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RESEARCH ARTICLE

REVISED Automated news in practice: a cross-national exploratory study

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Abstract

Background

This article provides a comprehensive picture of the current state of automated news—understood here as the auto-generation of journalistic text through software and algorithms—as well as to where it is headed. For this, I look at 18 news organisations in Europe, North America and Australia, following a strategic sample inspired by Hallin and Mancini's (2004) media system typology.

Methods

To conduct this cross-national exploratory study, I made use of semi-structured interviews with editorial staff, executives and technologists. I also rely on Actor-network theory (ANT) to tell when an *interference* is made to an otherwise *linear* situation, thus endowing automated news with a sense of agency.

Results

Overall, my findings show that the main interferences concern alternate data sources (e.g., news organisations' internal feeds, crowdsourced material), in-house interfaces that allow for more journalistic participation (e.g., internal self-editing tools, notification streams) and output other than text (e.g., automated audio summaries for voice assistants).

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Any reports and responses or comments on the article can be found at the end of the article.

Conclusions

Although these changes lead to greater journalistic professionalisation, they could also make news organisations become too dependent on Big Tech companies for data acquisition and dissemination of automated news products. That said, mutual negotiations and a re-alignment of interests may occur as platforms increasingly face journalistic challenges.

Keywords
automated news, automated journalism, algorithmic journalism, computational journalism, news production, actor-network theory



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REVISED **Amendments from Version 2**

The following changes were made in this version 3:

It is specified how interviews data were gathered, in the larger scope of the PhD project. Elements of data analysis using the ANT framework are also shared.

The section detailing ANT has been shortened to avoid citing technical terms that went unused in the study.

A word of caution is added to the part on Hallin and Mancini in the Discussion/Conclusion. It discourages drawing a causal relationship with the rest of our findings, presenting it as an interesting research window instead.

Any further responses from the reviewers can be found at the end of the article

Introduction

In recent years much attention has been given to automated news, a computer process generally understood as the auto-generation of journalistic text through software and algorithms, with no human intervention in-between except for the initial programming (Carlson, 2015; Graefe, 2016). Automated news—which is also sometimes referred to as "automated journalism", "algorithmic journalism" or "robot journalism"—relies on a basic utilisation of Natural Language Generation (i.e., NLG), a computer technique that has been used for several decades to generate text in areas like sports, finances and weather forecasting (Dörr, 2016). In the case of automated news, NLG algorithms are used to fetch information on external or internal datasets, this in order to fill in the blanks left on pre-written text. This resembles a bit the game "Mad Libs" (Diakopoulos, 2019), as programmers or editorial staff need to come up with templates that, on the one hand, include enough elements that can be predicted in advance and, on the other hand, can be connected to a big enough data flow.

Because of these limitations, only a small range of stories can be automated this way, for instance election results, financial news or sports summaries. Although there is little machine learning involved at the moment, this is becoming a growing area of interest: some machine learning applications of NLG production are already being advertised on the websites of companies that specialise in delivering automated content to business, media, and governmental organisations alike (Narrativa, no date 1); the European Union-funded project EMBEDDIA is looking at including elements of machine learning in automated news generated using pre-written templates to make it less formulaic and nicer to read (see Leppänen, 2023; Rämö & Leppänen, 2021); and the Czech news agency ČTK has been experimenting with machine learning techniques to generate automated news templates, with the help of a research team at the University of West Bohemia (Stefanikova, 2019). Recent breakthroughs related to large language models (e.g., ChatGPT, Google's Bard) have certainly stirred up debate, yet for the moment there is reason to believe that their opacity and unreliability do not make for journalistic usage[1].

Automated news started to be more discussed in the 2010s as *The Los Angeles Times* began covering homicides in an automated fashion (Young & Hermida, 2015) and launched a tool to generate earthquake alerts (Schwencke, 2014), while The Associated Press partnered with the firm Automated Insights to automate corporate earnings stories (Colford, 2014). Proponents of automated news typically develop their technology in-house, outsource it to an external content provider or use third-party solutions that let journalists design their own automated stories. For instance, the *Washington Post* developed an in-house tool to produce short automated pieces during the 2016 Rio Olympics (WashPost PR Blog, 2016a); *Le Monde* collaborated with the firm Syllabs to automatically cover the results of the 2015 regional elections in France (Rédaction du Monde.fr, 2015); and the BBC subscribed to an online platform, Arria NLG Studio, that lets journalists template out their own automated stories using a type of No-code language that makes it accessible to editorial staff with little computing experience (Molumby & Whitwell, 2019). As for its types of usage, automated news can be used to publish simultaneously at scale, as the Swiss media group Tamedia did with the generation of almost 40,000 hyperlocal stories to report on the outcome of a referendum (Plattner & Orel, 2019), or serve as first drafts to assist journalists with their own writing, as this seems to be the case at *Forbes* and at the *Wall Street Journal* (Willens, 2019; Zeisler & Schmidt, 2021).

In this article extracted from my PhD thesis (Danzon-Chambaud, 2023b)[2], I will provide a more complete picture of the use of automated news, conducting a cross-national exploratory study for this. I will rely on Actor-network theory (ANT) concepts to distinguish when an interference is made to otherwise *linear* situations where initial intent is kept and where it does what it is supposed to do. My sample for this research is made of 18 organisations based in 11 countries, which are representative of three media types (i.e., public service broadcasters, newspapers, news agencies). It follows a sampling strategy inspired by Hallin and Mancini's (2004) media system typology as I looked at newsrooms that belong to the Mediterranean, North/Central and North Atlantic models. Due to COVID-19 limitations, I have made use of semi-structured interviews that were conducted remotely between September 2020 and April 2021, with email exchanges taking place

1: At the time of writing, the New York Times reported that they and other outlets were shown a tool developed by Google, which is reportedly able to avoid the "pitfalls of generative A.I" (Mullin & Grant, 2023). Yet there is little information available at the moment to verify this statement.

2: Except for a few exceptions, this article uses the same wording as my PhD thesis.

up until 2022 to make sure content remained current and accurate. Other elements like screenshots and online material were also analysed in complement to these research interviews.

Algorithms in news production

To begin with, I will provide a brief overview of recent developments in the use of algorithms for news production. The first has to do with data mining techniques. Diakopoulos (2019) illustrates how advanced machine learning models—in other words the use of algorithms to make statistical inferences or classifications based on a large corpus of data—were used in investigative journalism to retrieve newsworthy material off a massive amount of documents. He cites the work of *The Atlanta Journal Constitution*, which managed to expose 2,400 doctors that have been disciplined for sexual misconduct in the United States while examining more than 100,000 records, using for that an algorithm that scored and sorted through documents based on the likelihood that an abuse had, indeed, actually occurred. That said, Stray (2019) highlighted how the use of such models in investigative journalism also comes with its own set of issues, like high error margins that need to be compensated with estimates, difficulties in accessing the data in the first place, or the high costs of deploying such models just for a one-off project. However, collaborative efforts in investigative journalism today could help solve some of these issues, as shown by the growing use of machine learning by the International Consortium of Investigative Journalists, in investigations like the "Implant Files", the "Mauritius Leaks", the "Luanda Leaks" or the "Pandora Papers" (Díaz-Struck *et al*., 2020; Díaz-Struck *et al*., 2021; Walker Guevara, 2019; Woodman, 2019).

Another manifestation of algorithmic news production can be found in initiatives that aim at automating fact-checking (see Danzon-Chambaud, 2020). Diakopoulos (2019) identifies similar machine learning methods where a trained algorithmic model can be deployed on textual data so as to reveal claims that are worth fact-checking. This is for instance what Duke University Reporters' Lab has been doing to verify some of CNN's transcripts with a software called "ClaimBuster". Diakopoulos also writes about more basic methods that consist in matching textual data against a database made of previous fact-checks and reliable data, as in the British charity Full Fact' efforts to debunk false claims in screen captions. In his report for the Reuters Institute for the Study of Journalism, Graves (2018) essentially details the same two approaches while putting a special emphasis on *stance detection*, a machine learning technique that tries to figure out whether a claim is supported or not.

In terms of algorithmic news production, though, automated news is by far what has got the most media and scholarly attention. Leaving aside the fret caused by the use of the term "robot journalism"—which, again, is inaccurate since it is only software and has no mechanical part (see Lindén & Dierickx, 2019)—automated news is generally talked about in two complementary ways: to compare its performance against real, human-written text and to assess its potential impacts on the labour market. In a systematic literature review I conducted on automated news research (Danzon-Chambaud, 2021a), I found that scholarship on readers' perceptions evaluated it to be very close to human-written text, with the exception of reading for pleasure (see also Graefe & Bohlken, 2020). Yet, as far as studies on practice were concerned I was unable to formulate a similarly cohesive and insightful argument. Most of the time automated news is viewed as a rather "passive" actor that, at best, helps journalists with routine tasks while they focus on more demanding work or, at worst, plays the role of a cold technology about to supplant them. I believe there is a fine line between these two, and am therefore interested in the following research questions:

RQ1. What results do we yield when we give agency to automated news?

RQ2. What potential implications does this bear for journalism practice and for journalism as a whole?

Methods

To answer these questions, I will conduct an exploratory study that spans across groups of countries, so as to have a diverse range of news organisations included in this research. I have chosen a sampling strategy inspired by Hallin and Mancini's (2004), which has often been used as a guiding framework to draw cross-national strategic samples of news organisations (see Cornia *et al.*, 2019; Cornia *et al.*, 2020; Menke *et al.*, 2018; Sehl *et al.*, 2019; Sehl & Cornia, 2021; Sehl *et al.*, 2021; Van den Bulck & Moe, 2018). Hallin and Mancini distinguish three types of media systems, based on their analysis of a set of dimensions that range from the structure of media markets to professionalisation and the role of State. These are: the "Mediterranean" or "Polarised Pluralist Model", which includes countries such as France, Spain and Italy and is characterised, among others, by a low level of journalistic professionalisation—not dissimilar to political activism—and by strong connections with the State given delayed liberalisation in these countries (even if commercial influences have progressively grown in importance); the "North/Central European" or "Democratic Corporatist Model", which concerns countries like the Nordics, Germany and Switzerland and where the media are considered social institutions that need to be protected by the State due to the pluralistic and consensus-based nature of these democracies, but still have a high degree of commercialisation and journalistic professionalisation; and the "North Atlantic" or "Liberal Model", which extends to countries like Canada, the United States and the United Kingdom, where commercialisation and journalistic professionalisation are relatively high and the role of the State moderated, even if sometimes commercial influences can circumscribe journalistic independence.

As for choosing media types, I have decided to include news agencies, newspapers and public service media for the following reasons: first, the use of automated news at news agencies is well established, especially in Europe (see Fanta, 2017); second, it can be argued that newspapers are more likely to engage with this form of technology, as their business model that is under threat because of the digital turn forces them to be more innovative, as opposed for instance to commercial broadcasters that can still rely on stable advertising

revenues and on other types of incomes (Cornia *et al.*, 2019); third, public service media can be considered leaders in providing "thorough" data journalism pieces to audiences (see Borges-Rey, 2016; De Maeyer *et al.*, 2015), especially as data journalism experts are more likely to be hired at public service broadcasters in Germany (Beiler *et al.*, 2020) and as public service media in Australia developed their own in-house solutions (de-Lima-Santos *et al.*, 2021): this can let us posit that the kind of programming skills that is at use in data scraping activities can also be leveraged to set up automated news.

For this exploratory study, I have relied on purposive sampling to select 18 news organisations, with each pair representing a different combination of media types and media systems (see Table 1). Due to COVID-19 limitations, semi-structured interviews with editorial staff, executives and technologists were conducted remotely between September 2020 and April 2021 (see Appendix A), with email exchanges taking place up until 2022 to make sure content remained current and accurate. The questions I asked generally followed the same structure (see the example of the questionnaire used with the *Washington Post* under "data availability"), while still retaining a degree of flexibility to adapt to the interviewee's or the organisation's specifics. It is important to mention that my interviewing strategy falls into the larger scope of my PhD project: the first questions involved descriptive aspects that were mostly used for this study while the remainder concerned more interpretative matters, which were used in another part of the dissertation. That said, there was sometimes an overlap as my interviewees would give their opinion while describing systems and share technical details when asked about their views.

To do this study, I obtained approval from my university's research ethics committee. Among these interviewees were 8 BBC staffers that I could gain access to thanks to a secondment I did with my research program. Interviewees were contacted by email or *via* social media, a gatekeeper's approval being sometimes needed[3]. Their names were not divulged so that they could speak more freely, although it is most likely that their hierarchy knew that they were participating in this research project. Written informed consent was obtained from each of the participants, and they were given the opportunity to review some of their statements that dealt with potentially sensitive or unclear information, but not my own interpretation over what they shared. My exchanges were rather smooth, my interviewees generally knowing what I was asking about and not being caught off-guard (they were given an indication of what will be discussed, but were not handed the interview questions in advance). I asked for clarifications in follow-up emails when needed. Finally, sex and gender were not considered to be particularly relevant in this study: as such, interviewees were not asked to disclose their gender, but in a strictly binary sense it turned out that 23 of them were male and 5 were female, thus reflecting a gender gap that could be further investigated.

I also analysed material published online (e.g., blog posts, trade publications, etc.) so as to have a better overview of the way automated journalism is implemented: these are linked to or referenced as such in my findings section; otherwise, information comes from statements collected over the course of my interviews. In addition, screenshots of automated news software or material that was found online or forwarded to me by research participants are also featured here. These elements are essentially informative, as they were used to complement my research interviews and to verify what my interviewees have said.

Table 1. News organisations studied based on media systems and media types[4].

Media systems	News agencies	Newspapers	Public broadcasters
North Atlantic	Associated Press (United States) Reuters (United Kingdom)	Washington Post (United States) The Times (United Kingdom)	BBC (United Kingdom) ABC (Australia)
North/Central	STT (Finland) NTB (Norway)	Stuttgarter Zeitung (Germany) Tamedia (Switzerland)	YLE (Finland) Bayerische Rundfunk (Germany)
Mediterranean	AFP (France) ANSA (Italy)	El Confidential (Spain) Rossel/Sudpresse (Belgium/France)	France Bleu (France) RTVE (Spain)

3: These "gatekeepers" could be, for instance, members of the marketing and advertising team, editorial managers or media executives.

4: There are a few shortcomings in this selection: first, Australia is not examined in Hallin and Mancini's work for practical reasons, but they do specify that both Australia and New Zealand have close connections to Western European countries; second, Hallin and Mancini describe Belgium as a mixed case that sits between the Democratic Corporatist (i.e., North/Central) and the Polarised Pluralist (i.e., Mediterranean) models: in this study, I have included it under the latter category as Rossel and its subsidiary Sudpresse own titles in France and in French-speaking Belgium; third, there is the issue of limiting myself to Western news organisations, as discussed in my literature review and also in subsequent work on media systems (see Hallin & Mancini, 2011); finally, even if the Spanish newspaper *El Confidential* does not have a print edition, it defines itself as a "digital newspaper" (*diario digital*), which is why it is included here.

ANT analytical framework

To give agency to automated news and no longer see it as a "passive" technological artefact, I will make use of concepts that belong to Actor-network theory (ANT), which I will briefly outline here. A fundamental aspect of ANT is that it essentially revisits sociology using a "bottom-up" perspective and rejects more traditional "top-down" frameworks. Instead, it encourages the researcher to follow, from scratch, a "rich bestiary of significant actors" (Clark, 2020, p. 160)—or rather *actants* (Blok, 2019; Crawford, 2005)—which involves human and non-human elements that can be as diverse as (Michael, 2017a, p. 5) "mundane objects, exotic technologies, texts of all sorts, nonhuman environments and animals". The term "actor-network" in itself speaks to the idea that every actor and all of its attributes—such as thinking, writing or loving for humans—are never entirely cut out from each other, thereby creating a "web of relations" that stretches "both within and beyond the body" and across which force or effect is distributed (Law, 1992, p. 384; Primo, 2019, p. 2). To better understand this, Law uses the following metaphor about himself (1992, pp. 383–384): "If you took away my computer, my colleagues, my office, my books, my desk, my telephone I wouldn't be a sociologist writing papers, delivering lectures, and producing "knowledge." I'd be something quite other—and the same is true for all of us." As such, ANT is therefore well suited to studying change in practice (Plesner, 2009); in the case of journalism, it helps account for all the "tools of the trade" (e.g., web searches, databases, smartphones) that make it as it is today, and can be used to document journalistic innovation, including automated news (Primo, 2019, p. 2).

Another marker of ANT is the concept of *translation*: not to be confused with language translation, ANT's *translations* rather speak to a phenomenon whereby *actants* come together to form an actor-network while re-aligning their interests (in several steps, though not detailed here). In doing so they potentially disengage themselves from other networks they belong to[5]. At the same time, *spokespersons* or *actants* that play a more central role gradually emerge. As Callon (1984, p. 224) put it: "Translation is the mechanism by which the social and natural worlds progressively take form. The result is a situation in which certain entities control others." That being said, for the actor-network to be able to last in time, successful *enrolment*, or (*ibid*., p. 211) "the device by which a set of interrelated roles is defined and attributed to actors who accept them", needs to be sustained, making it a structure where relational power is always up for negotiations (Michael, 2017a). If robust enough, though, it may give rise to a *macro actor* that is able to restructure society as whole (Cooren, 2009; Czarniawska, 2016).

Actor-networks can transport force or effect in either two ways: as an *intermediary* where meaning is maintained and where outputs can be predicted by inputs, and as a *mediator* where meaning is changed and where inputs are never a good predicator of outputs (Latour, 2005). To explain these specifics, Latour gives the following example:

- A properly functioning computer could be taken as a good case of a complicated intermediary while a banal conversation may become a terribly complex chain of mediators where passions, opinions, and attitudes bifurcate at every turn. But if it breaks down, a computer may turn into a horrendously complex mediator while a highly sophisticated panel during an academic conference may become a perfectly predictable and uneventful intermediary in rubber stamping a decision made elsewhere (Latour, 2005, p. 39).

When encountered intermediaries are then able to act at a distance (Law, 1984) as no force or effect is changed as it passes through them. They can also play a role in connecting *actants* and in cementing the network, as it is for instance the case with money, some technical artefacts or *inscriptions* when it concerns textual or graphical elements (Crawford, 2005; Hassard & Alcadipani, 2010; Latour, 2005; Michael, 2017b; Nikolova, 2008). Drawing on Callon (1990) and Latour (1992), Sayes (2014, p. 138) specifies that, ultimately, "an intermediary is a placeholder in the sense in which it merely does what anything else in its position would do". By contrast, he writes, "a mediator is something *more* than this". In the case of non-human elements, for instance, it is "seen as adding something to a chain of interaction or an association". Put differently, intermediaries transport force or effect in a *linear* way whereas mediator *interfere* with this linearity, yielding a result that actively contributes to shaping the socio-material world. When conducting an ANT analysis, Latour then recommends striving to see each entity as a potential mediator, and not simply as an intermediary: this, he argues (2005, p. 128), would "render the movement of the social visible to the reader".

In media and communication research, ANT can be used to investigate the introduction of a new technological artefact in a well-established network, especially as it is faced with resistance: indeed, as the new technology is being embedded into the actor-network with its own intended meaning, a series of mutual *translations* happens, resulting in new power relationships. For example, while studying the deployment of a Personal Digital Production system (i.e., PDP) at the BBC—which allowed editorial staff to film and edit videos on their own—Hemmingway (2005, p. 25) found that a "initial rejections of PDP came from those people on the network unable to organise resources until PDP operators were also internalised and socialised within the network".

In parallel, ANT can be employed to establish power relationships between entities that already exist in the network, as in Schmitz Weiss and Domingo's account of innovation in online

5: The use of the term *translation* in ANT can be better understood when looking at its Latin roots: here, translation rather refers to *trans-latio*, which makes reference to a change in location (Czarniawska, 2016).

newsrooms (2010). They observed (*ibid*., p. 1063) that "the obligatory point of passage of the production team as translator of journalistic needs into technological developments hindered opportunities for innovative ideas to flourish", as "breaking news reporters felt their ideas were neglected, and web developers limited themselves to following instructions from the online editor". According to them (*ibid*., p. 1068), this made online journalists feel "powerless in the decision-making process" while technologists viewed their colleagues' needs as a lack of skills. In the case of Internet and digital technologies being brought into Greek newsrooms, Spyridou *et al*. (2013) looked at interactions and power relationships between well-established actors (i.e., journalists), new actors (i.e., technological tools, convergence and participation) and former *intermediaries* with an increasingly important role to play (i.e., audiences), in order to find out, among others, whether the dominant journalistic culture adapts to or contributes to shaping new technological affordances. They eventually conclude (*ibid*, p. 93) that these changes "tend to get normalized or 'rationalized' through the values and norms of the dominant journalistic culture".

Even though ANT has been recommended by Primo (2019) to study automated news I found no use of it in my systematic literature review, which analysed 33 empirically-oriented scholarly articles published between 2005 and mid-2020. Although this review was by no means exhaustive as other publications on ANT and automated journalism fell outside my search criteria[6], it was still representative of a research gap worth of our attention. ANT certainly comes with its own limitations (see Ryfe, 2022), such as being too oblivious of any overarching social order and loosing track of the bigger picture (see Benson, 2017; Couldry, 2020), but it can meanwhile be used to give a "bottom-up" account of how automated news directly contributes to shaping the world, thus yielding agency. Distinguishing *mediators* from *intermediaries* then appears all the more necessary.

Results

As described in my methodology, I will conduct here a cross-national exploratory study using Hallin and Mancini's media system typology (2004) to strategically select news organisations, limiting myself to news agencies, newspapers and public service broadcasters. When analysing how automated news is implemented within these organisations, I will make use of ANT concepts to see whether it transports force or effect in a *linear* manner (i.e., *intermediary*) or if there is an *interference* to it (i.e., *mediator*), thereby changing the status quo and actively contributing to shaping socio-material reality. Using NVivo data analysis software, I identified and split descriptive elements between nodes that matched this distinction. I further analysed and refined them until patterns were found, which were then used as a guiding thread in this results section.

Linear situations

First, based on some of the most prominent examples that are developed in the introduction, it can be said that there is a *linear* effect to automated news when it merely transmits data from authoritative sources (private or governmental), when there is no direct journalistic involvement except through the affordances already provided for by third-party tools and—for now—when text only is generated, sometimes with visualisations, thus amounting to having *inscriptions*. Such an assemblage can be observed at news organisations outsourcing automated news to external content providers, like at the Associated Press, where teams collaborate with firms like Automated Insights and Data Skrive to come up with templates so that these companies can automate corporate earnings stories and sports recaps[7], based on private data (see Colford, 2014). Likewise, Italy's news agency ANSA publishes weather forecasts that are sometimes generated using automation and data provided by a weather forecast company, but also national and regional accounts of the spread of COVID-19, using public data collected through Narrativa's COVID-19 tracker initiative[8] and put together by the firm Applied XL (Narrativa, no date 2; Redazione ANSA, 2020). As for Spain's national public service broadcaster RTVE, it collaborated with Narrativa to run trials on less watched football competitions in Spain using private data and also prepared for generating stories on election results in small municipalities based on government data (Corral, 2021). This is similar to what the French public radio broadcaster France Bleu and French newspapers belonging to the Belgian media group Rossel (e.g., *La Voix du Nord, L'Union*) have been doing during recent elections in France with automated news generated by the firms Syllabs (France Bleu) and LabSense (Rossel), based on governmental data. Besides, the Belgian newspapers group Sudpresse (owned by Rossel) and LabSense also collaborated on automating amateur football games in Belgium, sourcing data from a sports association.

A linear effect is also spottable when automated news is designed internally. As such, Reuters' data team has been developing automated news the usual way while setting up stories on sports, financial news and COVID-19, relying both on private and public data. This was also true of *The Times*' automated journalism project on COVID-19 (see Danzon-Chambaud, 2021b), which was based on public

6: For instance, Wu, Tandoc and Salmon (2019) used ANT to deconstruct the idea of seeing "automated journalism" as text generation only, arguing that media practitioners rather viewed it (*ibid.*, p. 1453) as "anything from the machine aggregating and funnelling of content, to data scraping and auto-publication of stories". Besides, ANT can also be used in student work on automated journalism, as in Falk Eriksen's master thesis (2018) on the use of automated news by the Danish news agency Ritzau.

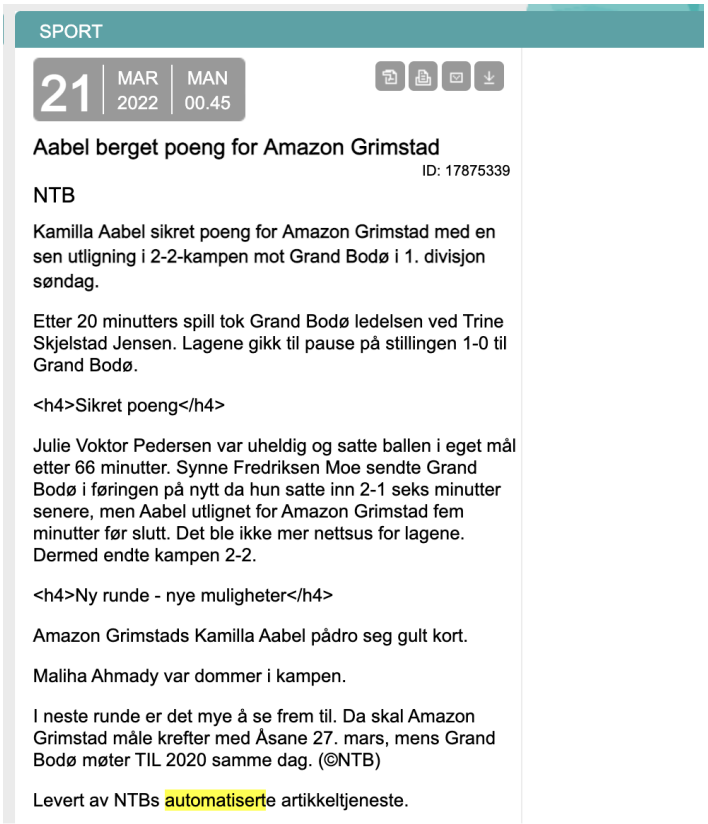
7: The data team at the Associated Press is also involved in setting up automated news for smaller scale projects, like polling results for each of the 50 American States or when transforming an exclusive dataset into local stories.

8: The Spanish public service broadcaster RTVE was also part of this initiative, mostly as an information provider, but is not mentioned here as it did not necessarily used automated news produced this way in a systematic manner.

data and programmed in-house. As for the Norwegian news agency NTB, it relied on a select few editorial developers with both a journalistic and technical background so as to be able to automate the same type of pandemic-related content as well as sports, election and financial news (see Figure 1), using private and public data for this.

On their end, the data team at the newspaper *Stuttgarter Zeitung* programmed automated news to cover the 2021 German election at a municipal level with local governmental data, while a team of technologists at the Finnish public service broadcaster YLE developed automated summaries on sports and election results, using both private and public service data and helped by a journalist who can understand code. Moreover, YLE made its code for generating ice hockey recaps open source, following a Parliament's request to limit unfair competition in the Finnish media market: as a result, other organisations like Finland's news agency STT used this code for their own ice hockey stories. Sometimes, an academic partner was also involved in the development of automated news, as in the Bavarian broadcaster Bayerischer Rundfunk's collaboration with the Technical University of Munich to automate match reports for a basketball league in Germany (Sebis Research News, 2021; Schneider & Köppen, 2021), which came in parallel with another project on COVID-19 (see Danzon-Chambaud, 2021b) and led to automating financial results as well (Schneider, 2022). To do this, the team relied on public health sources for their COVID-19 project and on private data for sports and financial news. Lastly, after experimenting with their own solution to automate the Rio Summer Olympics, the 2016 presidential election in the United States and high school American football coverage (WashPost PR Blog, 2016a; WashPost PR Blog, 2016b; WashPost PR Blog, 2017), the *Washington Post*'s engineering team joined forces with Northwestern University to develop a "computational political journalism R&D lab" ahead of the 2020 presidential elections (Schmidt, 2019), thus improving existing automated news models that draw on data collected by private brokers during election time.

A sense of linearity can also be found in the use of third-party self-editing tools that feature a form of No-code language, which allows editorial staff with little programming experience to design automated news on their own. This could be observed at the BBC, where the News Labs team used Arria NLG Studio to template out articles on A&E waiting times, tree planting and high street shopping, using public service datasets (see Danzon-Chambaud, 2021c). The Swiss newspaper group Tamedia used Wordsmith—Automated Insights' own NLG technology that was made directly accessible to clients through a self-editing interface (Mullin, 2015)—to draft out automated stories on referendums and election results in Switzerland (Marchand, 2019; Plattner & Orel, 2019) and to provide a statistical roundup of the


SPORT

21 MAR 2022 MAN 00.45

Aabel berget poeng for Amazon Grimstad

ID: 17875339

NTB

Kamilla Aabel sikret poeng for Amazon Grimstad med en sen utligning i 2-2-kampen mot Grand Bodø i 1. divisjon søndag.

Etter 20 minutters spill tok Grand Bodø ledelsen ved Trine Skjelstad Jensen. Lagene gikk til pause på stillingen 1-0 til Grand Bodø.

<h4>Sikret poeng</h4>

Julie Voktor Pedersen var uheldig og satte ballen i eget mål etter 66 minutter. Synne Fredriksen Moe sendte Grand Bodø i føringen på nytt da hun satte inn 2-1 seks minutter senere, men Aabel utlignet for Amazon Grimstad fem minutter før slutt. Det ble ikke mer nettsus for lagene. Dermed endte kampen 2-2.

<h4>Ny runde - nye muligheter</h4>

Amazon Grimstads Kamilla Aabel pådro seg gult kort.

Maliha Ahmady var dommer i kampen.

I neste runde er det mye å se frem til. Da skal Amazon Grimstad måle krefter med Åsane 27. mars, mens Grand Bodø møter TIL 2020 samme dag. (©NTB)

Levert av NTBs automatiserte artikkeltjeneste.

Figure 1. An example of an automated football game recap that was generated at NTB. This figure has been reproduced from NTB with permission, under a CC-BY NC 4.0 license.

spread of COVID-19 (see Danzon-Chambaud, 2021b), using public service datasets. As for the Australian public service broadcaster ABC, it subscribed to a bot-building application, Chatfuel, to create a messenger bot (see Figure 2) that uses public service data to inform users on electoral results (Archer, 2016; Elvery, 2016), but also to provide them with daily news summaries, weather forecasts and emergency alerts (see Ford & Hutchinson, 2019).

Interferences

In contrast to this linear effect, mapping substantial *interferences* requires carefully thinking about what could potentially re-shape the "chain of interaction" or "association" (Sayes, 2014) that automated news is part of. Thinking in a reverse way, this could be whenever these changes concern data other than coming straight from authoritative sources, systems that allow for direct journalistic participation other than through the affordances of third-party tools and, lastly, outputs other than text. First, with regards to other sources, a noticeable interference occurs as news organisations turn to their own internal feed, proceed to their own data collection or use archival material, thus avoiding the need to rely on third-party private or public service datasets. An example of this is the BBC's and ABC's efforts to connect their automated news system to an

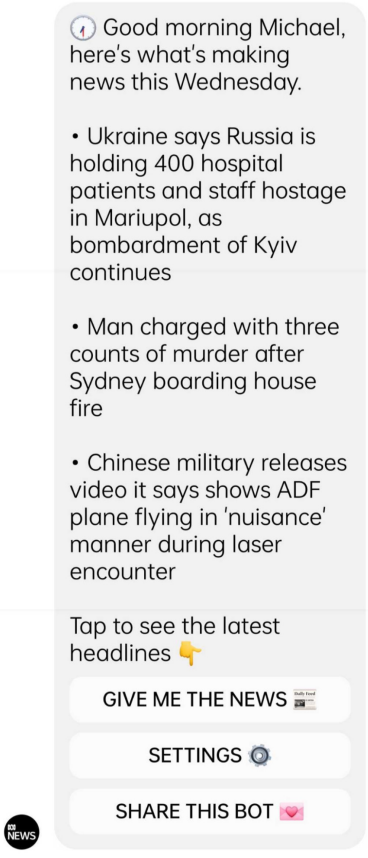


Figure 2. A daily news brief delivered by the Australian Broadcasting Corporation (ABC) through its conversational chatbot platform. This figure has been reproduced from ABC with permission, under a CC-BY NC 4.0 license.

internal election results feed (see Danzon-Chambaud, 2021c for the BBC), which in the case of ABC is linked to the corporation's own psephologist:

> We're mostly looking at the data sources we use for broadcast to start with, or that are at that level. (...) The election one is coming from the Australian electoral commission or the State electoral commissions, but then it's going through our election expert's system, Antony Green. So it's being processed by his system and he's taking those raw figures and putting his knowledge of electoral systems over them to come up with predictions and things like that.
>
> (Manager, ABC, Australia)

In a few instances, news organisations collected data on their own in order to automate news text, as shown in AFP's and Reuters' statistical roundups on the spread of COVID-19, which were both automated using shared spreadsheets that were manually filled by journalists on the ground, even if at Reuters this system was also connected to open data sources. As for tapping into archival material, the Finnish news agency STT collaborated for a time with the University of Turku, in Southern Finland, to automate ice hockey recaps using machine learning models (Kanerva *et al.*, 2019) that were trained on STT's own archives that dated back to the 1990s (see Figure 3). That being said, an executive at STT indicated that content generated this way did not meet the agency's standards to be delivered to clients, but was accessible to them should they be interested in it:

> It [STT's archives] goes way back, but there wasn't enough reports for the AI because (...) it just wants all the data and more and more and more… And it wasn't enough for the AI to learn enough. And the second thing was that there was too much human… well, too much human in them. So there was, like, adjectives and things that weren't in the data that the machine was fed. (...) For example, in ice hockey there was, like, standings that weren't in the data that the machine was given. So we ended up using some manual work to go through, not all, but a lot of the stories.
>
> (Executive, STT, Finland)

Additional interferences that related to source type were also visible in situations where crowdsourced material and social media feeds were used. The German newspaper *Stuttgarter Zeitung* relied on crowdsourced material to automate its air quality reports in the Stuttgart area, which were generated using AX Semantics' self-editing tool and connected to open data sourced from a network of community sensors (Plavec, 2017; Toporoff, 2017). In Australia, the ABC used opinion data collected through a polling exercise that is habitually done during election time so as to come with answers for its messenger bot (Gee & Prior, 2018), an approach that was further extended to probe the public's concerns on emergency preparedness. Social media feeds, on their end, were

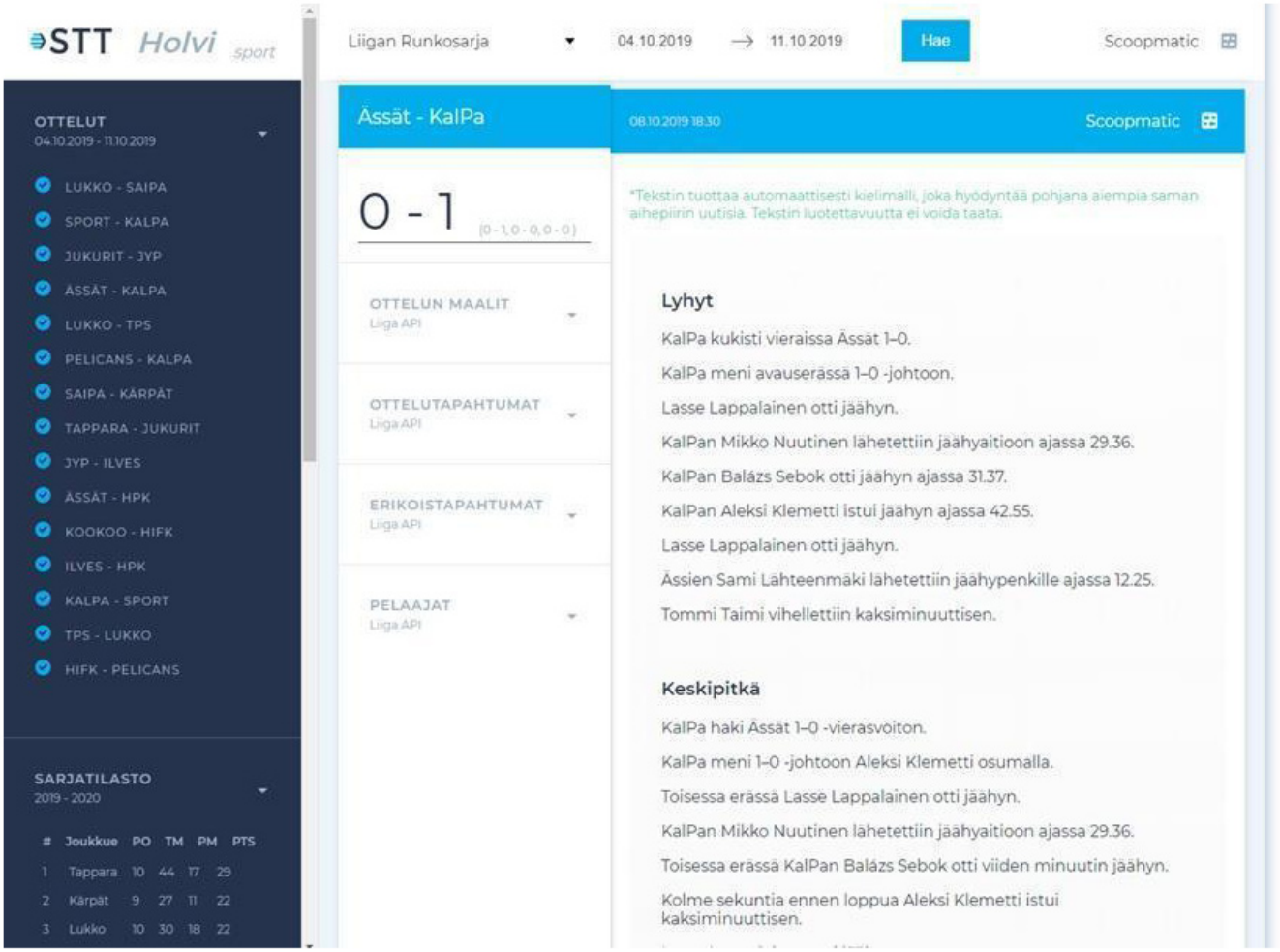


Figure 3. The interface on which ice hockey stories were generated using machine learning models that were trained on STT's internal archives, which covered games that were held since the 1990s. This figure has been reproduced from STT with permission, under a CC-BY NC 4.0 license.

put to contribution using web scraping techniques, so as to be able to collect user-generated content and to conduct computational analysis on it. This was done, for instance, at the Spanish public service broadcaster RTVE, which partnered with the University Carlos III of Madrid to generate automated football stories that adopt a tone and voice that reflect users' opinions (del Rey García, 2020). "You can have the version for one team, for example: 'It was a great success,' the balanced news, and, on the other hand, (...) 'they stole us the football match'", said an executive at RTVE. Likewise, Reuters' News Tracer acts as a "breaking news radar" while roaming on Twitter feeds to find relevant information, using advanced detection, classification and evaluation techniques for this; it then goes on to generate short automated text that is passed on to journalists for verification (Emerging Technology from the arXiv, 2017; Liu *et al.*, 2017).

Another area where substantial interferences are brought into force relates to automated news systems specifically built for journalists and not limited to the affordances of third-party tools, thus allowing for additional tweaking. These can be, first, internal software that comes with its own self-editing tool, features notification streams and provides access to auto-generated background information. Reuters' Lynx Insight system integrates all three: journalists can template out their own stories using a form of No-code language that resembles those of third-party tools (see Figure 4), receive Microsoft Teams notifications once stories generated this way (or that the data team set up) are ready and query the system as they look for automated news with background information.

The online newspaper *El Confidencial* constitutes another example of the use of an internal self-editing tool. The data team set up previews that help journalists visualise the automated story they are about to generate, instead of having to work right off computer scripts. "We prepared a web tool that they could use [that includes] the new text [created] with a different condition, and in real time they can see (...) how the

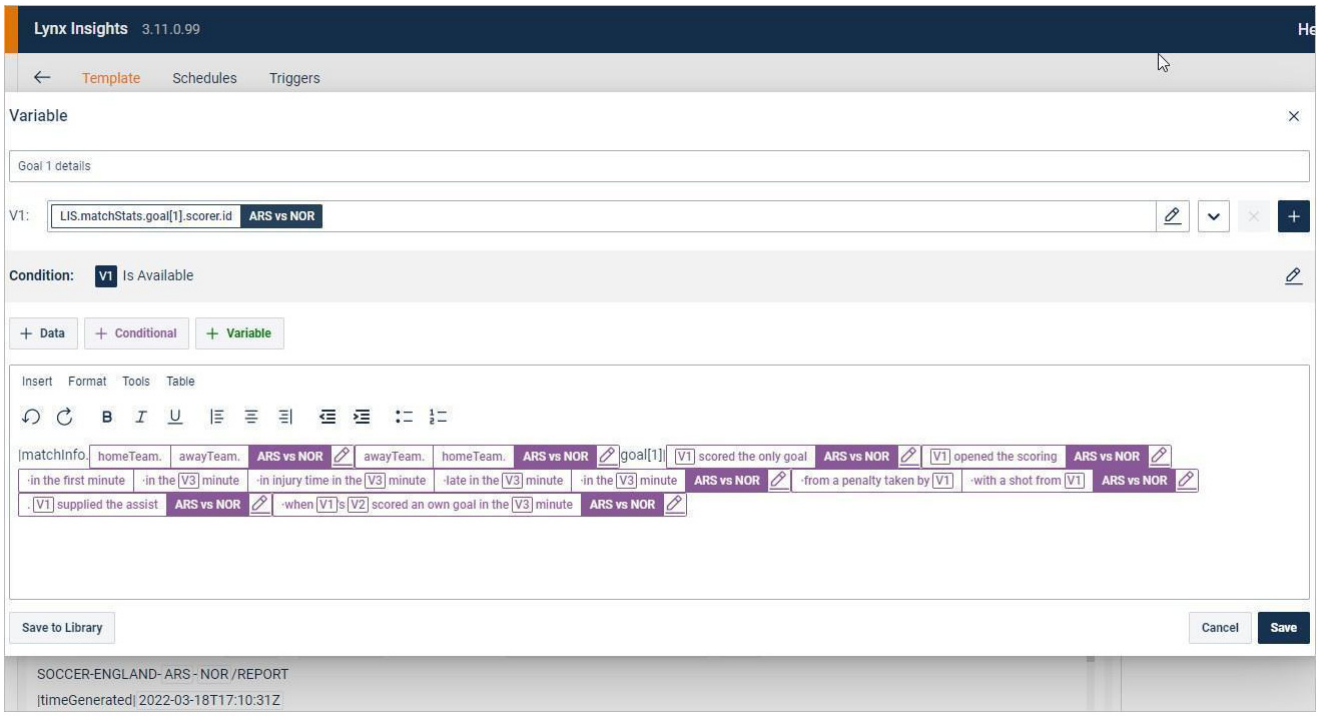


Figure 4. On Reuters' Lynx Insight platform, journalists can template out their own automated stories using a form of No-code language that makes it accessible to news staff with little programming experience. This figure has been reproduced from Reuters with permission, under a CC-BY NC 4.0 license.

final article will look like", said a technologist at the online newspaper. In another example of the use of automated back-grounders, the engineering team at the *Washington Post* and Northwestern University teamed up to create a query system that lets journalists access automated background information on the 2020 presidential election in the United States (see Figure 5): this contained for instance indications on the number and ethnic distribution of new registered voters in a given county (Diakopoulos *et al.*, 2020; WashPost PR Blog, 2020a). As for automated notification streams, the BBC used Slack messages in a combined workflow to cover the 2019 general election in the United Kingdom with automated news (see Danzon-Chambaud, 2021c).

Finally, one last meaningful interference that could be observed has to do with generating output other than text, in this case NLG-to-audio content—which may come with the mediating effect of turning the written word into the spoken word. This was visible in the *Washington Post*'s and ABC's efforts to create stories of their own, and not just audio content suited to help with vision impairment. Automated audio stories generated this way could then be tailored to a listener's location as in the *Washington Post*'s election updates that were inserted in the newspaper's political podcasts (WashPost PR Blog, 2020b) or be accessed *via* virtual assistants (e.g., Amazon's Alexa) as in the ABC's diffusion of emergency alert summaries that were created using its own NLG tool (Collett, 2021; Collett, 2022).

In this section, I highlighted how automated news is being used at 18 news organisations that were selected based on Hallin and Mancini's (2004) media system typology (i.e., North Atlantic, North/Central and Mediterranean models) and that featured different media types (i.e., news agencies, newspapers, public service broadcasters). Using ANT, I demonstrated that force or effect passes through automated news in a linear way as initial intent is kept and when it does what it is supposed to do (i.e, *intermediary*), whereas in other cases there is substantial interference to it (i.e., *mediator*). The latter goes as follows: first, using alternate data sources while relying on a media organisation's own internal feed, data collection or archives or, else, crowdsourced material or social media feeds; second, putting journalists at the centre of interfaces that are designed internally like in-house self-editing tools, notification streams and/or query systems for automated back-grounders; and, third, generating NLG-to-audio content as an output. These interferences, which are summarised in Table 2, are especially worth looking at since, according to Latour (2005, p. 128), "as soon as actors are treated not as intermediaries but as mediators, they render the movement of the social visible to the reader".

Discussion and Conclusion

Using ANT's lenses, considering automated news as *mediator* pointed out to significant interferences that are visible in the form of alternate data sources (i.e., own internal feed, data collection or archives, as well as crowdsourced material or social



Figure 5. At the Washington Post, a query system was set up in collaboration with Northwestern University so that reporters could access automated backgrounders that would help them cover the 2020 presidential election in the United States. This figure has been reproduced from [Diakopoulos *et al.,* 2020] with permission, under a CC-BY NC 4.0 license.

media feeds), interfaces that are designed internally and that allow for direct journalistic participation (i.e., self-editing tools, notification streams and/or query systems for automated backgrounders) and, finally, NLG-to-audio output. To paraphrase Latour (2005), this makes the movement of what can be considered the "actor-network of automated journalism" discernible to the researcher's eye, giving it agency and thus answering RQ1. As for the potential implications that it bears for journalism practice and for journalism as a whole, it is perhaps necessary to break—so to speak—with one of ANT's key tenets, which is keep any well-established sociological framework at bay. As a matter of fact, it has been argued that other sociological frameworks can be seen as "companion concepts", which are encountered at a later stage of analysis (Winthereik, 2020). Moreover, Couldry (2016, p. 5) stressed the importance of seeing ANT as "one important item in the media theorist's toolkit that, like any tool, needs to be supplemented by others".

Though no causal relationship is to be made, I am then coming back to the work of Hallin and Mancini (2004), who based their media typology on the concept of *differentiation* and *de-differentiation*, which brings an interesting window on future research. Originally theorised by Parsons and Luhmann, differentiation assimilates modernity with "dividing society into stratified subsystems with specific specializations" (West, 2021) while de-differentiation is about having these specialised structures return to a more homogeneous form. Following the logic of differentiation, Hallin and Mancini argued that the North Atlantic model of journalism sits the furthest away from social and political structures while the Mediterranean model presents strong ties between media and politics, which appear as two fields or sectors that often overlap. Finally, the North/Central European model is often situated somewhat in-between these two systems. They also observed that a process of de-differentiation driven by market forces seems to be steering the Mediterranean and North/Central European models further away from socio-political influences to bring them closer to the types of commercial values found in the North Atlantic model, resulting in making these media systems more homogenous.

Through this exploratory study we can start noticing a growing journalistic professionalisation in the way automated news is being employed, as it is drifting away from political and commercial influences (i.e., public service data, data brokers, automated content providers and third-party self-editing tools[9]) to become more under journalists' control, but also in citizens' hand (i.e., using crowdsourced material as a source). As shown in Table 2, North Atlantic media organisations (i.e., Reuters, *The Washington Post*, ABC, BBC) seem to be leading the way in this process of *differentiation*, in accordance with Hallin and Mancini's typology: as they write (2004, p. 80), "the Liberal Model is characterized by a high degree of differentiation of the media from other "other social bodies," particularly those historically active in the political sphere", which in this case also applies to techno-commercial influences. Hence, BBC's and ABC's use of internal feeds, Reuters' own in-house self-editing tool and the *Washington Post*'s providing access to

9: Even if they can be limiting in terms of format or affordances (which cannot be tweaked internally), third-party providers or tools are interesting for news organisations that do not have the technical expertise in-house or are looking to use automated news for a one-off coverage, but not to maintain it in the long run.

Table 2. **Automated news as *mediators*: areas with significant interferences, per media system.**

NORTH ATLANTIC				
		News agencies	**Newspapers**	**Public service broadcasters**
Sources	Internal feed	–	–	ABC/BBC
	Own data collection	Reuters	–	–
	Archives	–	–	–
	Crowdsourced material	–	–	ABC
	Social media feeds	Reuters	–	–
Interfaces	In-house self-editing tool	Reuters	–	–
	Notification stream	Reuters	–	BBC
	Automated backgrounders	Reuters	Washington Post	–
Outputs	NLG-to-audio	–	Washington Post	ABC
NORTH/CENTRAL				
		News agencies	**Newspapers**	**Public service broadcasters**
Sources	Internal feed	–	–	–
	Own data collection	–	–	–
	Archives	STT	–	–
	Crowdsourced material	–	Stuttgarter Zeitung	–
	Social media feeds	–	–	–
Interfaces	In-house self-editing tool	–	–	–
	Notification stream	–	–	–
	Automated backgrounders	–	–	–
Outputs	NLG-to-audio	–	–	–
MEDITERRANEAN				
		News agencies	**Newspapers**	**Public service broadcasters**
Sources	Internal feed	–	–	–
	Own data collection	AFP	–	–
	Archives	–	–	–
	Crowdsourced material	–	–	–
	Social media feeds	–	–	RTVE
Interfaces	In-house self-editing tool	–	El Confidencial	–
	Notification stream	–	–	–
	Automated backgrounders	–	–	–
Outputs	NLG-to-audio	–	–	–

automated backgrounders—to name a few—all contribute to greater journalistic professionalisation by ensuring independence from all these forms of external influences.

That being said, a process of *de-differentiation* could also be at play in that compliance with platforms' terms and conditions is generally needed to be able to connect to social media APIs (see van Dijck *et al.*, 2018) and matching their technical standards is necessary to have automated audio stories featured on voice assistants (e.g., Amazon's Alexa, Google Assistant). The question as to whether platforms or news organisations will act as *spokespersons* in this growing actor-network of automated journalism—and by extension RQ2—then remains open: should news media take on this role, for instance while developing their own self-editing solutions or relying on internal feeds, this could be interpreted as reinforcing the autonomy of the journalistic field, whereas—should they become too dependent on Big Tech companies for data acquisition and dissemination—this may result in making the field even more porous to techno-commercial influences. Interestingly, at the same time platforms are increasingly facing journalistic challenges while publishing content (e.g., fact-checking, neighbouring rights, etc.), which departs from their initial goal of connecting people or facilitating online search. Mutual *translations* may then well be on the way.

One limitation to this study has to do with a very much Western-centric selection of media organisations: at the time I reached out to interviewees, automated news was still a relatively new development that seemed to concern mostly news organisations based in the West, as well as some Asian newsrooms that I could not efficiently research because of my own language limitations. This meant I could not document the use of automated news in certain regions, like South America or East Asia. That being said, a growing number of scholars are now looking into these areas, among which figure research on the way automated news is employed at the Czech news agency ČTK (Moravec *et al.*, 2020) and across South American news media (García-Perdomo *et al.*, 2022).

As mentioned in my methodology, another limitation relates to the impossibility of carrying out direct observations because of the COVID-19 pandemic. Although newsroom ethnography was initially considered—and even arranged for with a couple of newsrooms—these plans had to be cancelled when it became evident that the pandemic would last for longer than initially envisioned. Instead, I made use of remote semi-structured interviews and increased the number of news media under study. In consequence, I was not able to see how automated news was being used with my own eyes (although a virtual walkthrough was conducted with BBC): this resulted in me walking a fine line between findings I could directly document, like an automated news dashboard that is available online, and others that were reported or not directly visible to me, like details of a computer script. Even though I did my best to verify all of these elements, they are still exposed to the type of fallibility that goes with human interpretation. This is why I speak of an exploratory study, since more triangulation would be required to generalise these findings.

One last limitation is about not being able to set in stone what remains essentially a field in flux, where new technical breakthroughs or ways of implementing automated journalism could be happening as I am writing these lines. For example, a couple of years ago, most NLG companies appeared to be external content providers only, in charge of creating automated news products in place of media companies, but then started offering self-editing tools as well, as in the case of Automated Insights (see Mullin, 2015). This fast-paced evolution of automated news products makes it difficult to analyse them based on development types (i.e., external content providers, in-house, third-party self-editing tools); however, this could be done once this is stabilised enough.

Other than this, possible research avenues include using ANT to determine whether, in the ongoing assemblage of an "automated journalism actor-network", news organisations or platforms act as *spokespersons*, especially as it may turn into a *macro actor* able to restructure media production as a whole. To a certain extent, platforms can be seen as already gaining the upper hand as recent text summarisation efforts to create quizzes, polls or summaries—which are somehow related to automated news—appear to be quite tailored to fitting social media content. Such an analysis would be essential in determining power relationships likely to shape future developments of automated news products.

Ethical approval

The Dublin City University Research Ethics Committee approved this study on the 25th of February 2020, under the approval number: DCUREC/2020/032

Data availability

Zenodo. Open Research Europe article "Automated news in practice": example of questionnaire, https://doi.org/10.5281/zenodo.7953236 (Danzon-Chambaud, 2023a)

This project contains the following underlying data:

- Automated news in practice_ example of questionnaire.pdf (semi-structured questionnaire developed to interview an executive at The Washington Post.)

Data are available under the terms of the Creative Commons Attribution 4.0 International license (CC-BY 4.0).

Acknowledgements

This study forms part of a PhD thesis.

Appendix A. Details of interviewees' news organisations, roles and gender as well as interview date and duration[10].

Interview	Organisation	Country	Position	Gender	Date	Duration
1	The Times	United Kingdom	Computational journalist	M	10/09/2020	00:44:15
2	Stuttgarter Zeitung	Germany	Editor	M	11/09/2020	00:49:28
3	France Bleu	France	Manager	M	07/10/2020	00:31:29
4	YLE	Finland	Senior technologist	M	08/10/2020	00:48:30
5	AP	United States	Executive	F	15/10/2020	00:30:12
6	BBC	United Kingdom	Manager	M	26/10/2020	00:42:53
7	NTB	Norway	Editor; Executive	M; M	19/11/2020	00:37:43
8	Tamedia	Switzerland	Senior computational journalist	M	20/11/2020	00:44:27
9	Bayerischer Rundfunk	Germany	Senior technologist	M	23/11/2020	00:35:27
10	Washington Post	United States	Executive	M	30/11/2020	00:29:21
11	STT	Finland	Executive	F	04/12/2020	00:31:09
12	Rossel/Sudpresse	Belgium/France	Executive	M	09/12/2020	00:44:21
13	El Confidencial	Spain	Executive; Technologist	M; F	15/12/2020	00:34:05
14	RTVE	Spain	Executive	M	16/12/2020	00:49:56
15	ABC	Australia	Manager	M	22/12/2020	00:45:09
16	BBC	United Kingdom	Senior technologist	M	22/03/2021	00:23:14
17	BBC	United Kingdom	Computational journalist	M	24/03/2021	00:41:21
18	BBC	United Kingdom	Journalist	M	29/03/2021	00:32:03
19	BBC	United Kingdom	Assistant editor	F	01/04/2021	00:12:11
20	ANSA	Italy	Executive	M	01/04/2021	00:21:21
21	BBC	United Kingdom	Technologist (1)	M	06/04/2021	00:42:01
22	AFP	France	Manager; Senior journalist	M; M	07/04/2021	00:34:52
23	BBC	United Kingdom	Technologist (2)	F	16/04/2021	00:33:00
24	Reuters	United Kingdom	Editor	M	20/04/2021	00:44:38
25	BBC	United Kingdom	Editor	M	28/04/2021	00:28:34

10: Positions are based on my own understanding of interviewees' roles and skills, and do not necessarily correspond to their official titles.

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Version 3

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Andrew Robotham
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The article “Automated news in practice: a cross-national exploratory study" by Samuel Danzon-Chambaud has satisfactorily addressed the remaining key points outlined in the previous round of revisions. Version 3 provides more clarity regarding data collection and analysis, as well a better contextualizing the relevance of Hallin and Mancini’s typology and (de)differentiation. As such it provides a worthy contribution to the field of journalism studies. This research provides both a good overview of the types of automated journalism tools being used across multiple countries and types of news media; something that fills a research gap at a time when such technologies are increasingly entering the mainstream. Furthermore, it offers several interesting insights into the underlying power-dynamics of automated journalism, and how these might evolve going forward.

The extent to which automated journalism may vary from one media model/system (as defined by Hallin and Mancini) to another is a question that deserves further attention and investigation. This includes digging deeper for answers on how technologies such as automated journalism relate to different models/systems.

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: digital journalism, journalistic practices, information production systems, datajournalism

We confirm that we have read this submission and believe that we have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

Version 2

Reviewer Report 19 October 2023

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Julian Maitra
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The revised article titled "Automated news in practice: a cross-national exploratory study" by Samuel Danzon-Chambaud represents an original and important contribution to the study of news automation in journalism. The revision addressed the major concerns raised in the first review round. It is now clear that the study uses an exploratory approach to assess the current state of automated news across 18 news publishers in Europe, North America, and Australia.

The study's methodological combination of Hallin and Mancini's media system typology and actor-network theory (ANT), a science, technology, and society approach popularized by researchers such as the French sociologist Bruno Latour, makes it an exciting addition to the journalism studies literature on automated journalism. ANT is particularly well suited to take into account the increasingly strong non-human agency technologies, such as news automation, assumed in the complex socio-technological networks where contemporary newsrooms operate.

Based on the clarifications and substantive improvements applied by the author in the revised manuscript, I can recommend this study for indexing without further modifications.

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: digital journalism, news audiences, media sociology

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

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The changes made to the article are satisfactory overall. The main comments from the first round of reviewing have indeed been addressed. In particular, the framing of the article as an exploratory study rather than case studies (point 2.1 below), and fits with the overall research method and data used. Furthermore, several improvements have been made to how ANT was presented (3.1-3.3; 4.1). However, we still believe that further information is needed regarding how data was analyzed (1.2-1.4). Lastly, we remain wary of the reference to Hallin and Mancini's model, especially in view of the claims that suggest some kind of causal link has been established (1.2; 2.2).

Point for improvement 1 from the first round of reviewing: *The paper lacks important details as to how the data was analyzed.*

Points improved:

1.1 Version 2 shows several improvements as to how the data were analyzed.
Recommended further improvements:

1.2 A brief paragraph answering the following questions is required to shed light on some of the method-related questions that remain unanswered to date:

- Once collected, how was the interview material treated, classified (for example into those categories outlined in table 2), analyzed, etc.?
- What role did your ANT framework play at this stage of data analysis?
- In particular, which (objective) criteria were used to make the distinction between linear and non-linear?

This is important because in the absence of such details, the article may give the impression of a confirmation bias towards fitting the results to the Hallin and Mancini model.

1.3 Further clarification is also required because the author does not discuss what degree his semi-structured interviews were used to collect the experiences, opinions, journalistic roles and perceived realities (related to automated journalism) of their interviewees on the one hand, and used to recreate a factual description or “model” of the technologies discussed on the other. Beyond being merely a practical matter, it is an epistemological one, since ANT - and especially the Latourian kind - is unique in the way it argues in favor of bringing these two perspectives together (see Latour, 2005, 87-99). The interview guide provided contains questions pertaining to both levels. Yet, it is unclear if/how the former were used. To put it differently, one of the keys to a successful ANT study is overcoming this “artificial” distinction and to explain how the human and non-human are intertwined, and to what effect.

1.4 It would be helpful if the author contextualized the interview data within the broader scope of the PhD research project. The disclosure is welcome, but practical implications should be addressed briefly. Did all the questions of the interview guide pertain to this study only or were

they used in view of further research? This will help clarify the previous point.

Point for improvement 2 from the first round of reviewing: ***Despite the large number of interviews carried out, most of the media are based on a single interview, which may prevent generalization and, in any case, does not allow us to claim the term "case study".***

The main issue has been addressed:

2.1 The use of the term exploratory instead of case study is welcome and better reflects the nature of the study. Indeed, the sampling strategy outlined in the paper now makes perfect sense and provides some great insights.

Recommended further improvements:

2.2 Regarding Hallin and Mancini's classification and the issue of differentiation, we are wary of the assertion regarding the link between differentiation and the North Atlantic model on the basis of the author's purposive sampling. Thus, we believe this should be framed as an interesting avenue for future research, rather than a causal relationship that has been established through solid empirical investigation.

Point for improvement 3 from the first round of reviewing: ***ANT was doubtlessly a key resource in designing the project and certainly played a role in how the project was designed and the data analyzed and interpreted. However, the prominence of ANT theory and terminology obscures the key takeaways and does not, in our opinion, contribute to a better understanding of automated news for the (average) reader.***

The main issues have been addressed:

3.1 The additional references to specific media-related ANT research are welcome.

3.2 The shift from intermediary vs mediator to linear vs interferences does, in our opinion, help make the article more accessible. The point related to how interferences are, in fact, expressions of (or traces of) journalistic autonomy is interesting and well-argued. It is much clearer in the revised version.

3.3 On the other hand, the addition in the conclusion section of the concept of enrolment is welcome and contributes to better understanding what is at stake regarding the (successful) adoption of automated journalism.

Recommended further improvements:

3.4 The changes add new terms concepts to an already long list of related to so-called ANT infralanguage. Many of these terms are introduced in the "ANT Analytical Framework" section, without being used in the results section or the conclusion (introduced but not used: *obligatory point of passage, heterogenous entities, simplification, black-boxing and punctualisation, immutable mobiles*). While this shows that the author has a good theoretical understanding of ANT, it doesn't necessarily benefit the article. For example, the space used for presenting ANT in general terms (which has been done many times and could easily be referred to with a single reference), may be

better used to provide a more technical explanation of how their identify interferences, and how and why these related to mediators and differentiation.

Point for improvement 4 from the first round of reviewing: ***At the very least, we would recommend putting less emphasis on ANT and restructuring the results section according to types of automated news and their uses (intended or not). This would also free up space to contextualize more, engage more with existing literature (about automated news) and better define the concepts and research questions. The addition of a specific "Discussion" section would be relevant.***

The main issues have been addressed.

4.1 Except for minor reservations expressed in the point above, this issue has been adequately addressed.

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: digital journalism, journalistic practices, information production systems, datajournalism

We confirm that we have read this submission and believe that we have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however we have significant reservations, as outlined above.

Author Response 26 Oct 2023

Samuel Danzon-Chambaud

Dear Prof. Pignard-Cheynel and Dr. Robotham,

Thank you for your additional feedback on this article, which helped me clarify the points you raised. Please find below how I addressed them:

I have specified the context in which the interviews took place. They were indeed done as part of the larger PhD project, and so the model questionnaire contains descriptive questions as well as more interpretative ones. This is now mentioned in Methods, at the end of the third paragraph.

This also helps explain how I went on with my data analysis, focusing on descriptive elements and sorting them using ANT's *linear* (i.e., *intermediaries*) vs. *interference* (i.e., *mediators*) effect. I have added a short explanation in the paragraph under Results.

As for the criteria that were used to make this distinction, they are each specified in the first sentence(s) that follow “Linear situations” and “Interferences”, in the Results section.

I have followed your advice on being cautious about causal relationship with Hallin and Mancini’s framework. This is why I now caution against this at the beginning of the second

paragraph of the Discussion/Conclusion, specifying meanwhile that it could provide room for future research.

Lastly, I have taken out from the ANT section “infra-language” that was not used in the rest of the article. Peer-reviewed summaries of ANT (i.e., Crawford, 2005; Nikolova, 2008; Cooren, 2009; Hassard & Alcadipani, 2010; Czarniawska, 2016; Michael, 2027a, 2017b; Blok, 2019; Primo, 2019) are referenced throughout the ANT framework part, should the reader want to read more about it.

I hope these modifications are in line with your expectations, and that they make the article fit for publication.

Yours sincerely, Samuel Danzon-Chambaud

Competing Interests: No competing interests were disclosed.

Version 1

Reviewer Report 24 July 2023

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Summary:

- The study addresses a highly relevant topic in journalism studies: the increasing adoption of news automation technology across media systems and newsrooms. The study’s innovative research design combines empirical and theoretical approaches. On the one hand, the author conducted 18 semi-structured interviews with news professionals from 11 Western countries between 2020 and 2021. The interviewees included employees from news agencies (e.g., AFP), public service broadcasters (e.g., BBC), and newspapers (e.g., Stuttgarter Zeitung). Additional empirical insights were generated through a news “netnography”.

- On the other hand, the author applied a theoretical lens to contextualize the empirical findings. This lens is inspired by actor-network theory (ANT), Hallin and Mancini’s media system typology (2004), and sociological notions of professionalization.

- A key finding using ANT terminology is that news automation technologies have been

adopted in two distinct ways: First, as *intermediaries* of journalistic work. Such "predictable" use may include cases where "private or public service datasets are being used as sources, when there is no journalistic involvement other than through the affordances already provided for by third-party tools" (p. 7). For example, the AP cooperated with the NLG firm Automated Insights, to provide template-based software to automate corporate earnings reports.

- Second, the author identified cases of a more "transformative" adoption of news automation when the technology *mediates* journalistic work. Such use of news automation is described as "drifting away from political and commercial influences [e.g., from third-party tech platforms and NLG firms]... to become more under journalists' control" (p. 13). This occurred, for example, when the BBC autonomously developed in-house news automation technology that relied on its proprietary data (and not on third-party data and platforms).

- The study argues that such a mediating adoption of news automation translates into higher professional autonomy for news organizations. The study finds that such *differentiation* (another ANT concept) is particularly prevalent among news organizations from the North Atlantic media system. Nevertheless, *dedifferentiation* processes may also occur in the actor-network, for example, when journalistic actors grow more dependent on third-party platforms for access to mediating news automation technology and data.

Major review points:

- **The study could be improved through a more coherent theoretical focus that explains the empirical findings better**. The study currently employs elements of ANT, Hallin and Mancini's media system typology, the sociology of professions, and sociological field theory (for the latter, see, e.g., p. 13). Each of these frameworks has its merits in journalism studies, particularly in the context of explaining issues of digital innovation. However, in the present study, it is less clear how the theory adds explanatory value to the empirical findings. ANT, for example, could be better used to explain the interrelationships in the actor-network of news automation in the analyzed newsrooms. How do the complex assemblages and interdependent agencies of journalistic actors, news stories, news automation algorithms, databases, tech platforms, etc., interrelate? In contrast, Hallin and Mancini's comparative framework could be more convincingly used to explain the reasons behind the different uses of news automation across media systems. Perhaps it could also be a solution to focus on one theoretical framework and provide a deeper explanation of its implications.

- **Clarify the data collection through semi-structured interviews**: The provided exemplary interview questions, which were specifically designed to interview a news professional from the Washington Post, raise questions about how the data was collected. Were all interviewees asked the same (or very similar) questions, or were they tailored to each respondent, as in the example? It would no longer constitute a semi-structured interview approach in the latter case. The author should clarify the data collection method to justify the representativeness of the empirical insights.

- **Unconvincing generalization of empirical (case study) findings**: While the empirical insights gained in the 18 interviews are valuable, they represent case study observations from specific organizations at specific points in time. The author used "purposive" – i.e.,

subjective – sampling to construct the dataset (p. 5). Therefore, some claims in the conclusion section, such as “All in all, this testifies of a growing journalistic professionalization in the way automated news is being employed, as it is drifting away from political and commercial influence…” (p.13), seem problematic. Likewise, concluding that news organizations from the North Atlantic media system are more adept at using news automation based on the interview insights from three news organizations (WaPo, ABC, BBC) is also not convincing. Such generalizations cannot be made without comprehensive data collection across much larger samples or through the use of statistical techniques of random sampling. While the author acknowledges some limitations, i.e., that the “field is in flux” (p. 13), the study could be improved by better clarifying how and to what extent its findings are generalizable.

Minor points:

- **Hard to read sentences**: While the paper is generally well-written, several sentences are too long and sometimes ambiguous, making their meaning difficult to decipher. The clarity of the writing could be improved by using topic sentences at the beginning of paragraphs and by limiting sentences to ca. 25 words. For example, consider breaking up the following one-sentence-paragraph with 135 words (p.9) into multiple sentences:

  "Another area where additional translations are brought into force relates to automated news systems that are specifically built for journalists, other than through the affordances already provided for by third-party self-editing tools. These can be, first, internal software that comes with its own self-editing tool, features notification streams and provides access to auto-generated background information, as in Reuters’ Lynx Insight system where journalists can template out their own stories using a form of No-code language that resembles those of third-party tools (see Figure 4), receive Microsoft Teams notifications once stories generated this way or that the data team set up are ready and query this system as they look for automated news with background information on the subject that they are covering."

- Similarly, the following sentence on p.10 is too long and hard to understand:
  "Using ANT, I demonstrated that some of them used automated news as intermediaries, where initial intent is kept and where it does what it is supposed to do, while others considered it more as mediators while bringing in additional meaningful translations, which go as follows: first, enrolling alternate data sources while relying on a media organisation’s own internal feed, data collection or archives as a source or, else, on crowdsourced material or social media feeds; second, enticing journalists while putting them at the centre of interfaces that are designed internally like in-house self-editing tools, notification streams and/or search features to access automated backgrounders; and, third, enlisting vocal elements through generating NLG-to-audio content as an output."

- **Unclear explanatory value of screenshots**: It remains unclear how some figures (e.g., Figures 3 and 5) contribute to or exemplify the findings of the study. The author should better explain what they show and how this sustains his arguments.

- **Interview date accuracy**: Appendix A mentions two interviews (in Norway and Switzerland) were conducted in 2010. Is this information correct?

Is the work clearly and accurately presented and does it engage with the current literature?
Yes

Is the study design appropriate and is the work technically sound?
Partly

Are sufficient details of methods and analysis provided to allow replication by others?
Partly

Are all the source data and materials underlying the results available?
Partly

If applicable, is the statistical analysis and its interpretation appropriate?
Not applicable

Are the conclusions drawn adequately supported by the results?
Partly

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: digital journalism, news audiences, media sociology

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

Author Response 06 Sep 2023

Samuel Danzon-Chambaud

Dear Dr. Maitra,

Thank you for providing me with helpful feedback, which helped make this work better and clearer. Please find below how I addressed your comments:

The theoretical focus has been reworked to put less emphasis on ANT. At the same time, I also tried to better detail how this theoretical framework helped inform my data analysis. I paid special attention to better explaining how I worked with the concept of *intermediaries* and *mediators*, relying for that on an analogy with *linear* usages and substantial *interferences* to it.

It is true that how automated news connects to the wider network has not been part of this analysis. However, seeing it as *mediator* (i.e., when interference is made to linear usage)—as this study strives to—opens up new research possibilities for tracing these connections. Although I took it out not to overload the conclusion, this relates to Latour's belief that "there exist translations between mediators that may generate traceable associations".

A brief hint as to what these future translations/negotiations may imply is given at the end of the article: as there is substantial interference to platforms' linear way of working when playing a journalistic role (making them mediators), mutual negotiations are then likely to happen with automated news.

My use of Hallin and Mancini has also been reworked for clarity's sake. In the Methods section I explain how my news organisation selection has been inspired by it, leaving the theoretical discussion on differentiation and de-differentiation to the Discussion/Conclusion part. That way, it is better integrated with my analysis of journalistic autonomy.

My use of semi-structured interviews has been clarified in the Methods section: I stress that I used essentially the same structure, except for the bit of flexibility that was required for each interview.

The point you made about generalisation is an important one. I have added a paragraph at the end that details the limitations I faced, especially given that I was not able to conduct investigations on the ground (because of COVID-19). I am being forthcoming about this, and explain how this impacts the generalisation of my research findings. This is why I now speak of an *exploratory* study.

I also rewrote hard-to-understand sentences and fixed the mistakes you spotted. The screenshots are now part of what I describe as supplementary informative material, as I took out the term "netnography" (which implied a greater role than what I envisioned).

I hope that you see these changes as adequate, and that this new version meets your expectations.

Yours sincerely, Samuel Danzon-Chambaud

Competing Interests: No competing interests were disclosed.

Reviewer Report 17 July 2023

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Strengths of article:

- This article deals with a highly relevant topic for the media, research and society in general.
- The research questions, which would benefit from being reformulated, are interesting. They deserve to be better contextualized.
- The empirical work is impressive, both in terms of the number of media studied and the diversity of countries represented. The dataset allows for an important contribution to journalism studies, in spite of some methodological limitations.
- The results are interesting and contribute to research on the topic.
- The article is well-written and clearly structured.

Points for improvement:

- The paper lacks important details as to how the data was analyzed.
- Despite the large number of interviews carried out, most of the media are based on a single interview, which may prevent generalization and in any case does not allow us to claim the term "case study".
- ANT was doubtlessly a key resource in designing the project and certainly played a role in how the project was designed and the data analyzed and interpreted. However, the prominence of ANT theory and terminology obscures the key takeaways and does not, in our opinion, contribute to a better understanding of automated news for the (average) reader.
- At the very least, we would recommend putting less emphasis on ANT and restructuring the results section according to types of automated news and their uses (intended or not). This would also free up space to contextualize more, engage more with existing literature (about automated news) and better define the concepts and research questions. The addition of a specific "Discussion" section would be relevant.

General context, topic and research questions:
The article’s overall topic of automated news is relevant to the field of journalism studies and addresses questions that have become of increasing interest to scholars and industry over the past couple of years (in other words since the field data was collected) and especially over the past year, notably with the advent of ChatGPT, which has elevated questions about news algorithms and AI to become some of the most pressing questions in many newsrooms. Such questions have become key strategic considerations in many newsrooms, not just those more innovative news media for which data has been collected for this study. Although the recent context cannot be addressed with published peer-reviewed research (no doubt there is a new wave of research underway that will begin to be published over the coming months/years), it can nevertheless be discussed in other ways, thereby making your research more relevant to readers. Although this could hardly be considered a weakness of the paper in its current form, it seems to us that there is a missed opportunity.

The introduction could situate the core problem(s) more precisely, and from the outset. There is a leap from the topic to the very specific research questions (addressed below) on the back of the presentation of the *ANT theoretical perspective*. Which journalistic and societal issues is this research related to and why? Why do we need an answer and how might an answer contribute to the research field, to industry and to society? Who has tried to answer these broad questions before? This overarching context requires some work.

Regarding the research questions themselves and their formulation:

- *"RQ1: Using ANT's lenses, what is the overall direction that automated news systems seem to be taking?"*
  It does not seem like you have defined "overall direction". It should be avoided using a term such as "seem" in a research question. In its current formulation it is of course a matter of guesswork, which cannot be evaluated scientifically. However, a simple reformulation is probably sufficient.

- *"RQ2. What are the implications of these developments for journalistic professionalisation?"* This research question is interesting but might benefit from clarification or reformulation (either by being better introduced above, or by being slightly reformulated). It is unclear from which viewpoint you are examining these implications (and the underlying theoretical assumptions). Are we interested in how we think journalists (or news professionals) expect journalistic professionalization related to automated news to develop and evolve, based on their discourses? Are we trying to document current practices, with a view to gaining a better understanding of how things might evolve?

Literature and theoretical concepts:
The literature review is well written (as is most of the article) and includes much of the key research on the topic of automated news. However, some of the literature on automated news/algorithmic news is a little dated and we would recommend the inclusion of some more recent work. The references are good and certainly warrant inclusion, but a lot has happened since 2015 (there are some references to literature in the results section that may be worthy of mention earlier on). The author mostly uses the literature to provide a history of the use of automated news but provides little in terms of the results and insights of previous research. The context is important, but the author could engage more with the results of previous research. In addition, the works cited deserve to be better integrated into a problematization effort, rather than simply summarizing the state of the art on the issue.

The ANT theoretical perspective is very well researched and presented (it is often not). The author refers to the seminal works of ANT and does well in explaining the key concepts. Since it is a perspective that has been used quite a lot in journalism and media studies (works that should be cited in the article), it might make sense to focus a little more on the more specific literature, and to introduce those media and journalism studies that have used ANT to study tools and technologies most similar to the research topic.

The author refers to a broad range of ANT concepts, or rather terms that Latour refers to as "infra-language". Yet, the concepts referred to in the analysis/results are (mostly) limited to mediators vs intermediary, and translation (often without the process of translation being described in detail). Thus, we are skeptical of the prominence of ANT in the study, and would not recommend using it

in the title. Further methodological points related to ANT are discussed below.
In view of their prominence in the introduction and the conclusion, we would find a brief explanation of the concepts of differentiation and dedifferentiation helpful (beyond the broad elements presented in the footnote).

Research design:
The research design – case studies of the use of automated news by eight newsrooms in different countries – is ambitious.
The author deserves praise for having managed to access news professionals in such a wide range of countries and types of media. The use of Hallin and Mancini's media system typology is certainly defendable. However, because it only includes one media per category, it should be argued that the sampling method offers a strategy to access a very wide range of phenomena and uses of automated news, rather than allowing for any significant comparisons between the media systems in question. The dataset of 25 semi-structured interviews from 18 news organizations is impressive. However, only the BBC includes more than one interview (8 interviews). The claim to have conducted multiple case studies based on a single research interview (with the exception of the eight conducted with the BBC) is a bold one. This is not to say that the research is not valid, but since the reference for case study research is Yin (1994), we would claim that this research does not match the criteria for a case study. Using this term in the title and several times in the text is therefore problematic.

The use of a combination of semi-structured interviews and complementary "netnographical" research is appropriate and certainly not incompatible with the research questions. However, the limitations of the method and data collected should be outlined more clearly. For example, semi-structured interviews are not best-suited for accessing an objective reality that is "out-there", but are more appropriate for constructivist perspectives, or require triangulation.

It is not clear how either type of data is analyzed (nor how much "netnography" was conducted, nor is it clear how the ANT perspective is concretely applied, despite the clear introduction to ANT (discussed below).
One of the criticisms of ANT is that it claims to be more method than theory, while providing little help in terms of practical implementation. However, it would have been helpful to explain how this analytical lens was used. One would not know where to begin if asked to replicate the study on a different dataset. From the outside, it mainly consists of the distinction between mediators and intermediaries, based on how the automated content is used, and/or reclaimed for other purposes. This is an extremely interesting question. And although we are certain that the ANT literature was key in obtaining some of the insights, we fear that the ANT "infra-language" might in fact render the results and discussion less clear. Since Bruno Latour's *Reassembling the social* is cited, it should also be noted that the approach is described as the painstaking reconstruction of complex links and associations between entities. Such depth would require multiple interviews for each case and an in-depth analysis of digital tools and technologies, for which, as stated, we have little methodological information and do not have access to the dataset (see below), and which is described as complementary.

Despite an in-depth knowledge of ANT literature, we were unable to understand several elements of the results section. This raises suspicions as to the author's own mastery of ANT. On the other hand, it is possible that the points being made are much simpler than they appear and as such,

would benefit from much simpler language. In short, the research design and data gathered provide many useful insights into automated news, but it is not necessarily what it claims to be (i.e., 18 ANT case studies of automated news).

Results and conclusions:
The information provided in the results section is precious, since it gathers a large number and wide range of technologies that can be defined as “automated news”, and related uses. As discussed previously, we are not certain that using ANT concepts makes for a better reader experience. In our view, classifying the different types of automated news and their uses – intended and unintended – would make for a better article. To do this, it would be necessary to confront the results obtained with the rich literature on automated news and the use of artificial intelligence in journalism. In this way, the article will find a better place in relation to the existing literature.

There are several interesting points made in the conclusion (e.g. internalizing vs Big tech). However, they a lost among the complexity of the ANT interpretations. To journalism scholars and researchers alike, framing the results from the perspective of what is at stake for journalism (and by extension for society at large) would be much more interesting and helpful.

Data:
Consisting mostly of semi-structured interviews with news professionals, the absence of source data is understandable. The examples, tables and screenshots facilitate understanding for a topic that can be quite abstract. However, unlike the interview, data, we suspect that at least some of the netnographical data could have been made available (notwithstanding business secrets). In the absence of such material, a simple list of the data analyzed would have provided better transparency.

Is the work clearly and accurately presented and does it engage with the current literature?
Partly

Is the study design appropriate and is the work technically sound?
Partly

Are sufficient details of methods and analysis provided to allow replication by others?
No

Are all the source data and materials underlying the results available?
Partly

If applicable, is the statistical analysis and its interpretation appropriate?
Not applicable

Are the conclusions drawn adequately supported by the results?
Partly

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: digital journalism, journalistic practices, information production systems, datajournalism

We confirm that we have read this submission and believe that we have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however we have significant reservations, as outlined above.

Author Response 06 Sep 2023

Samuel Danzon-Chambaud

Dear Prof. Pignard-Cheynel and Dr. Robotham,

Thank you for carefully reviewing my work, and for your detailed feedback. Please find below how I addressed your recommendations, which helped make this article stronger:

I have put less emphasis on the use of ANT, while also detailing a bit better how this theoretical framework informed my data analysis. Instead of “intermediaries” I now speak of instances where automated news is used in a *linear* way, and instead of “mediators” I refer to situations where substantial *interference* to it is made. The aim here is—as you wrote—to limit the use of ANT’s “infra-language” so as to make the text more readable.

I have reworked a bit my general overview of ANT so that some concepts are clearer (i.e., the more “passive” role of intermediaries as opposed to the more “active” contribution of mediators). I also mention some scholarly work that use ANT as a framework to study journalism practice.

As you suggested, I have provided a brief explanation of how algorithms are used in news production (e.g., investigative reporting, fact-checking), and better detailed what is at stake when studying automated news. I have rephrased my research questions accordingly, stressing that automated news should be rather studied when yielding agency.

I also briefly touch on generative AI (ChatGPT, Bard) in the Introduction, explaining that at this stage I believe its opacity and unreliability does not make for journalistic usage.

I can see how the use of the term “case study” is problematic. Instead, I now speak of an *exploratory* study and updated the text and title accordingly.

Likewise, the use of the term “netnography” implies a much greater role than what I envisioned. I am now referring to informative material that complement my research interviews. Limitations to using research interviews as a means of data collection are articulated more clearly at the end of the article, including the need for additional input to be able to generalise. Because of the length of the article, I have kept the brief definition of differentiation and de-differentiation theory as-is (I only added that it originates from the work of Parsons and Luhmann). However, I have moved it to a Discussion/Conclusion part where it is better integrated with my analysis of journalistic autonomy.

I hope that these changes meet your expectations, and that you see this modified version as a worthful contribution to journalism studies.

Yours sincerely, Samuel Danzon-Chambaud

Competing Interests: No competing interests were disclosed.