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Advancing a Material and Epistemological Turn in the Study of AI: A Review and New Directions for Journalism Research

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ABSTRACT

This paper explores how the journalistic scholarship on Artificial Intelligence (AI) has developed over the last decade by providing a qualitative review of the empirical work on AI in journalism, drawing on Anderson's sociological approaches to the study of computational and algorithmic journalism. While the review shows that the existing six lenses developed based on the sociology of news production have proven helpful in addressing AI as an object of study in journalism, the paper argues that this framework is no longer sufficient to address all the facets of AI. The paper, therefore, advances a material and epistemological turn in the study of AI. This turn is concretised through three analytical sensitivities inspired by the field of Critical AI Studies (CAIS) that aim to augment the existing approaches outlined by Anderson. These sensitivities include (1) attending to the "technical" in socio-technical, (2) studying the methodologies and histories of AI, and (3) unfolding the wider eco-system of AI. The paper concludes with new directions for future research aimed at tackling political, economic, institutional, organisational, cultural, and technological aspects of AI in journalism and future developments in AI, such as Generative AI.


KEYWORDS

Artificial Intelligence; Journalism; Critical AI Studies; Sociology of News; Algorithms; Qualitative Literature Review

Introduction

The pervasiveness of Artificial Intelligence (AI) technologies in the news sector has led to a surge of scholarship, reports, and conferences that aim to understand the opportunities and implications of AI in the newsrooms.¹ This level of attention radically differs from when Anderson, in 2013, criticised the currently limited body of literature on AI for its narrow utilitarian perspective on the impact of emerging technologies on an already troubled industry. Instead, he advocated for a critical sociological approach influenced by the sociology of news, urging scholars to engage in critical empirical studies of "computational and algorithmic journalism" (Anderson 2013). In

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this paper, I explore how the journalistic scholarship of AI has developed since then by providing a qualitative review of empirical work on AI in journalism between 2010 and August 2023. The review illustrates how AI today is studied as a multifaceted object shaped in and through its use and development across political, economic, institutional, organisational, cultural, and technological contexts. However, it also reveals that the current body of literature tends to background the materiality and epistemologies of AI in the analysis. Instead, the existing analyses foreground how AI is governed, institutionalised, resisted, controlled, or interpreted by other actors in or around the newsroom with an emphasis on its effects on journalistic epistemology.²

In contrast, the emerging field of Critical AI Studies (CAIS) (Raley and Rhee 2023)³ underscores the need for critical engagements with the epistemologies of AI technologies, urging scholars “to think from within the actual techniques, tools, and technologies of ML and how to leverage that practical knowledge in the development of new critical frameworks and methods” (Raley and Rhee 2023, 188). Grounded in CAIS, the paper proposes a turn to materiality and epistemology in studying AI in journalism, indicating a need to turn to theoretical repertoires pertaining to AI rather than journalism to understand AI’s implications in the sector. Concretely, the paper advances three analytical sensitivities that can augment the existing approaches outlined by Anderson (2013) that no longer sufficiently capture all facets of this now pervasive phenomenon. These include (1) attending to the “technical” in socio-technical, (2) studying the methodologies and histories of AI, and (3) unfolding the wider eco-system of AI. The need for this material and epistemological turn in studying AI is even more pertinent with the increasing proliferation of and access to Machine Learning (ML) and Deep Learning (DL), which are now also powering Generative AI (GenAI) technologies (Diakopoulos et al. 2024).⁴ These AI technologies have different material conditions and pose uniquely different questions than the rule-based algorithms and “simple” forms of automation that previously dominated the discussion in journalism and require a broadened scope of enquiry if we are to understand the broader implications of this development for journalism.

Revisiting the Sociological Approaches to AI in Journalism

In organising the review, I revisit the sociological approaches outlined by Anderson (2013), which include Schudson’s (1989) four sociological approaches to the study of news; “Politics and Public Policy”, “Economics”, “Organisation-level Dynamics”, and “Cultural History”. Anderson (2013) adds two additional approaches—“Institutions and Fields” and “Technology and the News”, where the former emerged as a critique of the cultural perspective and the latter is based on developments within the field of Science and Technology Studies (STS). The approaches were meant to be prescriptive of future critical and empirical research on AI in journalism—an invitation that has been embraced as about a third of the papers reviewed cite Anderson (2013) in their motivations for the study.

Not all reviewed studies follow the exact sociological approaches outlined by Anderson (2013) (although many do). Some draw on later conceptualisations of these

approaches by exploring the cultural practices of journalism through, for example, meta-journalistic discourses (Carlson 2016). Anderson (2013) also notes that close overlaps between the approaches make it difficult to separate them from each other, which could also be seen in the review. However, even when accounting for these adaptations, the literature is highly influenced by the sociology of news in its approach to AI. Using the six approaches as a structuring principle was a productive way to organise and illustrate how the current research addresses AI across different contexts and with different foci—and where it diverged from the original approaches. As a result, I ask two interrelated research questions:

RQ1: How has journalism scholarship approached the empirical study of AI, and what insights have been generated across analytical approaches outlined in Anderson's (2013) paper?

RQ2: What characterises the body of journalism scholarship, and how can insights from CAIS sensitise future research to augment the study of AI in journalism?

Methodology

The paper is based on a qualitative review of journalism studies research on AI aimed at aggregating, describing, and providing an interpretation of the collected literature and developing new theoretical or analytical insights (Shaffril, Samsuddin, and Samah 2021). Previous reviews of AI in journalism have taken quantitative approaches that map the geographic dispersion of the field or the theories and methods used (see, e.g., Calvo-Rubio and Ufarte-Ruiz 2021; Danzon-Chambaud 2021). In collecting the corpus, I used a hybridised search strategy combining database search with a snowballing approach. Such hybridised approaches are argued to be a sound methodology for systematic reviews (Wohlin et al. 2022). Concretely, I used a two-step approach that included (1) a data search using “Web of Science” and (2) a snowballing approach to identify further articles from the initial corpus and two recent special issues tackling this topic (Helberger et al. 2022; Thurman, Lewis, and Kunert 2019).

Web of Science was chosen as it offers a wide range of peer-reviewed scholarly content from different journals—particularly media-focused journals. It is also one of 14 databases deemed suitable for systematic reviews or meta-analyses (Gusenbauer and Haddaway 2020).⁵ To ensure that the variety of technologies under the umbrella of AI would be included, a combination of search terms was included (featuring in the titles, abstracts, or keywords):

- AI OR ARTIFICIAL INTELLIGENCE AND JOURNALISM OR NEWS
- ALGORITHM* AND JOURNALISM OR NEWS
- AUTOMAT* AND JOURNALISM OR NEWS

Several filters were applied to the search query. First, the search scope was limited to between 2010 and August 2023, as 2010 was when the first references to AI

Table 1. Overview of the included journals.

Included journals in database search		
Digital Journalism	Journalism Practice	Media Culture and Society
New Media and Society	Journal of Broadcasting	Convergence
Media and Communication	Electronic Media	African Journalism Studies
Journalism	Journalism Mass	Feminist Media Studies
Journalism Studies	Communication Quarterly	

Table 2. Overview of inclusion and exclusion criteria.

Inclusion criteria	Exclusion criteria
Peer-reviewed journal articles in media and journalism journals written in English and with a Q1 h-index score under communication	Book chapters, conference proceedings, editorial material, book reviews, articles in non-media and journalism journals (see inclusion list below), articles in other languages than English, non-peer reviewed articles, and articles with an h-index below Q1.
Empirical papers	Conceptual papers, review articles, research agendas, special issue introductions
Studies that focus on the development and use of AI by media organisations (also including external actors that take part in this development or the regulation of it). This choice was based on the original focus on the sociology of news production.	Articles focusing on AI in specific sub fields, such as investigative/data journalism, accountability reporting, AI in fact-checking, AI in journalism education. Articles with only limited mention of AI/Algorithms/Automation/Robot (not the direct object of study) or specific focus on audience metrics, social media and their algorithmic systems, news aggregators or search engines. Articles focusing on user perceptions (audience studies).

began to appear in journalism scholarship. Second, only peer-reviewed journal articles published in media and journalism journals with a Q1 h-index score based on the Scimago Journal & Country Rank from 2022 were included (see [Table 1](#) for overview of journals). This choice was made to focus on papers that have been widely read and cited and could be characterised as being integral to the development of how AI is researched in journalism studies. Third, only empirical papers were included to limit the focus to how AI has been studied. Fourth, specific sub-fields of journalism studies that have addressed AI in investigative reporting/data journalism and fact-checking were excluded to retain the focus on AI technologies that are used and impact journalistic practices more broadly (see [Table 2](#) for all inclusion and exclusion criteria). This produced an initial corpus of 233 articles, where 52 articles were included in the review after close readings of the abstracts and full papers in cases of doubt.

The database search was complemented with a snowballing approach from the 52 initially included articles, and the two identified special issues to ensure the corpus included articles that were widely cited but had not appeared in the database search. Nine additional papers were included as a result ([Figure 1](#)).

In total, 61 papers were part of the final review. The reviewing process was based on in-depth, iterative readings of the papers. To systematise this process, the tool “Notion” was used to structure the process, which allows you to add text and tags to articles. The entries included a summary and the primary definition of AI used in the paper, as well as tags relating to what applications of AI were studied, what countries the studies took place in, and the methods used. This process made it possible to include contextual information in the review to identify potential empirical

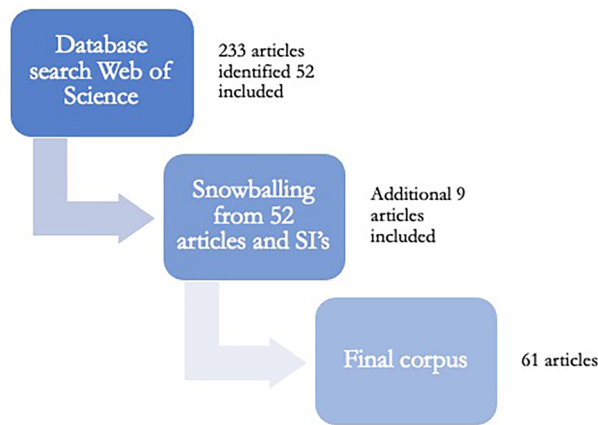


Figure 1. Illustration of the selection process.

gaps in the corpus. It was also helpful in guiding the placement of the studies under each of the six approaches.

In many cases, it was easy to place the articles based on, for example, the empirical approach (e.g., studying legal documents), but there were also more cross-cutting cases. In these cases, the selection was based on the focus of the analysis, whether it, for example, provided insights into the institutional or cultural context of AI. These assessments represent one of the weaknesses of the methodological approach in this paper, as the final placement was based on the author's reading and iterative interpretation. Other limitations include the narrow scope of the review, which focused on highly cited and read papers, which could exclude papers from less well-known or niche journals and thereby skew the geographic dispersion of the papers presented in the review. The same applies to the choice of only including papers written in English. Equally, the emphasis on studies exploring the use and development of AI systems by media organisations might have excluded papers that, for example, had a platform power focus while implicitly addressing AI.

Reviewing Journalistic Scholarship on AI

The review follows the structure of the six analytical approaches—the political, economic, institutional, organisational, cultural, and technological—characterising how the reviewed studies have broadly addressed AI both in terms of their methodology and what applications of AI they have studied before outlining what insights they have contributed with. As I approach AI as a collection of technologies (Brennen, Howard, and Nielsen 2018), I refer to the specific technologies discussed in each reviewed article to foreground their different foci. [Table 3](#) outlines the dominant applications of AI discussed in the literature and their related terms and provides a general definition summarising how most studies define the application.

Table 3. Overview of AI applications and their definitions.

Term used	Relating terms	General definition
Automated journalism	Robot journalism, algorithmic journalism, news automation	The use of AI to produce news content based on structured data, with references to the underlying subfield of Natural Language Generation (NLG)
News apps	Mobile news apps, including the use of personalisation and ranking algorithms	The use of AI to distribute news on apps
Personalisation	News personalisation, news recommenders, recommender systems	The use of AI systems that automatically filter and structure the news distribution according to pre-determined logics that personalises the distribution, often with references to recommender systems as the underlying AI system.
Computational news discovery and verification (CND & V) systems	Topic detection apps, news detection apps, verification apps	The use of AI to discover, detect, rank and verify news on social media platforms
Bots	News bots, chat bots	The use of AI to disseminate news on social media platforms and in some cases engage in conversational formats that personalise the distribution
AI broadly	AI, AI-systems, AI tools, automation	The unspecified use of AI across multiple functions in news

The Ethico-Political Context of News

Several studies take what can be called the ethico-political context of news-making as their analytical entry point to studying AI in journalism. Some studies focus on national or supra-national legal frameworks and how they affect the journalistic profession, also looking beyond Western democracies. Due to the history of self-regulation in journalism, some studies also focus on localised self-regulatory mechanisms, such as ethical guidelines. In contrast, other studies take a more practice-oriented approach, exploring how newsrooms are or could address emerging ethical guidelines and policies. Most studies focus on automated journalism and how it produces new legal questions, while the dominant methodology is document analysis with an emphasis on legal documents. As a shared characteristic, these studies address how AI induces the need for new policies to ensure “good” journalistic practice and how emerging legal frameworks covering AI affect journalism. With this focus, the research has provided insights on (1) emerging power shifts, (2) the need to look beyond Western democracies, (3) gaps in professional codes, and (4) the local challenges of successfully addressing emerging professional and ethical standards (Table 4).

One core dynamic studied is how the emerging legal frameworks produce power shifts and new risks for journalists. Such risks include being considered negligent and found liable for automated defamatory content of private individuals (Lewis, Sanders, and Carmody 2019), or more personal risks to journalists, whose positions become more vulnerable due to changes in who is assigned copyright (Kuai, Ferrer-Conill, and Karlsson 2022). Risks can also emerge due to the absence of concrete governance of media and journalism in regulation (Porlezza 2023a). These studies contribute insights into how legislation is strengthening the positions of already powerful actors in the media landscape while the autonomy of the journalistic institution is weakened (particularly in the Chinese case) (Kuai, Ferrer-Conill, and Karlsson 2022). This growing power

Table 4. Overview of dominant methods, applications, and geographies in the political approaches.

Analytical context	Main insight areas	Applications of AI	Methodologies	Geography
The ethico-political context of news	(1) Emerging power shifts, (2) the need to look beyond Western democracies, (3) gaps in professional codes, and (4) the local challenges of successfully addressing emerging professional and ethical standards.	Automated journalism (Díaz-Campo and Chaparro-Domínguez 2020; Jamil 2021b; Kuai, Ferrer-Conill, and Karlsson 2022; Lewis, Sanders, and Carmody 2019; Montal and Reich 2017). AI broadly (Diakopoulos and Koliska 2017; Porlezza 2023a, 2023b).	Document analysis (Diakopoulos and Koliska 2017; Díaz-Campo and Chaparro-Domínguez 2020; Kuai, Ferrer-Conill, and Karlsson 2022; Lewis, Sanders, and Carmody 2019; Montal and Reich 2017; Porlezza 2023a, 2023b) Qualitative interviews (Jamil 2021b; Montal and Reich 2017) Focus group (Diakopoulos and Koliska 2017)	North America (Diakopoulos and Koliska 2017; Lewis, Sanders, and Carmody 2019; Montal and Reich 2017) Asia (Jamil 2021b; Kuai, Ferrer-Conill, and Karlsson 2022) Europe (Porlezza 2023a, 2023b) Latin America (Díaz-Campo and Chaparro-Domínguez 2020)

asymmetry is visible in the dominant role of big tech—particularly platforms—in the legislation, where they receive better protection by the law (Kuai, Ferrer-Conill, and Karlsson 2022; Lewis, Sanders, and Carmody 2019) and are governed more clearly (Porlezza 2023a). Jamil (2021a) shows how the risks differ when looking beyond Western democracies. Concretely, she shows how, in the competitive authoritarian context of Pakistan, automated journalism might provide a doorway to further minimising media freedom for journalists and that questions of liability threaten the lives and livelihood of journalists in this context. Both Jamil (2021a) and Kuai, Ferrer-Conill, and Karlsson (2022) advocate for more sociocultural sensitivity when analysing the political conditions of newsmaking.

Another dynamic explored is the role of self-regulatory bodies of journalism and how they view AI as an ethical concern and provide guidance. Looking at existing deontological codes on automated journalism in Latin America, Díaz-Campo and Chaparro-Domínguez (2020) find that the existing guidelines remain valuable and relevant to some extent, but there are extensive gaps in the professional guidelines. In the context of the EU, Porlezza (2023b) finds that Finland is the only one out of 15 countries that directly addresses automation and personalisation in the press council's ethical code, highlighting how there continues to be minimal guidance available in most countries.

The last dynamic addressed relates to how AI policies are implemented in practice and the related struggles due to AI's complex nature and its continued framing as an unbiased technology. One study shows significant discrepancies between journalists' perceptions of what automated journalism disclosure should entail and the actual disclosure practices (Montal and Reich 2017). Diakopoulos and Koliska (2017) also highlight that achieving transparency might be difficult because of the hybrid sociotechnical nature of AI systems, where the exact location of decisions is not always clear-cut. Furthermore, they find that implementing these transparency practices is challenging due to a lack of business incentives and a fear of overloading users with information.

The Economic Conditions of News

Only two studies look at the economic conditions of news—one qualitative and one quantitative—exploring how the business models of media organisations have been affected by the broader economic changes brought on by AI and local newsrooms desires for how public support can best enable AI innovation. Their findings help to shed light on (1) how the innovation pace of AI is conducive to producing new market divides and (2) what forms of public funding are considered most conducive for AI innovation amongst local newsrooms (Table 5).

de-Lima-Santos et al. (2022) highlight how the innovation pace of AI as well as local and historical market conditions affect the ability of certain geographically located newsrooms in Brazil to keep up and develop sustainable business models around AI. Thereby inducing new market divides in the media landscape. The authors also find that many newsrooms have become more reliant on philanthropic short-term funding to pursue AI business models, which induces new challenges as they become dependent on inconsistent revenue models. Turning this issue on its head, Wilczek et al. (2021) explore what forms of public funding local newsrooms that pursue an AI-driven innovation strategy find more useful. Here, they find that direct financial support is not considered key; instead, local news organisations prefer the transfer of know-how.

Institutions and Their Logic

Several studies attend to the institutional context of news. One group of studies explores how AI as an “external force” influences journalism via other fields of power, while another group of studies examine how AI is institutionalised by media organisations. The latter studies often emphasise how this is needed to avoid threats of, for example, filter bubbles and to maintain existing journalistic values. The most used method is qualitative interviews, with only a few other methods employed—often in combination with interviews. Many of these studies engage specifically with Public Service Media (PSM) and personalisation. In general, AI is seen as entangled in institutionalist logics, and the papers provide insights into how these logics shape both the understanding of journalism and how AI systems are developed. They show how

Table 5. Overview of dominant methods, applications, and geographies in the economic approaches.

Analytical context	Main insight areas	Applications of AI	Methodologies	Geography
The economic conditions of news	(1) How the innovation pace of AI is conducive to producing new market divides, and (2) what forms of public funding are considered most conducive for AI innovation amongst local newsrooms.	AI broadly (de-Lima-Santos et al. 2022; Wilczek et al. 2021).	Qualitative interviews (de-Lima-Santos et al. 2022). Survey (Wilczek et al. 2021).	Europe (Wilczek et al. 2021) Latin America (de-Lima-Santos et al. 2022)

(1) external actors adopt and challenge journalistic doxa, (2) introduce new forms of capital, (3) affect how personalisation is institutionalised, and (4) how normative values are safeguarded and incorporated into AI systems (Table 6).

Several papers explore Bourdieu-inspired “field dynamics” and the role of external actors in adopting and challenging journalistic doxa. Wu, Tandoc, and Salmon (2019b) find that AI providers or developers are not seen as forcefully entering the journalistic field; instead, they are “implicit interlopers”, as Kunert (2020) describes it. This implicit entrance is achieved by strategically adopting the doxa or “rules of the game” of the journalistic field in how these new actors describe themselves and their relation to the news (Ananny and Crawford 2015; Usher 2017; Wu, Tandoc, and Salmon 2019b). Concretely, these actors describe themselves as supporting journalism’s democratic mission and economic sustainability, often highlighting how they are solving problems that existing (legacy) media have left unsolved (Ananny and Crawford 2015; Usher 2017; Wu, Tandoc, and Salmon 2019b). However, they also strategically challenge the journalistic field by positioning themselves as technology providers. Dörr (2016) and Kunert (2020) show how establishing a more mature market for automated journalism

Table 6. Overview of dominant methods, applications, and geographies in the institutional approaches.

Analytical context	Main insight areas	Applications of AI	Methodologies	Geography
Institutions and their logics	(1) How external actors adopt and challenge journalistic doxa, (2) introduce new forms of capital, (3) affect how personalisation is institutionalised, and (4) how normative values are safeguarded and incorporated into AI systems.	<p>Personsalisation (Bastian, Helberger, and Makhortykh 2021; Bodó 2019; Hildén 2022; Makhortykh and Wijermars 2021; Møller 2022, 2023a, 2023b; Rydenfelt et al. 2022; Sørensen 2020; Svensson 2023; Van den Bulck and Moe 2018).</p> <p>Automated journalism (Dörr 2016; Kunert 2020; Wu, Tandoc, and Salmon 2019a, 2019b).</p> <p>AI broadly (Ahmad, Haque, and Ibahrine 2023; Kristensen and Hartley 2023; Usher 2017)</p> <p>News apps (Ananny and Crawford 2015)</p>	<p>Qualitative interview (Ahmad, Haque, and Ibahrine 2023; Ananny and Crawford 2015; Bastian, Helberger, and Makhortykh 2021; Bodó 2019; Dörr 2016; Hildén 2022; Kristensen and Hartley 2023; Kunert 2020; Møller 2022, 2023a, 2023b; Rydenfelt et al. 2022; Svensson 2020; Van den Bulck and Moe 2018; Wu, Tandoc, and Salmon 2019a, 2019b).</p> <p>Document analysis (Ananny and Crawford 2015; Kristensen and Hartley 2023; Makhortykh and Wijermars 2021; Van den Bulck and Moe 2018)</p> <p>Content survey (Kristensen and Hartley 2023)</p> <p>Ethnography (Kristensen and Hartley 2023)</p> <p>Technology analysis (Dörr 2016).</p>	<p>Europe (Ananny and Crawford 2015; Bastian, Helberger, and Makhortykh 2021; Bodó 2019; Dörr 2016; Hildén 2022; Kristensen and Hartley 2023; Kunert 2020; Møller 2022, 2023a, 2023b; Rydenfelt et al. 2022; Sørensen 2020; Usher 2017; Van den Bulck and Moe 2018).</p> <p>North America (Ananny and Crawford 2015; Kristensen and Hartley 2023; Usher 2017).</p> <p>Asia (Wu, Tandoc, and Salmon 2019a, 2019b)</p> <p>Post-soviet states (Makhortykh and Wijermars 2021).</p> <p>Middle East (Ahmad, Haque, and Ibahrine 2023).</p>

produces increased institutional pressure on media to adopt automated journalism solutions. This external pressure leads to a growing institutionalisation of automated journalism and an increasing dependency on the providers who deliver the solutions or infrastructures for automated journalism applications. This shift produces the risk of AI providers becoming “explicit interlopers” by taking over not only the development of AI but also the function of news (Kunert 2020).

This expansion of journalism is also argued to increase the value of technical skills and solutions while devaluing journalism’s existing skills and products, thereby introducing new forms of capital (Møller 2023a; Usher 2017; Wu, Tandoc, and Salmon 2019a). Looking at the concrete development processes of recommender systems, Møller (2023a) shows how these dynamics are also detectable inside news organisations. He illustrates how data scientists import their own “data science doxa” that differs significantly from that of journalists and is associated with new forms of capital that more easily connect to forms of economic capital. This import of data science doxa, he argues, gives those with technical expertise an increasingly more powerful position during innovation processes. Similarly, Wu, Tandoc, and Salmon (2019b) find that the cultural capital of journalists is challenged as technical skills are becoming valued more highly in, for example, hiring processes. This shift leads to constant demand for technological upskilling, even in regions where AI is still in its infancy (Ahmad, Haque, and Ibahrine 2023).

A second dynamic explored under this approach relates to how journalistic institutions reshape AI technologies to fit with public service values (Sørensen 2020; Van den Bulck and Moe 2018) or within a journalistic approach to personalisation (Bastian, Helberger, and Makhortykh 2021; Bodó 2019; Møller 2022, 2023b; Rydenfelt et al. 2022; Svensson 2023). While Sørensen (2020) explores whether there is a difference between PSM and commercial media approaches to personalisation, two other studies examine how a journalistic logic to personalisation is obtained and negotiated with other competing logics (Bodó 2019; Svensson 2023). Svensson (2023) highlights how different logics are present during the development of recommenders, namely the market, democratic, programming, and personalisation logics, often resulting in a hybrid institutional logic shaping the final solution. Similarly, Bodó (2019) illustrates how recommender projects are shaped by a news personalisation logic distinct from the more generic platform logic of personalisation. While specific recommender projects might aim to move away from platform logics, Kristensen and Hartley (2023) show how media organisations’ dependencies on external infrastructure providers inevitably lead to emerging infrastructural influence through the logics of classification, standardisation, and datafication.

Taking a comparative approach to how AI is institutionalised, Van den Bulck and Moe (2018) show that there are also differences in how PSMs across different media systems engage with AI—some take a more cautious approach while others are more daring. Some expected patterns emerge, with eastern European PSMs being more apprehensive towards using personalisation, however, there are also surprising deviations as, for example, the generally first-moving Nordic PSMs have varying personalisation strategies. Moving beyond Western democracies, Makhortykh and Wijermars (2021) show how personalisation is interpreted differently in a post-soviet context, where there is almost no discussion of negative societal effects, except for

the threat of disinformation, which they connect to the state-controlled media environment.

A core focus in these studies of the institutionalisation of AI is how normative and PSM values are incorporated into these systems. Bastian, Helberger, and Makhortykh (2021) and Rydenfelt et al. (2022) find that editorial autonomy and diversity are core concerns related to personalisation. The former study also illustrates that a broad information offer, personal relevance, usability, and surprise are considered important, while the latter identifies two ethical “blind spots”, namely discrimination and privacy concerns. These “blind spots” are connected to the fact that these values are further away from classic journalistic norms and values and more connected to the development of AI systems (Rydenfelt et al. 2022). The studies also highlight how recommender systems require the operationalisation of values, which often lead to a reinterpretation and reassessment of said values (Bastian, Helberger, and Makhortykh 2021; Hildén 2022; Rydenfelt et al. 2022; Sørensen 2020). Operationalising diversity remains particularly difficult because existing measures are quite simple and tend to measure topical or genre diversity, which often leads to a more commercial understanding of diversity that challenges the institutionalisation of personalisation (Hilden 2022; Sørensen 2020). As a result, Møller (2023b) shows how only some values were generally embedded into the design of recommenders, namely those that are more easily operationalised, such as timeliness or relevance. As a result, human oversight and continued monitoring remained important guardrails to uphold other values, such as diversity. Møller (2022) also provides insights into how values are safeguarded and how the use of recommenders is normalised within the newsrooms by continuing to uphold the ideals of the editorial gatekeeper. This gatekeeping role was maintained by, among others, ensuring editorial control over parts of the website or by having ways to provide editorial input in the system, for example, by adding specific business rules that would affect the results of the recommenders.

The Organisational Context of AI Implementation

A smaller group of studies explore how AI becomes embedded into daily news practices and routines, emphasising the organisational enablers and barriers and the implications of these processes for journalistic practices and genres. These studies address a variety of AI technologies, which they explore from a design perspective or through a focus on the mutual shaping between technologies and social practices. Most studies draw on document analysis and interviews, while a few take an ethnographic approach. These studies tackle (1) the organisational enablers and barriers of AI implementation, (2) how to implement AI successfully, and (3) how such processes transform journalism (Table 7).

Several studies illustrate that specific organisational dynamics influence the adoption of AI applications. Diakopoulos (2020) illustrate how the use of CND tools is highly dependent on various factors, ranging from the willingness of the individual reporter to more contextual factors, such as slow or busy days. Young and Hermida (2015) find that a leadership change was incremental in transforming the LA Times Homicide Report from a blog to an automated journalism solution by enabling more support and recognition of technical skills. Rolandsson, Widholm, and Rahm-Skågeby (2022)

Table 7. Overview of dominant methods, applications, and geographies in the organisational approaches.

Analytical context	Main insights areas	Applications of AI	Methodologies	Geography
The organisational context of ai implementation	(1) The organisational enablers and barriers of AI implementation, (2) how to successfully implement AI, and (3) how such processes transform journalism.	AI broadly (Jones, Jones, and Luger 2022; Lopez et al. 2023). CND & V systems (Diakopoulos 2020) Structured news (R. Jones and Jones 2019) Bots (B. Jones and Jones 2019) Personalisation (Rolandsson, Widholm, and Rahm-Skågeby 2022) Automated journalism (Young and Hermida 2015)	Qualitative interviews (B. Jones and Jones 2019; Diakopoulos 2020, Jones, Jones, and Luger 2022; Lopez et al. 2023; R. Jones and Jones 2019; Young and Hermida 2015) Document analysis (B. Jones and Jones 2019; Jones, Jones, and Luger 2022; R. Jones and Jones 2019; Young and Hermida 2015) Ethnography (Lopez et al. 2023; Rolandsson, Widholm, and Rahm-Skågeby 2022)	Europe (B. Jones and Jones 2019; Jones, Jones, and Luger 2022; R. Jones and Jones 2019; Rolandsson, Widholm, and Rahm-Skågeby 2022) North America (Young and Hermida 2015) N/A (Diakopoulos 2020)

also show managerial ambitions played a dominant role in how the development of a recommender system unfolded, while B. Jones and Jones (2019) highlight how cultures of caution and existing technological infrastructures in large legacy organisations can further complicate the implementation of complex technologies.

Several studies also explore the conditions needed for successfully implementing AI. Some shed light on how collaborative endeavours are challenged by organisational structures that provide varying incentives for different disciplines within the organisation (B. Jones and Jones 2019; Lopez et al. 2023) or by a lack of knowledge of the AI system (Jones, Jones, and Luger 2022). The lack of knowledge can lead to mis- or non-use of these technologies. However, such instances can potentially be managed *via* interventions or user interfaces that make the systems more intelligible (Diakopoulos 2020; Jones, Jones, and Luger 2022; Lopez et al. 2023). Beyond intelligibility, Diakopoulos (2020) also points to the need for customizability so journalists can adjust the tools to different situations. The studies generally highlight the need for more participatory design processes, where journalists and technologists work more closely together throughout the entire design process to ensure the solutions are accepted and used once they are implemented (B. Jones and Jones 2019; Lopez et al. 2023; R. Jones and Jones 2019).

The studies that explore the mutual shaping of technology and practice have also illustrated the transformative effects of AI on journalistic practices. Automated journalism, for example, transformed crime reporting into a very standardised beat (Young and Hermida 2015), while CND systems affected what leads were seen as important

in the newsgathering stage (Diakopoulos 2020). The use of chatbots and experiments with structured news at the BBC also required journalists to develop new skills (e.g., producing good metadata) and produced changes in existing practices as journalists, for example, began to adjust their writing to fit the formats required by the atomised news templates. Thereby writing for machines rather than the audience (B. Jones and Jones 2019; R. Jones and Jones 2019). Rolandsson, Widholm, and Rahm-Skågeby (2022) also illustrate how AI projects can facilitate long-term organisational change. Concretely, they illustrate how a personalisation project transformed from being about providing recommendations to the audience to becoming a highly strategic project aimed at datafying the entire news organisation.

AI in Journalism as a Cultural Practice

Many studies situate AI within the cultural practices of journalism, engaging with how it might affect journalistic culture and identity. One study takes a cross-cultural approach and, uses quantitative analysis to explore journalists' attitudes towards AI adoption in Latin America, while the majority engage with the cultural practices inside the newsroom. A few studies explore the mediated meta-journalistic discourse on AI. The principal methodologies are interviews with editors and/or journalists and document analysis. The latter is the preferred methodology of the studies on meta-journalistic discourse. The studies generally focus on how journalists and editors make sense of and (re)articulate the role of AI in news, including the skills, core ideals and values of journalism and how they accept or resist AI. As writing news is at the core of journalistic identity, it is no surprise that the entrance of automated journalism has received much attention. These studies contribute with insights on (1) journalistic agency and the role of AI, (2) changes in journalistic skills and authority and (3) how AI is framed culturally (Table 8).

One dynamic that many studies explore is how journalist and editors see their agency in relation to AI. Most of the studies find that journalists and editors view AI as merely a tool that augments rather than replaces them, and several emphasise how humans will need to remain in the loop and control (Bucher 2017; Carlson 2015; Jamil 2021ab; Linden 2017a, 2017b; Milosavljević and Vobič 2019; Moran and Shaikh 2022; Rydenfelt 2021; Schapals and Porlezza 2020; Sirén-Heikel et al. 2019; Thäsler-Kordonouri and Barling 2023; van Dalen 2012; Yu and Huang 2021). De Haan et al. (2022), however, note that journalists' knowledge is often based on folk theories and that they are often unaware of the AI tools they use and how they impact their practice. Only the study by Munoriyarwa, Chiumbu, and Motsaathebe (2023) finds that there is a strong scepticism towards AI connected directly to fears of job loss and ethical concerns, while Jamil (2021b) also highlights how journalists in Pakistan view AI as a threat to their livelihood. As both studies look beyond the Western context, they illustrate distinct cultural differences. Interestingly, this difference is not detectable in the Chinese case, where the results resemble those conducted in Europe and the US (Yu and Huang 2021). This difference might indicate how attitudes change as AI becomes more normalised, as the introduction of AI in South Africa and Pakistan is more recent.

Three studies distinctly explore the social practices of attributing agency (and responsibility) to AI (Bucher 2017; Rydenfelt 2021; Sirén-Heikel et al. 2019). Bucher

Table 8. Overview of dominant methods, applications, and geographies in the cultural approaches.

Analytical context	Main insights areas	Applications of AI	Methodologies	Geography
AI in journalism as a cultural practice	(1) Journalistic agency and the role of AI, (2) changes in journalistic skills and authority, and (3) how AI is framed culturally.	AI broadly (Bucher 2017; De Haan et al. 2022; Duffy, Prah, and Ling Yan-Hui 2022; Jamil 2021a; Milosavljević and Vobič 2019, 2021; Moran and Shaikh 2022; Munoriyarwa, Chiumbu, and Motsaathebe 2023; Soto-Sanfiel et al. 2022; Yu and Huang 2021) Automated journalism (Carlson 2015; Linden 2017a, 2017b; Rydenfelt 2021; Schapals and Porlezza 2020; Sirén-Heikel et al. 2019; Thäsler-Kordonouri and Barling 2023; van Dalen 2012)	Qualitative interviews (Bucher 2017; Jamil 2021a; Milosavljević and Vobič 2019, 2021; Munoriyarwa, Chiumbu, and Motsaathebe 2023; Rydenfelt 2021; Schapals and Porlezza 2020; Sirén-Heikel et al. 2019; Thäsler-Kordonouri and Barling 2023; Yu and Huang 2021) Document analysis (Carlson 2015; Duffy, Prah, and Ling Yan-Hui 2022; Moran and Shaikh 2022; van Dalen 2012) Survey (Soto-Sanfiel et al. 2022) Ethnography (Bucher 2017)	Europe (Bucher 2017; De Haan et al. 2022; Linden 2017a, 2017b; Milosavljević and Vobič 2019, 2021; Moran and Shaikh 2022; Rydenfelt 2021; Schapals and Porlezza 2020; Sirén-Heikel et al. 2019; Thäsler-Kordonouri and Barling 2023) North America (Linden 2017a; Milosavljević and Vobič 2021; Moran and Shaikh 2022; Sirén-Heikel et al. 2019) N/A (Carlson 2015; Duffy, Prah, and Ling Yan-Hui 2022; van Dalen 2012) Asia (Jamil 2021a; Yu and Huang 2021) Latin America (Soto-Sanfiel et al. 2022) Africa (Munoriyarwa, Chiumbu, and Motsaathebe 2023)

(2017), for example, nuances how it is not a question of whether AI has agency; instead, AI should be seen as an organising framework guiding cultural practice, as AI becomes something to “think with”. Equally, De Haan et al. (2022) illustrate how journalists are often unaware of how AI systems implicitly affect their choices and remain passive in their stance towards these technologies. Two studies also find that managers strategically place human agency in contrast to technology in efforts to support AI implementation (Milosavljević and Vobič 2021; Yu and Huang 2021). In extension, Thäsler-Kordonouri and Barling (2023) find that the insistence on human control is an important factor in implementing automated journalism across local newsrooms in the UK.

The studies also point to how the entrance of AI leads to a reinterpretation of core journalistic tasks and skills to sustain journalistic authority. In this process, they ultimately “humanise” their profession by emphasising skills, such as creativity, humour, instinct, empathy, and contextual knowledge that are thought to be distinctly human (Bucher 2017; Carlson 2015; Milosavljević and Vobič 2019; Moran and Shaikh 2022; Schapals and Porlezza 2020; van Dalen 2012; Yu and Huang 2021). With this reinterpretation, journalists move away from more classical understandings of journalistic authority, connected to ideals of objectivity, speed, and accuracy, because these ideals are now seen as more connected with AI systems’ abilities and authority (Carlson 2015; van Dalen 2012). From a labour perspective, Carlson (2015) also finds the

emergence of new roles for journalists, such as meta-journalists who work with these tools. Nevertheless, many journalists continue to see the impact of automated journalism as minor (Thäsler-Kordonouri and Barling 2023). While some uses of automated journalism might lead to job loss, particularly of repetitive work, the strong journalistic ideology has generally served to mitigate job losses (Linden 2017a, 2017b).

Several papers also specifically highlight how (mediated) discourses around AI shape the cultural understanding of journalism (Carlson 2015; Duffy, Prah, and Ling Yan-Hui 2022; Moran and Shaikh 2022; van Dalen 2012). Looking at trade journals, Duffy, Prah, and Ling Yan-Hui (2022) find that AI is covered through a frame of inevitability and is generally viewed as a positive development, while Carlson (2015) finds an emphasis on hybridity in the way machines and journalists are framed. Moran and Shaikh (2022) point to how a utilitarian perspective also dominates the meta-discourses of the industry (e.g., funders and newsroom leaders). In contrast, journalists are more critical and address concerns regarding the profession and its public goals. A significant issue with these framings, as Duffy, Prah, and Ling Yan-Hui (2022) note, is that they can make it difficult to imagine alternatives around AI beyond the dominant frames.

The Technological Landscape and Development of AI

Many studies start their analysis from the technology and explore the deployment of AI technologies, engage with a process of building or experimenting with AI technologies, or examine the reconfigurations brought on by the development or use of AI. The primary methodologies are content surveys, interviews, and experimentation with AI technologies. While personalisation is very present, particularly in the studies that map the use of AI technologies, there is also significantly more variety in the applications studied than in prior approaches. These studies differ significantly from each other and, as a result, bring forward quite diverse insights into (1) how AI is deployed in newsrooms and its implications, (2) whether AI systems can “act” as journalists, and (3) how AI systems reconfigure journalistic decisions, values, and relations (Table 9).

Several studies have provided insights into what applications of AI are deployed by newsrooms, either globally (de-Lima-Santos and Ceron 2021) or concerning specific applications (Kunert and Thurman 2019; Lokot and Diakopoulos 2016; Sørensen 2013; Thurman 2011; Thurman and Schifferes 2012). On the global level, de-Lima-Santos and Ceron (2021) find that the dominant applications of AI in news are machine learning, computer vision, and planning, scheduling, and optimisation tools. In the context of specific AI technologies, some of the very early studies of personalisation illustrated how there was an identifiable shift towards more customisation and user control *via* the personalised features offered on the news sites. These studies also offered taxonomies for how to track the deployment of personalisation (Sørensen 2013; Thurman 2011; Thurman and Schifferes 2012). However, despite the possibilities for personalisation at this time, the sites remained predominately humanly edited, and editors were generally sceptical toward personalisation (Sørensen 2013; Thurman 2011). Kunert and Thurman (2019) conducted a follow-up study highlighting a shift towards deploying personalisation features in mobile environments. Moving beyond

Table 9. Overview of dominant methods, applications, and geographies in the technological approaches.

Analytical context	Main insights areas	Applications of AI	Methodologies	Geography
The technological landscape and development of AI	(1) How AI is being deployed by newsrooms and its implications (2) whether AI systems can “act” as journalists and (3) how AI systems reconfigure journalistic decisions, values, and relations.	Personalisation (Schjøtt Hansen and Hartley 2021; Kunert and Thurman 2019; Möller et al. 2018; Sørensen 2013; Thurman 2011; Thurman and Schifferes 2012) Automated journalism (Maiden et al. 2023; Stenbom, Wiggberg, and Norlund 2021; Thurman, Dörr, and Kunert 2017) Bots (Ford and Hutchinson 2019; Lokot and Diakopoulos 2016; Stenbom, Wiggberg, and Norlund 2021) CND & V systems (Fletcher, Schifferes, and Thurman 2020; Thurman 2018; Thurman et al. 2016) AI broadly (de-Lima-Santos and Ceron 2021; Wu, Tandoc, and Salmon 2019b) Structured news (Caswell and Dörr 2018) News apps (Weber and Kosterich 2018)	Experiment (Caswell and Dörr 2018; Fletcher, Schifferes, and Thurman 2020; Möller et al. 2018; Stenbom, Wiggberg, and Norlund 2021; Thurman 2018; Thurman et al. 2016) Content survey (Ford and Hutchinson 2019; Kunert and Thurman 2019; Lokot and Diakopoulos 2016; Sørensen 2013; Thurman 2011, 2018; Thurman and Schifferes 2012; Weber and Kosterich 2018) Qualitative interviews (Ford and Hutchinson 2019; Sørensen 2013; Wu, Tandoc, and Salmon 2019b) Workshop (Maiden et al. 2023; Thurman, Dörr, and Kunert 2017) Ethnographic (Schjøtt Hansen and Hartley 2021)	Europe (Schjøtt Hansen and Hartley 2021; Kunert and Thurman 2019; Maiden et al. 2023; Möller et al. 2018; Sørensen 2013; Stenbom, Wiggberg, and Norlund 2021; Thurman 2011; Thurman, Dörr, and Kunert 2017; Thurman et al. 2016; Thurman and Schifferes 2012) North America (Kunert and Thurman 2019; Thurman 2011; Thurman, Dörr, and Kunert 2017; Thurman and Schifferes 2012) N/A (Fletcher, Schifferes, and Thurman 2020; Lokot and Diakopoulos 2016; Thurman 2018; Weber and Kosterich 2018) Global (de-Lima-Santos and Ceron 2021) Oceania (Ford and Hutchinson 2019) Asia (Wu, Tandoc, and Salmon 2019b) Africa (Maiden et al. 2023)

personalisation, Thurman (2018) surveyed the use and features of CND systems (Thurman 2018), while Lokot and Diakopoulos (2016) provided a taxonomy of newsbots on Twitter. Here, they illustrate how some bots are used to repost content on social media, while others are used more innovatively to provide niche, geo-specific content, or commentary (Lokot and Diakopoulos 2016).

Another dynamic explored is how well AI technologies can mimic journalists. Two studies experiment with prototyping new tools to elicit insights (Caswell and Dörr 2018; Schifferes et al. 2014), which enable them to illustrate what directions are best for future development. In the context of story discovery, Schifferes et al. (2014) find that identifying key voices on social media might be the best option for identifying newsworthy content, while Caswell and Dörr (2018) illustrate how automated journalism projects can be expanded via an event-driven approach. Several studies

experiment with prototyping AI tools or presenting journalists with an AI tool to experiment with. The main focus of these studies is the evaluations of these tools where the judgements of journalists or editors are often used as “ground truths” to either “prove” the reasonable success at mimicking journalistic practices (Fletcher, Schifferes, and Thurman 2020; Maiden et al. 2023; Möller et al. 2018; Schifferes et al. 2014; Thurman, Dörr, and Kunert 2017; Thurman et al. 2016) or the failure to do so (Stenbom, Wiggberg, and Norlund 2021). Thurman et al. (2016) shed light on the fact that these tools are often built to mimic journalistic understanding of (in this case) newsworthiness. However, they also exhibit the same biases as journalists. The studies help highlight the limitations of using these tools by illustrating how automated journalism struggles to “act” as a journalist, as they, for example, lack contextual knowledge, produce functional but boring stories, or cannot interrogate the data (Stenbom, Wiggberg, and Norlund 2021; Thurman, Dörr, and Kunert 2017; Thurman et al. 2016). Thurman, Dörr, and Kunert (2017) also highlight constraints, such as resources or access to quality data, that limit the potential use of these systems. In contrast, Möller et al. (2018) show how a recommender system can be more diverse than its human counterparts by comparing the results of recommender systems with humanly curated news sites.

A few studies take a more socio-technical approach to AI in their studies, showing how AI systems reconfigure the news. Wu, Tandoc, and Salmon (2019c) show how existing news-making processes have become increasingly hybridised, and the decisions made can no longer be seen as purely human but must be seen as guided by algorithmic suggestions. Weber and Kosterich (2018) also highlight a hybridisation by exploring the code behind news apps. Here, they illustrate how news apps take over part of the editorial function by embodying a set of decisions usually taken by the editor, but in a way more geared towards user preferences due to the accuracy metrics applied. Following the development process of a personalisation system, Schjøtt Hansen and Hartley (2021) illustrate how existing journalistic values, such as timeliness and localness, are transformed to become AI-compatible, ultimately reshaping them alongside the broader understanding of news. Looking beyond the reconfigurations in the newsroom, Ford and Hutchinson (2019) show how a chatbot managed to remediate the relationship with the audience through a more informal tone and reach previously underserved audience groups but, as a result, also transformed the news genre.

Summarising and Identifying Gaps

The review illustrates how AI has been studied as a multifaceted phenomenon and that journalism scholarship is no longer confined within a utilitarian frame. Instead, AI has been explored critically to illustrate, for example, how problematic power shifts are emerging because of legislation or how AI technologies are institutionalised in ways that consider the normative values of the field. Thereby the review illustrates the continued relevance of the sociological approaches to studying AI in journalism. Particularly as these approaches have been adapted over the years to, for example, broaden the scope of studies within the cultural approach and through the emerging “design orientation” (Diakopoulos 2020) across both the institutional, organisational,

and even political approaches. Only a small minority of the papers maintain an analytical focus on the practical utility of AI—specifically in the earlier technological analysis of AI. Some papers also continue to problematise AI in a way that portrays a fear for the future of journalism, however, mainly to debunk this fear.

Table 10. Summarised overview of the review.

Analytical context	Main insights areas	Applications of AI	Methodologies	Geography
The ethico-political context of news	(1) Emerging power shifts, (2) the need to look beyond Western democracies, (3) gaps in professional guidance, and (4) the local challenges of successfully addressing emerging professional and ethical standards.	Automated journalism (5), AI broadly (3)	Document analysis (7), Qualitative interviews (2), Focus group (1)	North America (3), Asia (2) Europe (2), Latin America (1)
The economic conditions of news	(1) How the innovation pace of AI is inductive to producing new market divides, and (2) what forms of public funding are considered most conducive for AI innovation amongst local newsrooms.	AI broadly (2)	Qualitative interviews (1), Survey (1)	Europe (1), Latin America (1)
Institutions and their logics	(1) How external actors adopt and challenge journalistic doxa, (2) introduce new forms of capital, (3) affect how personalisation is institutionalised, and (4) how normative values are safeguarded and incorporated into AI systems	Personalisation (11), Automated journalism (4), AI broadly (3), News apps (1)	Qualitative interview (17), Document analysis (4), Content survey (1), Ethnography (1), Technology analysis (1)	Europe (15), North America (3), Asia (2), Post-soviet states (1), Middle East (1)
The organisational context of AI implementation	(1) The organisational enablers and barriers of AI implementation, (2) how to successfully implement AI, and (3) how such processes transform journalism.	AI broadly (2), CND & V systems (1), Automated journalism (1), Personalisation (1), Structured news (1), Bots (1)	Qualitative interviews (6), Document analysis (3), Ethnography (2)	Europe (4), North America (1), N/A (1)
AI in journalism as a cultural practice	(1) Journalistic agency, (2) journalistic skills and authority, and (3) the ontological boundaries of AI.	AI broadly (10), Automated journalism (8)	Qualitative interviews (10), Document analysis (4), Survey (1), Ethnography (1)	Europe (11), North America (4), N/A (3), Asia (2), Latin America (1), Africa (1)
The technological landscape and development of AI	(1) How AI is being deployed by newsrooms and its implications (2) whether AI systems can “act” as journalists and (3) how AI systems reconfigure journalistic decisions, values, and relations.	Personalisation (6), Automated journalism (3), Bots (3), CND & V systems (3), AI broadly (2), Structured news (1), News apps (1)	Content survey (8), Experiment (6), Qualitative interviews (3), Workshop (2), Ethnographic (1)	Europe (10), North America (4), N/A (4), Global (1), Asia (1), Africa (1) Oceania (1)

There is a dominant focus on automated journalism in the studies exploring the cultural practices of journalism and AI, whereas studies within the institutional approach strongly focus on personalisation. This may be because automated journalism was initially framed as taking over jobs, while personalisation was seen as challenging the core institutional task of journalism to support democracy. Furthermore, there is a geographic focus on the US and Northern Europe, and the economic context of AI in journalism remains underexplored. Specific methodologies dominate, with qualitative interviews being the most broadly applied. These patterns represent topical, geographic, and methodological gaps, which should also be addressed in future literature (Table 10).

The central gap this article aims to address is analytical and relates to the role played by AI technologies in the analyses. While the studied AI technology is often well-defined early in the respective papers, it is usually taken for granted in the analysis, figuring more as the occasion than the object of study. Concretely, there is a tendency to prioritise social explanations and to engage with AI in essentialist ways by continuously referring to the “AI system” or the application without engaging with the underlying materiality. Furthermore, most studies focus on the newsroom as the analytical site and overlook the actors, sites and practices that shape AI development outside the newsroom. This returns to the choice of methodologies in the current body of literature, which remain very interview-centred, with journalists and editors as the preferred interviewees. Grounded in this identified gap, I argue for a material and epistemological turn in the study of AI in journalism that would broaden the scope of enquiry in journalism scholarship.

Advancing a Material and Epistemological Turn: Sensitising Insights from the Field of Critical AI Studies

In proposing a material and epistemological turn in journalism scholarship to address the identified analytical gap, I draw inspiration from CAIS. It is important to note that this is a highly pluralistic and multi-disciplinary “field in formation” (Raley and Rhee 2023) that has its foundation within the humanities and social science (Seaver 2017).⁶ The main aims of the field have been to contribute with “countermythologies and epistemologies” (Raley and Rhee 2023, 188) that can help destabilise the dominant representations of AI that often portray AI technologies as inherently powerful (Elish and Boyd 2018; Ziewitz 2016). There is a shared emphasis on moving beyond essentialist accounts of AI that risks fetishising the technologies by allowing them to be abstract entities viewed as capable of producing effects on the context they enter (Crawford 2016). Such essentialist accounts of AI invisibilise the sociotechnical labour required to develop, deploy, and maintain such systems. As Crawford (2016) notes, they “foreclose more complex readings of the political spaces in which algorithms function, are produced, and modified” (79). Contrarily, CAIS scholars have argued for the need to provide situated accounts of AI (Jaton and Sormani 2023) that highlight how AI systems are “uncertain, provisional and messy fragile accomplishments” (Kitchin 2017, 18). Such accounts should, therefore, address how these systems are dependent on professional practices, data structures and large computing infrastructures to work (Jaton 2017; Kitchin 2017; Neyland and Möllers 2017) and increasingly shaped by how DL and GenAI models can be accessed (Hua and Raley 2023).

With a foundation in this initial characterisation of the field, I advance three analytical sensitivities that can augment the existing analytical approaches outlined by Anderson (2013). I expand the analysis beyond the sociology of news to include new theoretical repertoires that directly engage with the materiality and epistemological assumptions underpinning AI development and how this development has evolved with, for example, GenAI. The discussion of these sensitivities is not exhaustive, but it illustrates how they could expand future studies of AI in journalism.⁷

Attending to the “Technical” in Socio-Technical

The first analytical sensitivity concerns the role of materiality in the current analysis of AI in journalism. Generally, the analytical focus of the studies reviewed is on the subject(s) (i.e., the journalists, editors, or technologists). While some papers address the human-technology dichotomy (e.g., Stenbom, Wiggberg, and Norlund 2021) or highlight the socio-technical nature of AI (e.g., Diakopoulos and Koliska 2017; R. Jones and Jones 2019), there remains a human-centric focus in the studies, where the central analytical sensitivity is placed on the “socio” rather than the “technical” with an emphasis on journalistic voices. This focus produces a dualism in the analysis where agency is predominantly afforded to the human actors at the expense of analytical attention toward materiality. In contrast, some of the emerging empirical work critically addressing AI highlight the importance of considering how the materiality of AI (e.g., the data or employed metrics) might resist or shape developments, for example, by changing the course of the project (Jaton 2017; Neyland and Möller 2017; Neyland 2019). These studies draw on a specific understanding of materiality stemming from STS, where “materiality is usually understood as a relational effect. Something becomes material because it makes a difference” (Law 2010, 73). By paying attention to the moments when materiality makes a difference, the analyses can become attuned to the specific ways the use and development of AI systems are inducing transformations in journalism—sometimes very subtly. This is not an argument to revert to a technology-centric analysis but to enable a better understanding of how the materiality of AI technologies shapes the conditions of possibilities for the development of AI in the news sector—and what the implications are because even the anticipation of new technology can create long-lasting effects in newsrooms (Schjøtt and Hartley 2024).

This proposal is perhaps the least “radical”, as several papers by journalism scholars have argued for the need to attend to the non-human actors in the newsroom (e.g., Lewis and Westlund 2015; Primo and Zago 2015). A few papers in the review also already have a more symmetrical sensitivity to the question of agency. These papers, for example, attend to how AI systems are actively, yet perhaps invisibly, part of shaping newsroom practices and culture (see, e.g., Bucher 2017; Wu, Tandoc, and Salmon 2019c) or how the need to metricise values when developing a recommender system take part in producing new understandings of those exact values (Schjøtt Hansen and Hartley 2021). However, these studies remain a minority. To engage with the materiality, future journalism scholarship should move away from studying what journalists think about AI or what tools they use and, instead, address the situated ways that, for example, annotation practices redefine certain understandings of news

categories. Additionally, this work could study how the involvement of journalists and editors is shaped by the knowledge tools deployed by data scientists. Such insights would allow newsrooms to understand how these sociotechnical practices affect, for example, the aim of developing systems that align with journalistic values and better mitigate potential problematic aspects of such practices.

Furthermore, it will be important to pay attention to changes in the materiality of AI because, as Hua and Raley (2023) argue, DL and GenAI have different material conditions than other forms of AI. Such models are often only represented in a single line that activates the predictive, but inaccessible, model.⁸ The enclosed nature of these models, therefore, requires scholars to engage with the materiality differently. Scholars could, for example, study the localised implementation of such models where ancillary code is added that re-trains or adds post-processing steps to the model results, while also paying attention to how the model providers might constrain such actions (see Hua and Raley 2023). Paying close attention to material differences can help reveal where new dependencies are emerging, as integrating such models often requires alignment with the protocols of developer platforms, such as TensorFlow (Hua and Raley 2023).⁹ For newsrooms, where such infrastructural dependencies are already a reality, it will be key to understand how the material possibilities of DL and GenAI further entrench existing or create new forms of dependencies.

Studying the Methodologies and Histories of AI

The second analytical sensitivity builds on the first by emphasising the need to situate the study of AI within its epistemologies and histories (Mackenzie 2017). Due to the focus on the social explanations of AI, there is generally little attention paid to how AI systems import unique methodologies and histories into the context of journalism. No studies, for example, address the histories of the datasets used or the epistemologies underpinning evaluation practices. In CAIS, scholars have started to pay attention to the techniques involved in dataset production and evaluation of AI systems, highlighting how datasets cannot simply be seen as operational tools needed to make AI work. Instead, they are composed of sociocultural data and entangled in power relations (Thylstrup 2022). As an example, Denton et al. (2021) provide a genealogy of the famous dataset ImageNet, tracing the history of its construction. Through this historical account, they illustrate the implicit assumptions, norms, and values that have been integral in developing this dataset. Similarly, Crawford and Paglen (2021) interrogate the underlying assumptions of several datasets for visual AI systems by exploring their taxonomies and how their construction impacts the workings of these systems in societies. Others have turned to the practices of those who label and annotate datasets, raising questions of inequality, labour, and power (Miceli and Posada 2021; Orr and Crawford 2024). Scholars have also explored the role of so-called “ground truths” or benchmarks in evaluating AI. Here they illustrate how these ground truths, on the one hand, determine how the problem to be solved is technically defined, while they, on the other, are integral to constructing the validity or certainty around the system’s functioning and serve as referents for future developments (Grill 2022; Jaton 2017; Raji et al. 2021). Others have also examined how ideas of error are historically constructed and how the epistemological nature of error is changing with

the advent of ML, which affects how error can be mobilised in public controversies (Aradau and Blanke 2021) or how error becomes a political site in which the public problems of AI—and also now GenAI is decided (Ananny 2024).

These studies show how understanding the social and cultural histories of ML and DL systems can help to problematise their application in localised domains, such as news. A good example of this type of research is Vrijenhoek's (2023) analysis of the largest open-source dataset for training and evaluating news recommenders, the MIND dataset. Here, she shows how the dataset advances a somewhat limited understanding of diversity, which shapes how diversity more generally becomes operationalised in the news sector. Further genealogies of datasets could help show how this could also impact journalistic ideals around fairness or potentially produce discriminatory effects for the audience. Alternatively, scholars could analyse how evaluative practices founded in an experimental epistemology of "good enough" (Amoore 2020) affect the organisational processes of testing and monitoring AI systems. Such studies would expand the scope of enquiry from focusing on changes in journalistic epistemologies brought on by AI to studying how AI epistemologies bring about new transformations in journalism. These types of studies could also help tackle new questions that newsrooms face relating to, for example, GenAI, where the non-deterministic structure of neural networks challenges existing ideals around authorship and explainability. These changes require a better understanding of the reasonings of such models and how that can be "translated" to human reasoning (Fazi 2021).

Unfolding the Wider Eco-System of AI in Journalism

Tracing the methodologies and histories of AI systems inevitably expands the scope of where AI should be studied. Both open-source datasets and models, for example, originate from outside the newsroom and are also affected by broader standardisation processes induced by, for example, cloud computing providers. The third analytical sensitivity, therefore, addresses the need to unfold the wider ecosystem or socio-technical assemblage of AI (Kitchin 2017). A few reviewed studies have already moved outside the newsroom and looked towards the broader news infrastructures.¹⁰ Looking, for example, at how start-ups become part of defining the journalistic field (Ananny and Crawford 2015; Usher 2017), how Big Tech logics are impacting journalistic practice (Kristensen and Hartley 2023), or how legal actors are affecting the journalistic agency and producing new risks (Jamil 2021a; Kuai, Ferrer-Conill, and Karlsson 2022; Lewis, Sanders, and Carmody 2019). However, the majority of studies stay within the bounds of the newsroom and fail to capture the entire technological infrastructure, including the institutions, markets, and legislations that shape these technologies (Kitchin 2017). CAIS scholars have already identified new emerging sites of importance, such as AI competitions (Luitse, Blanke, and Poell 2024; Orr and Crawford 2024) and cloud computing providers who increasingly hold power over how AI can be developed (Luitse 2024). Luchs, Apprich, and Broersma (2023) also direct attention towards online courses on AI provided by Big Tech companies, showing how they consolidate their power through these courses by providing new avenues of recruitment and centring the courses around their model infrastructures. These studies illustrate the necessity to move beyond the usual suspects in journalism

research, as these new actors are increasingly affecting the development of AI, which, in turn, shapes the localised AI practices in the newsrooms. Such research could include studying the broader technological stack, such as hardware, cloud computing, and developer platforms, and emerging industry initiatives aimed at supporting AI implementation in the news to understand new dependencies and the influence these actors have in the news space. In the wake of GenAI, new licensing deals around training data have emerged, such as the recent deal between the Associated Press (AP) and OpenAI (O'Brian 2023), but also new partnerships aimed at answering emergent questions around data provenance, such as Project Origin (Project Origin 2024). These new initiatives will require careful analytical attention to understand how this will affect, for example, the economic models of news publishers.

Concluding: New Directions for the Study of AI and Journalism

In this paper, I have provided a review of journalism scholarship on AI across the six approaches outlined by Anderson in 2013. This diagnostic approach allowed for an analysis of how scholarship has addressed questions concerning AI in journalism from different perspectives, namely the political, economic, institutional, organisational, cultural, and technological context. While the review shows that the approaches provided by the sociology of news have proven helpful in addressing AI as an object of study in journalism, the comparative discussion with CAIS also shows how such approaches overlook the technological agency, methodologies, histories, and wider assemblage of AI. Rather than proposing additional approaches to the study of AI, the paper instead advances an overarching material and epistemological turn in journalism scholarship on AI that can be applied across the existing approaches. This turn is concretised through three analytical sensitivities that can augment the existing approaches to better capture how AI as a unique technology impacts journalism. They do so by (1) placing analytical attention on the materiality of AI as opposed to the human subjects, (2) by starting from the epistemologies of AI as opposed to the epistemology of journalism, and (3) by moving outside the newsroom to study the actors and processes that increasingly sociotechnically govern AI development in newsrooms. These sensitivities contribute to journalistic scholarship by moving beyond seeing AI as an occasion to revisit the newsrooms to study how journalists use or perceive AI technologies. Instead, new studies should take inspiration from theories that directly address AI technologies and examine how their materiality and epistemologies might raise new questions for journalism scholarship and the news industry. There are many directions this research could take. To conclude, I offer a few potential avenues for future research that illustrate how these sensitivities could help augment research tackling political, economic, institutional, organisational, cultural, and technological aspects of AI in journalism. These include:

- Situated ethnographic accounts of AI systems in the making that pay particular attention to the methodologies and materials that shape this process, such as the available data and ways of evaluating AI systems.

- Genealogies and critical analysis of “golden standard” datasets and benchmarks used in journalism to better understand how their histories and inherent assumptions affect the field of journalism and its democratic role.
- Studies of how emerging institutional intermediaries shape how AI is conceptualised, developed, and used (e.g., training providers, competition platforms, funders, or consultancies).
- Studies of how cloud computing providers and GenAI model providers increasingly hold power over and shape AI development through their easy integration with specific developer platforms and through the material constraints of localised implementation.

As these suggestions reveal, new research methodologies might be needed that move beyond the dominant approach of interviewing journalists, editors, or even the more technical teams. These lines of research might require more technographic approaches (Luitse 2024) to understand the governing dynamics of platforms and AI model providers or more ethnographic studies of AI development that can capture the different ways the actors involved come to know and negotiate the functioning of the systems. Hua and Raley (2023) also show how more advanced AI models and GenAI constantly require us to engage with these technologies in new ways. A material and epistemological turn will, therefore, be important to understand how these existing and emerging technologies’ unique materiality, epistemologies and ownership structures will affect journalism now and in the future.

Notes

1. In this paper, I adopt the notion of AI to describe what is at the centre of the reviewed studies. This choice was made because AI has become the dominant term used to describe “a collection of ideas, technologies, and techniques that relate to a computer system’s capacity to perform tasks normally requiring human intelligence” (Brennen, Howard, and Nielsen 2018, 1).
2. Carlson (2022) argues that the study of journalistic epistemology has become a cornerstone in journalism research, defining it as studying the “coordinated practices of various agents to produce news” (64).
3. I use CAIS as a common denominator for the field, which builds on existing insights from Critical Algorithm Studies (Seaver 2017) and is related to many different fields, such as Science and Technology Studies (STS) and also have emerging subfields, such as Critical Dataset Studies (Thylstrup 2022).
4. Generative AI is defined as “a type of artificial intelligence technology that can create new content, such as text, images, audio, video, or other media, based on the data it has been trained on and according to written prompts provided by users” (Diakopoulos et al. 2024).
5. The results were compared to other databases such as Scopus and Google Scholar which are generally known to have a more diverse journal selection. Still, the results were very similar and due to the hybrid approach, it was deemed sufficient to use Web of Science.
6. It is important to note, that the scholars referenced here come from a variety of fields among also STS and would perhaps not identify as CAIS scholars, but here it is used as an umbrella term to capture research that engages critically with the constitution and epistemologies of AI systems.
7. For further inspiration for reading see e.g., “Critical Algorithm Studies: a Reading List” or “Knowing Machines”.

8. Such models can also often only be accessed via Application Programming Interfaces (API's) (Hua and Raley 2023).
9. Hua and Raley (2023) argue that DL and GenAI have induced a shift from an analytical focus on algorithms to one that engages with models, as these interactive systems are highly composite and no longer strictly algorithmic.
10. This could be argued to represent an infrastructural turn in journalism scholarship (Young and Hermida 2024), which this paper further extends by looking towards actors who are not directly linked to the news industry or emerging forms of collaborations and partnerships.

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