

# Design Thinking for Journalism in the AI age\*

Towards an Innovation Process for Responsible AI Applications

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## ABSTRACT

Artificial Intelligence (AI) technologies offer opportunities for news organizations to become more efficient. At the same time, the adoption of AI in journalism raises concerns, including whether such efficiency-driven AI applications will endanger the democratic function of news organizations. In this paper, we present a Design Thinking (DT) process that draws on co-creation with journalists and aims to balance efficiency and quality standards within an innovation process toward a responsible AI application for journalism. We developed the DT process based on interdisciplinary literature and tested it based on a project with journalism students from a leading German journalism school.

## CCS CONCEPTS

- General and references → Cross-computing tools and techniques → Design

## KEYWORDS

Artificial Intelligence, Efficiency, Quality, Journalism, Design Thinking

## 1 Introduction

The history of Artificial Intelligence (AI) is rooted in various disciplines, such as mathematics, statistics, computer science, psychology, and engineering. Its use for scalable products took off only recently, particularly due to increased computing power and data availability. This also applies in journalism, where AI has been described as “an umbrella term for a range of technologies” [9:1914] that draw on rule-based systems and machine learning. In part due to the economic challenges they face, 68 percent of the news organizations investigated by Beckett [6:32] have started to adopt AI to make journalists’ work more efficient, and 20 percent name AI as a tool to improve their business models. News organizations have explored and exploited the manifold potential of AI

\*Design Thinking for Journalism in the AI age

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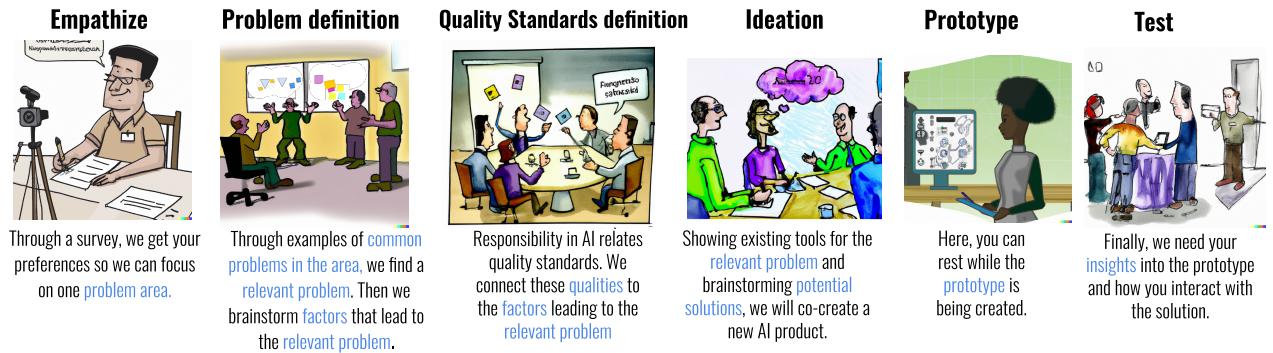
C+j • DATAJ Conference, June, 2023, Zurich, Switzerland

throughout all stages of their news value chains [10,35], for instance, to monitor issues, check facts, create content, recommend news, and optimize paywalls. Accordingly, news organizations have entered the “AI age.”

At the same time, however, the adoption of AI in journalism raises concerns, including whether such efficiency-driven AI applications will endanger the democratic function of news organizations [5,13], which involves securing “the quality of public discourse” [16:193]. For instance, Dörr, Köberer and Haim [12] argue for more accountability and transparency in the AI-based production of journalistic content. Regarding the personalized distribution of journalistic content, Helberger, Karppinen, and Makhortykh [16] state that AI applications should present users with content diversity to prevent the formation of possible filter bubbles. Accordingly, AI applications in journalism should not only be responsible for increasing the efficiency of news organizations but also adhere to journalistic quality standards. However, while the implementation of efficiency and quality standards may lead to trade-offs [34], research and best practice guidelines on how news organizations can balance efficiency and quality standards and, thereby, develop responsible AI applications, remain scarce (e.g., [4,15,21,27,31]).

Moreover, technology providers without dedicated journalistic roots are increasingly shaping how AI is used in journalism [28]. Due to this external dependency, we argue that there is an urgent need for more user-centric approaches that involve journalists in the co-creation of AI applications [2,11,19,30]. Methodologically, we argue that Design Thinking (DT) offers such an approach. After all, DT allows for a human-centric perspective on complex problems [3] and helps organizations with their innovation processes [26], not least in the realm of AI-driven innovation [33].

Against this background, in this paper, we present a DT process that draws on co-creation with journalists and aims to balance efficiency and quality standards during the innovation of AI applications in news organizations. We conceptualized the DT process based on literature from computer science, journalism studies, and DT. We tested it through a project with 15 journalism students from a leading German journalism school between December 2022 and February 2023. This pilot project aimed to develop a low-fidelity prototype of a responsible AI application for local journalism. After all, a significant challenge facing journalism today lies in



**Figure 1. DT process infographic for responsible AI applications (images produced with DALL-E)**

the collapse of local news provision [32] with potentially severe consequences for local communities and, more broadly for democratic societies [22].

The remainder of this paper is structured as follows: section 2 summarizes the DT process that we developed and assessed; section 3 presents related work and compares it with our DT process; section 4 draws conclusions.

## 2 DT Process for Responsible AI

Our innovation process for responsible AI (Fig. 1) draws on the widely applied DT approach developed by the Stanford Design School [20:313]. In order to adapt this approach to journalistic needs, we incorporated software engineering techniques, particularly from requirements engineering, that aim to identify user needs not only from a functional but also from a qualitative point of view, i.e. qualities such as transparency and explainability, among others, should be amalgamated into software production [25].

Furthermore, these techniques also bring necessary trade-offs—which often show up when implementing quality standards [8]—to light early in the design process. For instance, the implementation of more transparency may result in less privacy. Early detection of this trade-off would allow mitigation, such as implementing stricter privacy regulations in other parts of the proposed software. Accordingly, it is necessary to balance such quality standards with techniques such as those proposed by Chung et al. [8]. The gray hexagons in Fig. 2 show where we adapted the Stanford Design School's original DT process.



**Figure 2. DT adapted for responsible AI in Journalism**

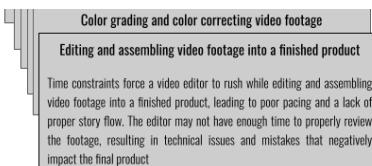
For the first DT step, “empathize”, an online survey was conducted to identify the most relevant problem area along the news value chain in local journalism. Participants were asked to identify activities where economic pressure, time

constraints, and/or the need to meet specific quality standards affect local journalists the most. Based on this survey (provided upon request), time constraints regarding video creation were identified as the most relevant problem area. All but one of the subsequent DT steps—i.e., “problem definition”, “quality standards definition”, “ideation”, and “testing”—were conducted via in-person workshops to facilitate collaboration and co-creation among the participants. The DT “prototyping” step was, however, undertaken by the authors without the involvement of the participants (because the participants had only limited expertise regarding existing algorithms in AI). In the following, we present the DT steps in more detail.

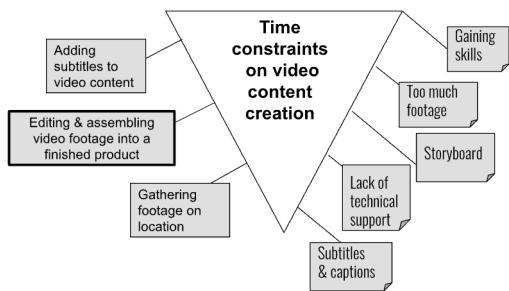
### 2.1 Definition of the problem

The goal of this workshop was to obtain meaningful and actionable problem statements regarding time constraints during video creation. For that purpose, problem example cards were created to speed up the acquisition or recall of knowledge (Fig. 3). Participants were asked to define the core problem in two steps. First, they were asked to select the three most relevant problems presented in the example cards and to suggest further problems themselves. Second, from this selection, they were asked to define the core problem. As Fig. 4 shows, time constraints regarding editing and assembling video footage into a finished product were identified as the core problem.

Next, participants were asked to specify factors that lead to this core problem. For that purpose, the triangle technique [18] was applied. It visualizes the problem definition through a triangular center, the core problem on the left, and the factors leading to this core problem on the right (Fig. 4).



**Figure 3. Cards with examples related to video creation**

**Figure 4. Triangle technique for defining the problem**

## 2.2 Definition of quality standards

The goal of the next workshop was to define relevant journalistic quality standards for editing and assembling video footage into a finished product. To facilitate a discussion regarding possible trade-offs, quality standards were related to possible functionalities of the AI application. For that purpose, cards were created where quality standards were linked to problem factors (Fig. 5). At this point, problem factors (Fig. 4) were conceptualized as functionalities. The quality standards were determined based on the Code of the German Press Council as well as literature on journalistic quality.

With the back of the cards indicating only the quality standards and using the notation from the Non-Functional Requirement framework [8], participants were instructed to model corresponding relationships. Fig. 6 shows an example of such a model. Arrow valences indicate the types of relationship between quality standards where a "+" indicates a contribution and a "-" indicates a conflict.

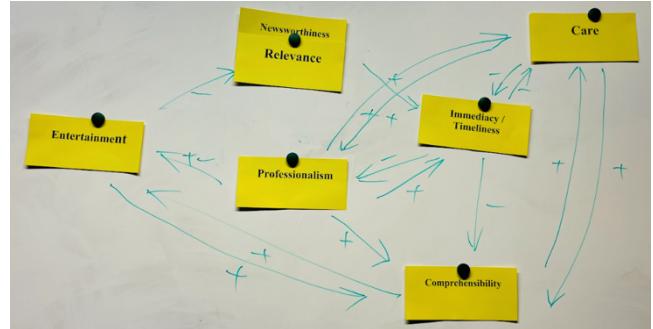
## 2.3 Ideation

The goal of this workshop was to co-create the main prototype idea. For that purpose, participants were presented with existing AI applications for video creation to facilitate the ideation of an innovative AI application. Subsequently, using resources from earlier workshops (e.g., problem factors, here conceptualized as functionalities, and quality standards) participants were asked to prepare a logical sequence of how the AI application would address the problem identified. More specifically, a timeline was created indicating which functionalities and which corresponding quality standards are necessary at which point in the ideated AI application (Fig. 7).

## 2.4 Prototype

The DT process facilitated the prototyping of the AI application in different ways (Fig. 7). First, the problem factors (Fig. 4) were transformed into functionalities of the AI application. Second, the logical order of features was given by

Quality: Care	Factors:
Research is an indispensable instrument of journalistic due diligence. The publication of specific information must be carefully checked for accuracy in light of existing circumstances. Its sense must not be distorted or falsified by editing, title, or picture captions.	Storytelling Subtitles and captions

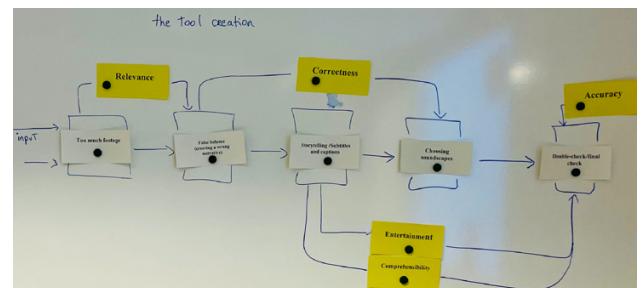
**Figure 5. Quality standards cards related to problem factors****Figure 6. Modeling trade-offs between quality standards**

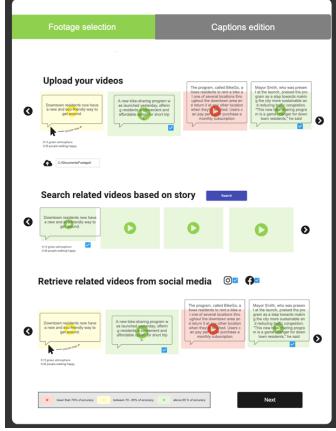
the participants to simplify the notion of inputs and outputs that are required by the envisioned AI application. Third, functionalities were mapped to quality standards to support the selection of corresponding technologies.

From this, the authors compiled a low-fidelity prototype using mock-up and sketching techniques for each of the proposed functions. Fig. 8 shows the resulting prototype for the footage selection function. Prototypes for all functions of the AI application are available ([link](#)).

## 2.5 Test

The goal of the last workshop was to determine whether the developed prototype met the participants' requirements. The workshop consisted of two steps. First, participants were asked to assess the prototype regarding its functionalities and quality standards. Second, participants suggested changes for the prototype to tailor it even further to the originally defined core problem (Fig. 9). Based on this feedback, the prototype was refined. This testing was iterated two times, once in-person during the workshop, and once digitally via a shared online document.

**Figure 7. Technique for ideating the prototype**



**Figure 8. Footage selection with AI**

### 3 Embedding into related work

Halskov and Lundqvist [14] have used domain and technology inspiration cards to accelerate knowledge gathering and simplify DT workshops. This practice has been also applied by AI developers such as Nexocode [23]. In our DT process, we also used cards, not only to speed up the process but also to facilitate collaboration and co-creation among participants during the workshops. Sinders and Ahmad [29] applied a DT approach that moves from general to more specific questions, thereby adding more complexity in each subsequent workshop. Our DT process applied a similar approach, as we first identified a broad problem and then worked through the complexity by gradually breaking the problem down. In addition, we considered the bottom-up property of DT during the definition of quality standards, i.e., by using the notation from the Non-Functional Requirement framework [8].

Furthermore, Tang [30] has used DT to collect as many ideas as possible without considering feasibility or rationality. We agree with the authors that free brainstorming can facilitate creativity. However, we argue that particularly during the prototyping step of the DT process, feasibility considerations are necessary, and, in fact, emerge naturally. After all, during this step, one needs to design an AI application that is computationally feasible to develop and organize corresponding functionalities (and quality standards) in a logical order. Finally, especially in computer science, DT approaches have focused on finding solutions in order to agilize DT. For instance, Ahmed et al. [1] have focused on data-driven problem discovery rather than eliciting it from participants, while Parizi et al. [24] have proposed a recommendation system to optimize techniques selection during each step of the DT process.

### 4 Conclusions

While AI technologies offer opportunities for news organizations to become more efficient, the adoption of AI in



**Figure 9. Testing the prototype using the whiteboard**

journalism raise concerns, namely whether such efficiency-driven AI applications will endanger the democratic function of journalism. Accordingly, we argue that AI applications in journalism should be responsible so that they not only increase the efficiency of news organizations but also adhere to journalistic quality standards.

Therefore, in this paper, we present a DT process that draws on co-creation with journalists and balances efficiency and quality standards with the goal to innovate responsible AI applications in journalism. We developed the DT process based on interdisciplinary literature and assessed it based on a project with 15 journalism students from a leading German journalism school. In sum, the project developed a low-fidelity prototype of a responsible AI application that aims to solve a core problem in local journalism, namely *time constraints regarding editing and assembling video footage into a finished product*. With its specific functionalities, the developed prototype aims to increase efficiency and thereby mitigate time constraints. At the same time, it incorporates journalistic quality standards.

Journalists are increasingly involved in the co-creation of AI applications [2,11,14,19,29,30], however, contrary to our DT process, these co-creation approaches have not applied specific techniques to accommodate quality standards; the so-called non-functional requirements that the area of software engineering has been investigating for more than 20 years. As presented in this paper, these requirements are, however, relevant to developing responsible AI applications, i.e., AI applications that increase journalistic efficiency and adhere to journalistic quality standards.

However, DT has been also criticized because it may restrict creativity due to its formally structured process [17,36]. Accordingly, in the future, further techniques could be incorporated into DT. For instance, Dimitrakopoulou and Lewis [11] suggest merging DT with techniques that facilitate more reflective listening processes to improve the empathizing step of the DT process. After all, this is probably the most important step in engaging participants with TD. This is corroborated by Chaplin [7]. Halskov and Lundqvist [14] emphasize the importance of early use of diverse prototypes, for example: sketches on a whiteboard, digital 3D models, or scenarios, among others, which can be used to filter the design space, i.e. the problem space. Kolko [17], in turn, proposes the use of lateral thinking, which involves examining a situation from different, also unexpected, perspectives.

## ACKNOWLEDGMENTS

We thank the journalism students for participating in the DT project.

## REFERENCES

- [1] Bakhtiyar Ahmed, Thomas Dannhauser, and Nada Philip. 2018. A lean Design Thinking methodology (ldtm) for machine learning and modern data projects. In *2018 10th Computer Science and Electronic Engineering (CEEC)*, IEEE, Colchester, United Kingdom, 11–14. DOI:<https://doi.org/10.1109/CEEC.2018.8674234>
- [2] Tanja Aitamurto, Mike Ananny, Chris W. Anderson, Larry Birnbaum, Nicholas Diakopoulos, Matilda Hanson, Jessica Hullman, and Nick Ritchie. 2019. HCI for accurate, impartial and transparent journalism: Challenges and solutions. In *Extended Abstracts of the 2019 CHI Conference on Human Factors in Computing Systems*, ACM, Glasgow Scotland UK. DOI:<https://doi.org/10.1145/3290607.3299007>
- [3] John Alford and Brian W Head. 2017. Wicked and less wicked problems: A typology and a contingency framework. *Policy and Society* 36, 3 (July 2017), 397–413. DOI:<https://doi.org/10.1080/14494035.2017.1361634>
- [4] Jack Bandy and Nicholas Diakopoulos. 2021. Curating quality? How Twitter's timeline algorithm treats different types of news. *Social Media + Society* 7, 3 (July 2021). DOI:<https://doi.org/10.1177/20563051211041648>
- [5] Mariella Bastian, Natali Helberger, and Mykola Makhortykh. 2021. Safeguarding the journalistic DNA: Attitudes towards the role of professional values in algorithmic news recommender designs. *Digital Journalism* 9, 6 (July 2021), 835–863. DOI:<https://doi.org/10.1080/21670811.2021.1912622>
- [6] Charlie Beckett. 2019. *New powers, new responsibilities: A global survey of journalism and artificial intelligence*. London School of Economics and Political Science (LSE), London.
- [7] Heather Chaplin. 2016. Guide to journalism and design. *Tow Center for Digital Journalism*. Retrieved from [https://www.cjr.org/tow\\_center\\_reports/guide\\_to\\_journalism\\_and\\_design.php](https://www.cjr.org/tow_center_reports/guide_to_journalism_and_design.php)
- [8] Lawrence Chung, Brian A. Nixon, Eric Yu, and John Mylopoulos. 2000. *Non-functional requirements in software engineering*. Springer Science + Business Media, New York.
- [9] Mark Deuze and Charlie Beckett. 2022. Imagination, algorithms and news: Developing AI literacy for journalism. *Digital Journalism* 10, 10 (November 2022), 1913–1918. DOI:<https://doi.org/10.1080/21670811.2022.2119152>
- [10] Nicholas Diakopoulos. 2019. *Automating the news: How algorithms are rewriting the media*. Harvard University Press, Cambridge.
- [11] Dimitra Dimitrakopoulou and Seth C. Lewis. 2022. The generative dialogue framework and the pursuit of better listening by journalists: A design-centered approach for more constructive conversations with audiences. *Digital Journalism* ahead-of-print (May 2022). DOI:<https://doi.org/10.1080/21670811.2022.2075415>
- [12] Konstantin Dör, Mario Haim, and Nina Köberer. 2017. Normative Qualitätsansprüche an algorithmischen Journalismus. In *Gesellschaft ohne Diskurs? Digitaler Wandel und Journalismus aus medienethischer Perspektive*, Alexander Filipović, Marlis Prinzing and Ingrid Stapf (eds.). Nomos, Baden-Baden, 121–134. DOI:<https://doi.org/10.5771/9783845279824-121>
- [13] Mario Haim and Andreas Graefe. 2018. Automatisierter Journalismus: Anwendungsbereiche, Formen und Qualität. In *Journalismus im Internet*, Christian Nuernbergk and Christoph Neuberger (eds.). Springer Fachmedien Wiesbaden, Wiesbaden, 139–160. DOI:[https://doi.org/10.1007/978-3-531-93284-2\\_5](https://doi.org/10.1007/978-3-531-93284-2_5)
- [14] Kim Halskov and Caroline Lundqvist. 2021. Filtering and informing the design space: Towards design-space thinking. *ACM Trans. Comput.-Hum. Interact.* 28, 1 (February 2021), 1–28. DOI:<https://doi.org/10.1145/3434462>
- [15] Natali Helberger. 2019. On the democratic role of news recommenders. *Digital Journalism* 7, 8 (September 2019), 993–1012. DOI:<https://doi.org/10.1080/21670811.2019.1623700>
- [16] Natali Helberger, Kari Karppinen, and Lucia D'Acunto. 2018. Exposure diversity as a design principle for recommender systems. *Information, Communication & Society* 21, 2 (February 2018), 191–207. DOI:<https://doi.org/10.1080/1369118X.2016.1271900>
- [17] Jon Kolko. 2018. The divisiveness of design thinking. *interactions* 25, 3 (April 2018), 28–34. DOI:<https://doi.org/10.1145/3194313>
- [18] Gerd Macke, Ulrike Hanke, and Pauline Viehmann. 2008. *Hochschuldidaktik: lehren, vortragen, prüfen*. Beltz Weinheim, Basel.
- [19] Brian McKernan, Jennifer Stromer-Galley, Ania Korsunska, Sarah E. Bolden, Patrícia Rossini, and Jeff Hemsley. 2022. A human-centered design approach to creating tools to help journalists monitor digital political ads: insights and challenges. *Digital Journalism* ahead-of-print (April 2022). DOI:<https://doi.org/10.1080/21670811.2022.2064321>
- [20] Pietro Micheli, Sarah J. S. Wilner, Sabeen Hussain Bhatti, Matteo Mura, and Michael B. Beverland. 2019. Doing design thinking: Conceptual review, synthesis, and research agenda. *J Prod Innov Manag* 36, 2 (March 2019), 124–148. DOI:<https://doi.org/10.1111/jpim.12466>
- [21] Cristina Monzer, Judith Moeller, Natali Helberger, and Sarah Eskens. 2020. User perspectives on the news personalisation process: Agency, trust and utility as building blocks. *Digital Journalism* 8, 9 (October 2020), 1142–1162. DOI:<https://doi.org/10.1080/21670811.2020.1773291>
- [22] Ragnhild Kristine Olsen, Victor Pickard, and Oscar Westlund. 2020. Communal news work: COVID-19 calls for collective funding of journalism. *Digital Journalism* 8, 5 (May 2020), 673–680. DOI:<https://doi.org/10.1080/21670811.2020.1763186>
- [23] Dorota Owczarek. 2021. Applying design thinking to artificial intelligence: Why should you use it in your AI-based projects? *Nexocode*. Retrieved from <https://nexocode.com/blog/posts/applying-design-thinking-to-ai>
- [24] Rafael Parizi, Marina Moreira, Igor Couto, Sabrina Marczak, and Tayana Conte. 2022. Tool proposal for recommending design thinking techniques in software development. *JSERD* 10, 3 (March 2022). DOI:<https://doi.org/10.5753/jserd.2021.1931>
- [25] Roxana Lisette Quintanilla Portugal, Luiz Marcio Cysneiros, and Julio Cesar Sampao Do Prado Leite. 2022. Explainability in a time of socially responsible software. In *2022 IEEE 30th International Requirements Engineering Conference (RE)*, IEEE, Melbourne, Australia, 295–301. DOI:<https://doi.org/10.1109/RE54965.2022.00044>
- [26] Daniel Schallmo and Klaus Lang. 2020. *Design Thinking erfolgreich anwenden: So entwickeln Sie in 7 Phasen kundenorientierte Produkte und Dienstleistungen* (2., aktualisierte Auflage ed.). Springer Gabler, Wiesbaden [Heidelberg]. DOI:<https://doi.org/10.1007/978-3-658-28325-4>
- [27] Anna Schjøtt Hansen and Jannie Møller Hartley. 2021. Designing what's news: An ethnography of a personalization algorithm and the data-driven (re)assembling of the news. *Digital Journalism* ahead-of-print (October 2021). DOI:<https://doi.org/10.1080/21670811.2021.1988861>
- [28] Felix M. Simon. 2022. Uneasy bedfellows: AI in the news, platform companies and the issue of journalistic autonomy. *Digital Journalism* 10, 10 (November 2022), 1832–1854. DOI:<https://doi.org/10.1080/21670811.2022.2063150>
- [29] Caroline Sinders and Sana Ahmad. 2021. The labor behind the tools: Using design thinking methods to examine content moderation software. *interactions* 28, 4 (July 2021), 6–8. DOI:<https://doi.org/10.1145/3470492>
- [30] Yingying Tang. 2020. Promoting user advocacy through design thinking in the age of automated writing. In *Proceedings of the 38th ACM International Conference on Design of Communication*, ACM, Denton TX USA, 1–6. DOI:<https://doi.org/10.1145/3380851.3416784>
- [31] Neil Thurman, Seth C. Lewis, and Jessica Kunert. 2019. Algorithms, automation, and news. *Digital Journalism* 7, 8 (September 2019), 980–992. DOI:<https://doi.org/10.1080/21670811.2019.1685395>
- [32] Karin Wahl-Jorgensen. 2019. The challenge of local news provision. *Journalism* 20, 1 (January 2019), 163–166. DOI:<https://doi.org/10.1177/1464884918809281>
- [33] Amanda J. Weller. 2019. Design Thinking for a user-centered approach to artificial intelligence. *She Ji: The Journal of Design, Economics, and Innovation* 5, 4 (2019), 394–396. DOI:<https://doi.org/10.1016/j.sheji.2019.11.015>
- [34] Jess Whittlestone, Rune Nyrrup, Anna Alexandrova, and Stephen Cave. 2019. The role and limits of principles in AI ethics: Towards a focus on tensions. In *Proceedings of the 2019 AAAI/ACM Conference on AI, Ethics, and Society*, ACM, Honolulu HI USA, 195–200. DOI:<https://doi.org/10.1145/3306618.3314289>
- [35] Bartosz Wilczek and Mario Haim. 2022. Wie kann Künstliche Intelligenz die Effizienz von Medienorganisationen steigern? *Medienwirtschaft* 19, 4 (2022), 44–50.
- [36] Sofie Willemsen, Tamara Witschge, and Sabrina Sauer. 2021. Improvisation and entrepreneurial journalism: Reimagining innovation. *Journalism Studies* 22, 11 (August 2021), 1487–1503. DOI:<https://doi.org/10.1080/1461670X.2021.1951618>