, 2003: 8), which has ramifications for overall human-AI actorhood in problem-solving. Specifically, this thesis lean on context-sensitive presumption of agency.

To illustrate, hybrid agency, where the boundary between human and algorithms remains structurally fundamental, can be seen as “balkanizing” human and AI agencies and discrediting their “entangled” co-existence across the broader socio-material assemblages (Gehman, Glaser, & Meritt, 2025: 477; Glaser, Sloan, & Gehman, 2024). Alternatively, an entangled agency might also simplify or exclude much of the sequential and path dependent interactions under different objectives (Raisch & Fomina, 2025b). If these two perspectives constitute the two hypothetically valid ends of hybrid agency’s theoretical spectrum, the focus should attend to the contexts that favors one view over the other. For instance, while humans can disregard AI solutions

(conscious *attitude*) – which reinforces disentanglement on the surface –, they might retain much of the AI generated vocabulary (subconscious *behavior*) – which makes entanglement, though unbalanced, subconscious and somewhat inevitable in how it influences problem-solving (Zvelebilova, Savage, & Riedl, 2024). Words on their own can manipulate attention and trigger memory differently irrespective of what humans do directly with them. For instance, “quadruple bypass” and “heartbreak” belong to the same event, where the former emphasizes the medical and quantitative aspects and the latter has emotional and symbolic depth (Zvelebilova et al., 2024: 14). Alternatively, attitude and behavior inconsistencies are likely to be asymmetrical across team members (see different interaction modes and views of AI in Gkinko & Elbanna, 2023: 5), therefore raising further questions around the existence of multiple interacting agency spectrums within teams solving the same problem. Study one and two lean on each of these ends of the agency spectrum explained in Chapter 3 under specified boundary conditions.

# 3 Research Design and Methodology

## Philosophical Stance and Assumptions

I approach the problem of human-AI collaboration with pragmatism as an upfront method of thinking and observing environmental structures and inferring their *meanings*, and engaging in an overall process of valuation (Dewey, 1908; 1939). Valuation in this account reflects my effort to develop “genuine and grounded propositions about the purposes, plans, *measures*, and policies which influence human activity [...]” (italics added, Dewey, 1939: 57). The center of gravity of such a stance rests on “meanings” and “measures”. This is crucial for human-AI inference and interpretation from language. As AI can only “speak math” (Selbst, Boyd, Fiedler, Venkatasubramanian, & Vertesi, 2019: 61), the combination of *meaning measurements* and *measurable meanings* is inevitable, and in fact, central.

However, this combination is not straightforward, nor fully accommodated in one epistemological body. Moreover, it does not necessitate a reconciliation of the Machine Learning, Computer Science, Linguistics, and Social Sciences literatures, but a productive dialogue over methods of inquiry. Each of these bodies reflects a distinct disciplinary and semantic structure of knowledge (see Carlile, 2002) that itself challenges knowledge integration and relaxing respective epistemological vantage point. The impacts and role of AI in society, whether at the individual or collective levels, represent a complex problem, where “not only is the system behavior complex, but the values and goals that society holds for that system vary as well” (Miller, Baird, Littlefield, Kofinas, Chapin III, & Redman, 2008: 49). One way to address this conundrum, is to lean on multidisciplinary approaches, under the assumption that their epistemological asymmetries and disagreement give rise to “higher order evidence” (Christensen, 2010), or in social terms, “reflexivity” (Weick, 1999). This is not to be seen as an act of isolated curiosity in perspective-juggling, but an epistemological tool that allows us to give the disagreement

its recognizable shape (in terms of degrees of similarities, coherence, and deviations) and to externalize our assumptions and prior beliefs about the problem and the process of approaching the problem and making them systematically comparative and traceable (Christensen, 2010).

The reader need not be concerned that Paper I follows a Simonian problem-solving approach (Simon, 1988; 1996; March & Simon, 1958), while Paper II rests on a Deleuzian assemblage perspective that governs the human-AI relationship (Glaser, Sloan, & Gehman, 2024) and much of Science and Technology Studies traditions (Star, 1989) that grounds inference and interpretation as a nested relational process. Each perspective, as I shall explain later, emphasizes some aspects of the complex system I am investigating, and downgrades others, notably around principal assumptions of the agency and user-designer dichotomy.

## Theoretical and Methodological Grounding

### **Paper I and II**

Paper I and II are conceptual studies that lean on a multidisciplinary assessment of the relevant theories and literature that spans the applications of computational text analysis in social, organizational, and managerial science (e.g., Bonikowski, Luo, & Stuhler, 2022; Hannigan et al., 2019; Shrestha, He, Puranam, & von Krogh, 2021) and Machine Learning literature to cover their technical aspects (e.g., Blei, Ng, & Jordan, 2003; Devlin, Chang, Lee, & Toutanova, 2019).

Conceptually, Paper I resides in the behavioral theory of the firm (Gavetti, Greve, Levinthal, & Ocasio, 2012; March & Simon, 1958). It complements the recent literature on hybrid-problem solving (Raisch & Fomina, 2025a) with a redirected focus on textual data, and natural language's complexity. Hybrid problem-solving builds on the assumptions of organizational search that an "organization's recognition of a problem leads to a search process that ceases once a satisfactory solution is found" (Cyert & March, 1963). The combination of AI and human searches in this regard is reflected in the notion of "local search", where a new solution will be found near an old one (Cyert & March, 1963: 170) and "distant search" where much more of the solution landscape can be covered. The former may reinforce suboptimality, while the latter takes time and additional cognitive resources. Thus, AI can be seen to fulfil more

distant search while humans can take care of what is locally available as a possible solution. These assumptions do not apply to textual data.

Specifically, I argue that dealing with textual data imposes a distortion of the search space, which in itself becomes a meta-search problem. Before search begins, this process is subject to a multitude of design assumptions regarding how text should be preprocessed, i.e., what is set to represent a meaning “geometry”, and how different algorithmic logics set different search paths to different problems.

As for Paper II, it resides in the Science and Technology Studies (STS) tradition (Star, 1989). It seeks to complement the recent literature on the transformational effects of intelligent technologies on the epistemological landscape in organizations (Sergeeva et al., 2026; Faraj et al., 2026; Chalmers et al., 2026; Phillips, 2026). Given my focus on the emerging epistemological landscape, I prioritize the process “of knowing” – which entails interaction of prior knowledge, data, provisional knowledge leaps, and contextual factors –, where organizational actors come to make sense and understand their environment through textual data (Whittle, Vaara, & Maitlis, 2023), and where relational interpretative affordances emerge from the interaction of asymmetrical analytical capabilities (Stelmaszak et al., 2026).

Both studies examine how predictive AI applications is changing how we should approach textual data in organizations. In Paper I, I ground the issue of language and text as multimodal data, where assumptions that hold in quantitative applications of algorithms fail. In Paper II, I ground these issues in relational terms, not as a complex data and design problem, but in terms of human-AI asymmetries in a shared process that faces discontinuities.

What is overlapping in these two studies concerns the emerging meta-analytical rather than analytical capabilities of human-AI interactions, that belongs to neither, but emerge as system-level properties. Precisely, analysis – the lower-order construct of performing a task – and meta-analysis – the higher order construct of reasoning around how to approach a task – (cf., Bastian, Hjelle, & Sheperd, 2026: 233) speaks directly to the distortion problem in Paper I, and to the relational asymmetries between humans and AI in Paper II.

These two studies diverge around questions of agency. Paper I conserves human-AI mutual influence but retains the agential boundary between what is human and what is artificial. Paper II collapses this agential boundary (not to argue against Paper I) on the epistemological landscape to relocate the problem from different agents to asymmetrical ways of knowing. This divergence is crucial for my thesis.

First, I attempt to articulate my personal stance on AI in organizations. Outcomes of intelligent technologies “depend less on humans’ and AI’s respective search capabilities than on the specific ways these capabilities are combined, as well as on the contextual conditions” (Raisch & Fomina, 2025b: 483). While Paper II is based on entangled agency in a specific context, it is worthwhile noting that this entanglement can be discrepant across organizational actors (Raisch & Fomina, 2025b). Thus, Paper I, by taking a behavioral approach that reinforces discreteness rather than entanglement, accounts for discrepancies among organizational actors (e.g., when organizational actors designing the problem-solving architecture are not the same people using it to solve the problem).

Second, the technical details and assumptions at the core of algorithms reside in the Machine Learning and Computer Science literatures, and these details cannot be ignored, given their differential impact on the analytical process. However, while alluding to these details is possible, for instance, in a behavioral approach, these concerns aren’t easily conveyed to interpretive audiences. Hence, the choice of theoretical apparatus is also a pragmatic concern over the tradition-restricted semantics, which enable and restrain the use of certain concepts.

### **Paper III**

Paper III covers the methodological dimension of the discussion held in Paper I and II. This study emphasizes the central role of the human inference in the process, and tries to define the analytical capabilities in terms of their implications to human cognition, namely, perception – identifying relevant stimuli or patterns – and conception – explaining these patterns. This is the throughline across the three studies (Paper I-III) that this process that is humanistically intertwined, is now discrepant, making both perception and conception leveraged for superior analytical capabilities. This does not mean that AI can identify patterns objectively and humans can explain them subjectively; it simply stands on the assumption that AI can help organizational actors hold two types of subjectivities in productive tension. Specifically, the ambiguity between what is being prioritized as worthy of explanation independent of meaning on one hand, and how it is made meaningful on the other, becomes the central aspect of predictive AI’s use (Mohr & Bogdanov, 2013: 560).

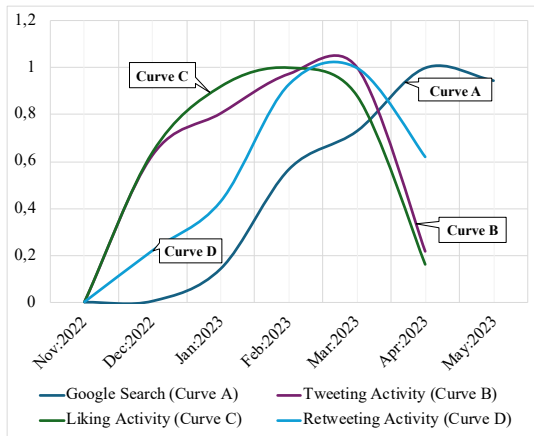
# Data Collection and Analysis

Paper IV as the only empirical study in this thesis, also serves as the experimental space on which assumptions, arguments, and logics behind the first three studies were developed, refined, and made defensible.

## Paper IV

When ChatGPT was launched in November 2022, generative AI became accessible to a broader public. Millions worldwide got their first experience of “chatting” with a fluent robot, and many were amazed at the chatbot’s potential. This amazement helped trigger a widespread generative AI hype. The empirical context of our study is Twitter (now X). We consider social media platforms as “relational publics” (Starr, 2021: 69; Hannigan, 2023) “that cut across more ‘bounded’ and ‘stable’ social formations, this is the bridging function that gives publics emergent possibilities in the creation of new social movement [...]” On Twitter, individuals post short texts, pictures, or videos, and share information, interpretations, and opinions of private and public events. Such “Tweets” can be discussed, shared or “liked” by other users, stimulating an ongoing conversation about many public issues. Thus, our starting point is that relational publics bring individuals together through meanings and labels (see Hannigan, 2023; Starr, 2021).

We chose Twitter for its notable social influence among other platforms and attention given to it in academic research (see Hannigan, Briggs, Valadao, Seidel, & Jennings, 2022; Fisch & Block, 2021). We extracted English Tweets that contain “*chatgpt*” on a randomly selected day and time window, through the Twitter Application Programming Interface (API) in *Python*. Tweets covered a period of 24 weeks (sequential), starting in November 2022 – when ChatGPT was released – and ending in April 2023, when we observed a decline in excitement and plateau in attention (see Figure 1). We initially extracted 247,664 Tweets. After removing duplicates and initial cleaning, this dataset was reduced to 215,279 Tweets.



**Figure 1. Attention and Excitement after the Launch of ChatGPT (from Hamadi & Brattström, In Press)**

We followed the principles of grounded theory (Gioia, Corley, & Hamilton, 2013; Glaser & Strauss, 2017). To do so, we combined the use of topic modelling, as a rendering process that enabled us to uncover robust patterns in our large dataset (Hannigan et al., 2019), supplemented by in-depth analysis of a subset of 10,000 tweets, which helped us gain a more nuanced and contextual understanding of topics.

## Ethical Considerations

Two ethical dimensions concern this thesis. First, I take full ownership of the text, meanings, and the ideas communicated in this chapter and in the separate studies, except where co-authorship applies (Paper III and IV). As a non-native English speaker, the use of LLMs was sometimes incorporated for grammatical improvement and proofreading. Second, the empirical study relied on publicly available social media data on non-sensitive matter. Ethical approval was obtained before the beginning of the study. My coauthor and I were careful of the “right to be forgotten” that GDPR grants to digital platform users (EU Regulation 2016/679). Where using social media posts was needed to illustrate findings, we rephrased them to prevent the traceability of their authors.

# 4 Summaries of The Compiled Papers

## Paper I: Navigating Distorted Search Spaces Through Structured Flexibility: The Case of “Qualitative” Hybrid Problem-Solving.

Hassan Hamadi

### **Abstract**

As AI becomes more integral to organizational activity, scholars are beginning to distinguish its role in supporting humans in explorative tasks, such as problem-solving, alongside more established use in predictive decision-making. Nevertheless, solving problems with qualitative data complicates the means of optimizing AI use for improved solutions. Unlike quantitative tasks, the fundamental differences between human and AI qualitative analyses, such as AI’s analysis incorrectness, incompleteness, and inevitable explanatory uncertainty create a distorted search space. In this article, I problematize such distortion in qualitative search as a specific example of problem-solving. I mobilize the concept of structured flexibility from the hybridity literature to make the case for hybrid qualitative search. Overall, the proposed stepped model exploits AI’s means-end optimization in conjunction with the evolutionary and adaptive nature of human explanatory efforts. Through enabling guardrails, humans can transform the distorted search space into a bounded space for experimentation. Guardrails enable adaptive guidance through a flexible structure that can organize the chain of thought trials, without restricting the emergence of better explanations, thus transcending human and AI separate capabilities. This article contributes to the nascent hybrid problem-solving literature, and has implications for organizational hybridity, and overall, AI management.

**Keywords.** Artificial Intelligence; Natural Language; Text Analysis; Organizational Search.

**Presentation.** Stockholm School of Economics, Chalmers University of Technology, and Copenhagen Business School.

**Status.** Working paper, received feedback from Richard “Rick” Hunt (VT), Sebastian Krakowski (SSE), George von Krogh (ETHZ), Timothy (Tim) Hannigan (Telfer), Joep Cornelissen (RSM), and Stefan Arora-Jonsson (UU).

**Target.** Will be refined and submitted to Academy of Management Review.

# Paper II: Interpretation Across Ambiguous Discontinuities: Topic Modeling As Epistemic Boundary Crossing.

Hassan Hamadi

## **Abstract**

Topic modeling, or using algorithms to analyze text, is a growing organizational practice of inquiry. This process has largely been associated with additive capabilities of analyzing larger empirical scopes at a faster pace through a discrete view that splits and optimizes processing labor between humans and algorithms. However, how this process transforms the interpretative potential remains unclear, especially that it entails an iterative practice of language-mediated meaning-making. Precisely, this process creates ambiguous epistemic discontinuities that arise from the structural asymmetries between organizational actors and algorithms, while both are entangled in agency over meaning-making. Taking insights from Science and Technology Studies (STS) on how actors organize and exploit boundaries' ambiguity, this article argues that viewing topic modeling as boundary crossing can inform scholarship about the transformed interpretative potential in organizations. By problematizing the epistemic discontinuities as major boundaries to be crossed, this article theorizes three relational interpretative affordances of topic modeling: (1) tractable categorization, (2) modular association, and (3) generative extrapolation. Viewing organizational actors and intelligent technologies as parts of algorithmic assemblages, this article contributes to understanding the transformation of organizations' reasoning and analytical capabilities, and to the nascent discussion about epistemological transformation in organizations.

**Keywords.** Boundary Crossing; Computational Text Analysis; Topic Modeling; Artificial Intelligence; Interpretation; Ambiguity

**Status.** Working paper.

**Presentation(s).** Presented at EGOS 2026 – Subtheme: “The Algorithm Decides: AI, Human Judgment, and Organizational Decision Making.

**Target.** Submit to Organization theory.

# Paper III: Augmented Inference Making: Organizing the Chain of Thought Trials from Perception to Conception.

Hassan Hamadi and Anna Brattström

## **Abstract**

With the abundance of data and digital traces of human behavior that are currently available, and the availability of algorithmic resources to analyze them, management scholars have the opportunity to significantly expand their scope of theoretical discovery and tackle increasingly complex management problems. However, for us to take advantage of this opportunity, we need a more precise understanding of how algorithmic analysis can augment human inference making, the tradeoffs that are at stake, and how to best integrate algorithmic analyses into inductive theory building processes. Addressing this need for development, we propose in this paper *Augmented Inference Making* (AIM) as a distinct method to improve inductive theory building from large sets of textual data, extending management scholarship at the critical intersection between methodological advancements and theory building. We explain how unavoidable biases of human cognition – in particular confirmation bias and wishful thinking – can be manipulated in a structured process to become useful rather than harmful. We outline how the integration of different algorithmic techniques, combined with manual inference from data, directs attention to different dimensions of empirical regularities in text, hence, enriching theory building while retaining flexibility.

**Keywords.** Inference; Machine Learning; CATA; Theory Building; Artificial Intelligence

**Presentation(s).** AOM 2025, Academy of Management Journal paper development workshop 2025, Rethinking Entrepreneurship series at Copenhagen Business School.

**Award.** Best PhD student-led paper, AOM 2025 – Research Methods Division.

**Target.** Develop a GitHub tutorial and submit to Organizational Research Methods.

# Paper IV: ChatGPT, a Hype that Teaches: Generative AI and the Collective Accumulation of Technology Literacy on Social Media.

Hassan Hamadi and Anna Brattström

## Abstract

The 2022 launch of ChatGPT triggered a wave of social media discussion about generative AI. Drawing on 215,279 posts from five months after this launch, we extend prior accounts of hype as vehicle for strategic resource mobilization, to develop a theory of hype as collective sensemaking and knowledge creation. Existing models rest on a fixed relational architecture: knowledgeable actors leverage information asymmetries to project visions, directing expectations top-down. ChatGPT collapsed this architecture by making generative AI accessible, democratizing technology evaluation. Meanwhile, social media emerged as the arena where relational publics could form, driving vision formation and contestation around generative AI from bottom-up, reshaping how a nascent technology acquired meaning. Combining grounded theory with computational text analysis, we develop a process model on relational publics' role in hypes. We explain how collective knowledge accumulates through traceable conceptual prototyping: testing a technology's capability and proposing meaning simultaneously. Also, that when this knowledge crosses a technology literacy threshold, hype transitions from an expanding to a containing phase. The model advances our understanding of how novel technologies diffuse when crowds simultaneously co-construct visionary imaginaries and practical knowledge, and of the role social media plays in this process.

**Keywords.** Disruptive Technology, Discontinuities; Artificial Intelligence; Topic Modeling; Sensemaking; Open Innovation, Crowdsourcing & Open Science.

**Status.** In press in the *Academy of Management Journal*.

**Presentation(s).** AOM 2025, AMJ paper development workshop 2024, SKEMA paper development workshop, Emlyon Seminar Series 2026, Stockholm School of Economics, and Chalmers University of technology.

# 5 Key Findings and Theoretical Implications

Paper I complements the recent literature on hybrid problem-solving and human-AI ensembles (Raisch & Fomina, 2025a; Choudhary et al., 2025). The premises of Paper I rest on exploiting the complexity of natural language, multimodality of possible algorithmic logics, and the overall asymmetries between humans and AI when it comes to language. Overall, Paper I conceptualizes hybrid qualitative search as a structured process in which human and AI capabilities are deliberately combined within enabling guardrails rather than simple task automation or optimization. It shows how these guardrails help teams manage competing rationalities, cognitive biases, uncertainty, and tensions, turning the distorted search space into a source of adaptation, creativity, and methodological pluralism. More broadly, the paper reframes AI augmentation as an emergent capability of human-AI interaction, emphasizing counterfactual exploration, reflective delay, and the strategic orchestration of human intuition and AI analysis to generate insights that neither could produce alone. Paper I lays down the fundamental architecture for solving language problems, over which different types of AIs (see Chalmers et al., 2026) can participate in this program of procedures.

Building on insights from the Science and Technology Studies (Star, 1989; Akkerman & Bakker, 2011), Paper II contributes to the literature of algorithmic organizing (Glaser et al., 2024; Gehman et al., 2025) and the relational view on AI (Stelmaszak et al., 2026). This study grounds the epistemic discontinuities that govern the shared (human-algorithm) interpretative process in topic modeling (as a theoretical substantiation of predictive AI's use on language). Traversing these discontinuities, as this paper argues, creates meta-analytical capabilities that reside in neither account (human nor algorithm). Paper II elaborates on how the human-algorithm collaboration creates ambiguity between how a problem is perceived and how it gets conceptualized. The very process of organizing this ambiguity gives rise

to a new organizational epistemic configuration, and allows for relational interpretative affordances to materialize in the interpretative process.

Relying on established methodological approaches in management and organization studies (Glaser & Strauss, 2017; Weick, 1989; Locke, 2007; Edmondson & McManus, 2007; Cornelissen, 2025), Paper III illustrates how diverse analytical heuristics in computational text analysis can improve the process of theory building. The study contributes to novel epistemic ways of thinking about methodological approaches (Horner, Cornelissen, & Zundel, 2024; King, Goldfarb, & Simcoe, 2021; Luoma & Hietanen, 2024). It explains how theorists can develop an “adaptive explanatory scheme” that remains open to multiple theoretical vantage points in support of their inferencing process to the best explanation (Cornelissen, 2005; Lipton, 2004). Moreover, the study alludes to how the combination of algorithmic and human efforts can be coupled into an “ideal inferencing system” capable of diversifying perception, and separating perception from conception in order to take advantage of inevitable human biases.

As an empirical illustration of the arguments in preceding Paper I-III, Paper IV illustrates the range of affordances that we, as organizational actors (in professional or academic contexts), can realize through the combination of human and algorithmic analytical efforts. The particular use of Structural Topic Modeling (Roberts et al., 2016; Schmiedel et al., 2019) is central to explain the affordances that results from hybridizing data (quantitative metrics as metadata and textual data fitted together in the same computational regime), and the combination of “meaning measurements” and “measurable meaning” (rendering and post rendering analyses). For instance, this hybridization and combination enabled us to detect a threshold that couldn’t be identified in standard analytical qualitative approaches. Similarly, it enabled us to detect a transformation in social behavior (what we explain as *endogenous sociality*, see Paper IV). Overall, the theoretical process model we eventually produced captures the qualitative and quantitative transformation of a complex social event that couldn’t be achieved in a conventional analytical process. While the methodological chapter in this study became unusually complex, it comes as an illustration of how the combination of human and algorithmic efforts provides the necessary process complexity to solve complex problems. It illustrates the meta-analytical capability to alternate between explanation and accuracy as we navigate two epistemic layers (over the same dataset; unlike mixed methods over different data types): one where meaning is measured and rendered explanatory, and where the other conceptualizations are measured and rendered validatory.

# 6 Reflections and Practical Implications

Across the four papers, a micro-level distinction rests on the distinction of structural (syntactic) and semantic dimensions of natural language, and how humans and algorithms are asymmetrically matched to them. Earlier generations of AI, particularly those built on predictive and topic modeling architectures, operated fairly transparently on the structural, syntactic regularities of text, leaving the semantic, interpretive work visibly to humans. Generative AI complicates this picture considerably. Because it produces fluent, contextually plausible natural language, it can appear to interpret rather than computationally infer, even though its underlying operation remains that of statistical pattern-completion over a syntactic structure. This creates a subtler and more consequential asymmetry than the one the dissertation's papers were originally built around: humans must now distinguish not only between their own interpretive work and the AI's structural output, but between AI output that looks interpretive and AI output that is, in fact, merely inferential. Paper I's guardrails, reflective delay and counterfactual exploration are relevant in principle. Humans, as they set objectives and define their organizational problems, can trace how syntactic choices (e.g., concepts used in prompting an LLM) influence generative AI's output. Consequently, they can juxtapose how the variation in structural aspects, maps to variation in semantic and causal explanations.

This reframes what collaboration means in hybrid analytical work using generative tools alongside predictive ones. Paper II's account of epistemic discontinuities and Paper III's notion of an "ideal inferencing system" suggested that value comes from keeping inference and interpretation deliberately distinct so each – and the variation in each – can check the other. Generative AI makes that separation harder to enforce precisely because it erodes the visible boundary between the two. Its outputs are no longer raw structural artifacts like topic clusters, correlations, statistical results. Instead, they constitute ready-made and fluent interpretations that can be mistaken for

the human's own conceptual work if researchers aren't careful. Paper IV's dual epistemic layers – interpreting (explanatory) then inferring (validatory) from meaning measurements – become even more critical as a discipline in this context, because generative AI threatens to compress both layers into a single, fluent output. The dissertation's core theoretical contribution, then, gains a sharper edge in light of generative AI. Initiating guardrails around meaning-making will further require unmasking language-based inferences mistaken for valid interpretations and vice versa.

For researchers designing hybrid qualitative processes, the practical takeaway is to build workflow stages that explicitly separate structural (syntactic) processing from semantic judgment – and, with generative AI included, to add an additional checkpoint that assesses the relevance of an AI-generated interpretation, whether it is interpretively meaningful or simply a structural artifact. Organizationally, this raises the stakes of explicit documentation and architectural designs and assumptions behind configurations. Since generative AI can produce plausible-sounding interpretation at scale, teams should institutionalize review protocols specifically calibrated to this risk – for instance, akin to Weick's (1989) emphasis on thought trials' independence, requiring that any generative-AI-assisted interpretative claim be independently reconstructed or verified by a human analyst working from the structural evidence alone (results from predictive AI), or an alternative AI agent with access different accessed evidence or orthogonal instructions. Practically, this might mean maintaining audit trails that separately log AI-generated language, the structural evidence it was based on, and the human judgment that ultimately validated or revised it. Such documentation ensures the tractability of methodological pluralism and accountability, as well as helps grappling with the distinctive generative AI era risk of “botshit” (Hannigan, McCarthy, & Spicer, 2024).

# 7 Last Word

*“The limits of my language mean the limits of my world.”*

Ludwig Wittgenstein

If there is one thread that runs through this dissertation, it is the proposition that language is not merely a medium through which thought is expressed, but a cognitive technology through which thought is made possible, coordinated, and transformed. Human societies do not simply communicate through language, but rather, they are constituted by it. Every institution, scientific theory, legal system, economic model, and cultural norm depends upon shared symbolic structures that enable individuals to reason beyond the limits of immediate experience. Language extends memory across generations, distributes cognition across communities, and makes collective imagination possible.

This perspective carries profound implications for how we understand Artificial Intelligence (AI), how we use it, and how we prototype its possible prospects. Much of contemporary AI research treats language primarily as data: sequences of tokens to be modeled, compressed, and predicted. This view has enabled extraordinary technical progress, yet risks overlooking the very phenomenon that gives language its significance. Language is not simply the observable trace of human cognition. It is the very cognitive infrastructure that enables cognition to emerge, stabilize and evolve. It is an interface between possibility and plausibility, mediating not only what can be said, but what can be thought, debated, institutionalized, and ultimately realized.

An analogy from modern physics illustrates this distinction. The Higgs boson cannot be observed by unaided human perception<sup>1</sup>. Its existence becomes accessible only through the elaborate epistemic infrastructure of a particle collider – a system that creates the conditions under which the phenomenon

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<sup>1</sup> Thankful for Professor Grégoire Croidieu for this thought.

can be detected and interpreted. Likewise, many forms of human understanding do not exist as fully formed ideas awaiting expression. They become accessible only through the symbolic infrastructure of language. Language is therefore not merely the output of intelligence, rather, it is the apparatus through which intelligence renders aspects of reality observable to itself. Without appropriate linguistic concepts, distinctions remain invisible, possibilities remain unnamed, and entire domains of reasoning remain inaccessible.

Yet language does more than reveal reality as it participates in constructing the conceptual worlds within which societies operate. The vocabulary through which phenomena are described determines which distinctions become meaningful, which causal explanations appear convincing, and which futures become imaginable. A society that acquires new concepts does not only acquire new words or new conceptual arrangements – it acquires new cognitive dimensions. Scientific revolutions, political transformations, and technological innovations have always depended as much upon new languages of description as upon new empirical discoveries. The evolution of civilization is therefore inseparable from the evolution of its symbolic repertoire.

Therefore, the relational nature of language and meaning collides with assumptions of task decomposability, through which resources, as well as algorithms are allocated and optimized. Seen from this standpoint, the dominant discourse on AI augmentation appears surprisingly narrow with respect to language matters. Augmentation is frequently evaluated through incremental metrics: faster information retrieval, broader access to knowledge, improved productivity, or greater computational capacity. These are important achievements, but they largely measure quantitative improvements in performing existing cognitive tasks.

The history of science suggests a different understanding of augmentation. Consider the Event Horizon Telescope, the global collaboration that produced humanity's first image of a black hole. No single telescope possessed the physical aperture necessary to resolve the image. Instead, geographically distributed observatories were synchronized to function as a single virtual telescope with an effective diameter approaching that of the Earth. The breakthrough was not simply that astronomers gathered more data or observed more efficiently. Instead, a fundamentally new observational capability emerged from the coordinated configuration of many independent instruments. Augmentation, in this sense, was transformative rather than additive. It created a mode of observation that resided in neither of the technological constituents.

AI may represent an analogous transformation in the cognitive domain. Its significance is not only about accelerating reasoning or expanding access to information, but in enabling new forms of distributed cognition and ecosystems of intelligence that neither humans nor machines could realize independently. As language mediates interactions between individuals, AI increasingly mediates interactions among vast networks of people, documents, institutions, and computational systems. Notably, human-AI configurations may develop and learn to hone emergent capacities arising from new forms of coordination, synthesis, and conceptual exploration.

This shift requires rethinking what it means for AI to “understand” language. Language models are often evaluated according to their ability to reproduce statistically plausible sequences of words (or predict the next token). Yet the more consequential question is how they participate in shaping the space of plausible ideas. Their outputs increasingly influence scientific inquiry, public discourse, education, policy, and creative practices. They contribute to the symbolic environment within which human reasoning unfolds. Consequently, AI should not be understood as processing linguistic data, but as participating in the cognitive technology through which societies continuously negotiate meaning, establish institutions, and aspire to better futures. The questions of agency in contemporary organization and management studies represent a promising direction.

That said, the central arguments in this dissertation reflect how cognition is fundamentally distributed, socially embedded, and linguistically mediated. Language is both the archive of collective intelligence and the generative mechanism through which collective intelligence continually reconstructs itself. As AI becomes an increasingly active participant in the linguistic and symbolic ecosystem, the challenge is no longer to model language more efficiently, but to understand how computational systems reshape the cognitive interface between possible and plausible worlds.

To reiterate, the future of AI, therefore, cannot be reduced to larger datasets, greater computational power, or more accurate metric performance. Its deeper significance lies in its capacity to transform the epistemic infrastructures through which humanity thinks collectively. Just as scientific instruments have repeatedly expanded the boundaries of what humans can perceive, language has set the boundaries of what humans can conceive. AI now stands at the intersection of these traditions – not merely processing language, but becoming part of the cognitive apparatus through which societies discover, negotiate, and create the realities they inhabit.

To conclude, I leave this work with more curiosity than certainty. If language is humanity's oldest cognitive technology, and if AI is becoming an active participant in that technology rather than merely a consumer of its outputs, then we may only be witnessing the beginning of a profound transformation in how intelligence itself is organized. The most consequential questions may no longer concern whether machines can think like humans, but rather how, when humans think with machines, the production and legitimation of concepts and vocabularies will reshape societies' perceptual and conceptual commitments and what they consider possible, and what entirely new forms of collective reasoning may emerge from this partnership. Every major cognitive instrument – from writing to the printing press, from the telescope to the computer – has expanded not only what humanity could know, but what humanity could imagine. The glorification (e.g., AI surpassing humans) or dismissal (e.g., AI is a stochastic next word predictor) of AI's impacts, does not only build its momentum from the technology's sophistication, but from the centrality of language to societies and humanity. Whether prospects like Artificial General Intelligence – AI that matches or surpasses humans at any thinking task – remain imaginary or come to realization, it will be defined by the limits of language at that time.

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# Mainly-Human Essays on Artificial Intelligence

## An Inference-Interpretation Dyadic Approach to Algorithmic Language Processing in Organizations

Despite growing interest in human-AI collaboration, existing approaches tend to treat AI as a tool for task automation, prediction, or optimization of decomposable analytical activities. This view overlooks the epistemic and methodological complexity that arises when humans and algorithms jointly infer and interpret ambiguous, language-based phenomena. This creates a set of fundamental problems for organizational inquiry: how can organizational actors, as well as researchers, exploit rather than suppress, the asymmetries, discontinuities, biases, and competing processing rationalities between human and algorithmic ways of knowing? How can humans and algorithms navigate complex problems, and generate insights that neither can produce independently? This dissertation therefore addresses the need for a process-oriented, micro-level account of human-AI collaboration that explains how exploiting irreducible human-AI asymmetries can create new inferential, interpretive, and theory-building capabilities across the continuum of computational language analysis.



Through a compilation thesis of four independent papers, this dissertation addresses two interrelated analytical units in human-AI collaboration in the context of inquiry: inference and interpretation. Drawing on literatures of hybrid problem-solving, algorithmic organizing, Science and Technology Studies, and organizational methodological innovation, this dissertation demonstrates how asymmetrical processing capabilities, and the corresponding epistemic discontinuities they create, can generate meta-analytical capabilities that reside in neither human nor algorithmic reasoning alone. The resulting insights are fundamental for understanding human-AI augmentation as an emergent organizational capability and for designing analytical processes that harness human and algorithmic differences to improve overall language-mediated reasoning aptitude.