Title:

The cultural capital you need to work with automated news: Not only "your beautiful piece of work", but also "patterns that emerge"

Authors' affiliation:

Samuel Danzon-Chambaud (PhD graduate)*, Alessio Cornia*

*School of Communications, Dublin City University

Disclosure statement:

This article uses passages from the lead author's PhD thesis, and adapts material from the industry report he published at the BBC.

Abstract:

This article sheds light on the emerging forms of cultural capital that media practitioners need to acquire to work with automated news, as in Bourdieu's understanding of unique abilities that include, among others, journalistic expertise and technical know-how. To uncover these new skills, we carried out 30 interviews with editorial staff, executives and technologists working at 23 media organisations based in Europe, North America and Australia. We show that these new forms of cultural capital are essentially two-fold: on the one hand, they involve taking a "structured journalism" approach so as to think of what an ideal story may look like, and then by breaking it down into smaller predictable elements that can be reusable across many versions of that same story; on the other hand, they also call for knowing how to embed a media organisation's standards and practices into code for automated news. Overall this study argues that a new type of cultural capital emerges, as it is associated with the production of automated news. We call it the *distinct-abstract* capital, whereby journalism is thought of both as a one-off endeavour and as a process that can be deconstructed in an abstract way close to computer programming.

Keywords:

automated news, automated journalism, algorithmic journalism, computational journalism, Bourdieu, Field theory.

Main text:

1. Introduction

Automated news—alternatively referred to as "automated journalism," "algorithmic journalism" or "robot journalism"—stands for the computerised generation of journalistic text through software and algorithms, with no human intervention in-between except for initial programming and sometimes quality checks before

publication (Carlson, 2015; Graefe, 2016). It relies on a basic utilisation of Natural Language Generation (NLG), a programming technique employing algorithms to source information from online and offline datasets in order to fill in blanks left on pre-written text. This resembles the game "Mad Libs" (Diakopoulos, 2019) as programmers or journalists are required to create general templates that include enough elements that can be thought of in advance, but also that can be connected to a substantial flow of data that add the specifics of a story. As a result, only a limited number of stories can be automated, for instance election results, financial news or sports stories.

Automated news, which is now part of many newsrooms' operations, can be implemented in three ways: internally, as news organisations develop it in-house (e.g., the solution adopted at The *Los Angeles Times* and The *Washington Post*); externally, as they outsource it to NLG providers (e.g., *Le Monde* and The Associated Press); and semi-externally, as they subscribe to third-party tools that allow news staff to design its own templates, using a form of No-code language that is accessible to everyone (e.g., BBC). Machine learning is increasingly involved in automated news solutions (see e.g. Leppänen, 2023 and Stefanikova, 2019). Recent breakthroughs in generative AI have brought NLG to a whole new level, but it remains to be seen if its opacity and unreliability can be overcome so that it can be used in critical journalistic usage (see Mullin and Grant, 2023).

A systematic literature review of automated journalism scholarship (Danzon-Chambaud, 2021a) demonstrates that we still lack an insightful and cohesive understanding of the way automated news impacts journalism practice. In most cases, automated news is depicted as either an helpful tool that takes on routine tasks and enable journalists to focus on more demanding work or as a threatening technology that is about to supplant them. Regardless of whether automated news facilitates or substitutes the work of journalists, it remains to be explored what types of skills and mindset journalists are required to develop to master this technology and use it to produce stories that satisfy journalistic standards and ethical considerations.

This study's key contribution is in its analysis of the emerging dispositions that journalists need to acquire to work with automated news and, more broadly, with computational journalism projects. We rely on Bourdieu's concept of *cultural capital* to identify the types of skills and mindset needed, and then we reflect on their

repercussions for journalism practice. We show how automated news requires journalists to develop what we call a *distinct-abstract capital*. It stands for combining journalists' unique ability to process new information to create distinctive stories (in line with established professional standards) with a more structured and abstract approach similar to computer programming, which involves predetermining the recurring elements of a story to create the templates that will be connected to datasets. We will also see how mastering automated news and ensuring quality outputs requires embedding into code existing professional and ethical standards.

The structure of this article unfolds as follows. Initially, we briefly address how journalists have reacted to technological change, highlighting the need to better look at algorithmic production within newsrooms. Then, we discuss how Field theory can help in interpreting our findings, formulate our research questions, and detail our methodological choices. Subsequently, we present our findings by focusing, first, on the "structured journalism" approach developed within the selected organisations and on the challenges it poses. In the second part of our findings section we analyse how newsrooms try to embed into code the established journalistic standards and the specifics of the news outlets' stylistic approach. Finally, we conclude by discussing the new type of *distinct-abstract* capital that emerged from our analysis.

2. Journalists' reactions to technological change

In his analysis of discourses about "technologically specific forms of work" in American journalism from 1975 to 2011, Powers (2012) sees three ways journalists react to new technological capacities being brought into the newsroom: first, by considering them an extension of existing occupational practices and values, which then triggers conversations on how to best harness them in order to enhance journalistic autonomy; second, by seeing them as a threat that needs to be "subordinated" because they do not correspond to occupational norms, which generally prompts a call to go back to core occupational practices and values and making those new forms of work look foreign, unnecessary and even dangerous; third, by evaluating whether these new forms of work can serve as a basis for a reinvention of occupational norms, even if what lies ahead is still unclear.

Looking at the deployment of new technologies over time, we see how they align with Powers' categories, starting with the extension of existing occupational practices and values. Taking greater access to telephone lines in 1930s' American newsrooms and the introduction of cars with radio communication as an example, Mari (2018) observed that journalism practice was enhanced through reporters being able to better reach out to their sources and gaining extra mobility on the ground. In contrast, Zelizer (1995) illustrated how the introduction of wirephoto was perceived by American journalists as a threat that needed to be subdued: they either devalued photography in favour of text, claimed proficiency as photographers themselves, or reluctantly accepted wirephoto as a 'necessary evil' to meet audience demands of realism. Finally, regarding the reinvention of occupational norms, Boyles and Meisinger (2020) showed that American newspaper librarians, among the firsts to be impacted by digital disruption, adapted by taking on the new tasks left vacant by redundant staff or by managing book clubs.

Introduced as part of digitalisation, algorithms do have critical implications for journalism practice: first, they allow for the deployment of web metrics within newsrooms, potentially reducing journalists' autonomy as those have to factor readers' preferences into their own news judgement (Anderson, 2011); second, they can be programmed so that they directly contribute to news making. Diakopoulos (2019) shows that algorithms can be used this way to assist journalists with fact-checking or investigative pieces, or to generate content through automated news or "newsbots" on social media.

Using algorithms for news production can then be seen as one of the latest "technologically specific forms of work" described by Powers. Whether practitioners evaluate those as a continuation of existing norms, a threat to occupational values or an opportunity for reinvention, though, remains quite unclear. Schapals and Porlezza (2020: page 17) found that in German newsrooms automated journalism is seen as "*complimentary to* rather than *competing with* their existing skillset," and the interviewed journalists stressed how its application would have enabled them to focus on in-depth investigations and other core journalistic tasks. Similarly, Wu, Tandoc and Salmon (2019a) found that news workers assume they have control over algorithmic news production, thus fitting into Powers' category of a continuation of existing norms.

However, in another article (2019c), they underline that the very technical skills that are needed to work with automation are met with resistance by senior journalists used to traditional ways of doing journalism, or by practitioners who see those as being rather a programmer's job, thus making them look foreign or unnecessary as in Powers' second category. Finally, Milosavljević and Vobič (2021) illustrated that newsroom managers were holding a somewhat mixed discourse of "algorithmic sublime" that tend to mitigate the damaging effects these could have on journalism practice—such as leaving humans aside—to focus instead on the opportunity to augment journalism's public spirit.

Given the uncertainty about how media practitioners may react to the use of algorithms in news production, it is worth investigating their perceptions of the impact of automated news on their work, which now has a foothold in many newsrooms (see Danzon-Chambaud, 2023). Thurman, Dörr and Kunert (2017) first examined journalists' experiences and views on "robot journalism" and found that, despite some benefits (e.g. covering uneconomical beats like local sports), automated journalism presents fundamental limitations such as reliance on single data streams and the lack of a "human angle". Our study extends the growing body of literature on the impact of automation on journalism practice by focusing on journalists' views regarding the skills, mindset, and type of capital needed to work with automated news.

3. Bourdieu's Field theory as a framework

Practice theory developed by French sociologist Pierre Bourdieu appears as an adequate framework to investigate the impact of automated news on journalism practice. In what is called "Field" theory, Bourdieu sees the world as many *fields*, mezzo-level structures that are governed by two major forces: one drawn from *economic* capital, or "money or assets that can be turned into money," and one made of *cultural* capital, which stands for unique abilities to a field like "educational credentials, technical expertise, general knowledge, verbal abilities, and artistic sensibilities" (Benson and Neveu, 2005: page 4). There are other forms of capital too (Jenkins, 2005) like *social* capital (e.g., relationships, networks) and *symbolic* capital (e.g., reputation, honour), as well as field-specific ones like *journalistic* capital, the cultural capital proper to the journalistic field (Schultz,

2007), which may be comprised of social and symbolic capital (Meyen and Riesmeyer, 2012). Regarding *technological* capital, Bourdieu sees this as belonging to cultural capital, qualifying it (2005a: page 194) as a collection of "procedures, aptitudes, routines and unique and coherent know-how, capable of reducing expenditure in labour or [financial means] or increasing its yield."

At the heart of Field theory is the idea that, within each field, economic and cultural capitals regroup under what is known as the *heteronomous* pole and the *autonomous* pole in the journalistic field, but come under different names in other spheres. Bourdieu (2005b) explains that the *heteronomous* pole speaks to a form of journalism that is permeable to the influence of other fields—often the political or the economic one—as shown for instance by advertisers' leverage over commercial television news. By contrast, the *autonomous* pole represents what Bourdieu sees as the "purest" way of doing journalism, which is independent and free from external pressures. This can be seen for instance in cases of Pulitzer Prize-awarded pieces or impactful journalistic investigations (Bourdieu, 2005b; Benson and Neveu, 2005). When he formulated these ideas, Bourdieu actually saw the journalistic field as becoming increasingly *heteronomous*, mostly because of the power television had over other forms of journalism.

Bourdieu's Field theory also takes into account how one navigates within the field. He introduces concepts like the *doxa*, which stands for the "universe of tacit presuppositions that we accept as the natives of a certain society" (Bourdieu, 2005b: page 37), and the *habitus*, which posits that "individuals' predispositions, assumptions, judgments, and behaviors are the result of a long-term process of socialization" (Benson and Neveu, 2005: page 3). In the journalistic field, the *doxa* can be understood as the "rules of the game" (Tandoc and Jenkins, 2017) and the *habitus* as a "feel for the daily news game" (Schultz, 2007). Bourdieu (1997) also brings up what he calls the *hysteresis* or the "Don Quixote effect," through which people "judge and act today according to dispositions previously acquired under quite different social conditions" (Benson and Neveu, 2005: page 10), making their *habitus* unsynchronized with a new prevailing order (Wu, Tandoc, and Salmon, 2019b). To give an example that speaks to Bourdieu's roots, this could be when farmers in southwestern France were no longer able to use their *habitus* to court women, because of the dominating place taken by urbanisation

(Bourdieu, 2002). This situation of *hysteresis* may occur whenever a field is profoundly transformed, following a major crisis.

In journalism studies, Bourdieu's Field theory concepts have been used, among others, to map out the different types of capital at play within the journalistic field or one of its various subfields (e.g., see Siapera and Spyridou, 2012 for online journalism; English, 2016 for sports journalism). Another stream of research has to do with finding out whether new entrants in the field (e.g., bloggers in Vos, Craft, and Ashley, 2012; news start-ups in Tandoc and Jenkins, 2017 and Usher, 2017) contributes to changing or maintaining the prevailing *doxa*. This stream takes inspiration from Bourdieu's argument (2005b: page 39) that "to exist in a field (...) is to differentiate oneself." In doing so, new entrants either strengthen or transform economic and cultural capitals.

Based on Bourdieu's idea that players in a field struggle over positions, with success depending on their journalistic capital and material resources, Örnebring and colleagues (2018) developed a theoretical model that accounts for the blurred and hybridised nature of contemporary journalism. This model highlights the close interrelation between journalistic capital, access to resources and job security, with access to newsroom resources or secure job positions, for instance, depending on a journalist's reputation. The authors also emphasise the need to understand how developments in automation affect the different positions in an evolving journalistic field.

There are of course limitations to analysing journalism through the lens of Field theory (see Benson, 2006 for the role of the political field in subsidising the media); however, its main strength lies in that it reconciles structure with agency. This is also true of other sociological frameworks—for instance Gidden's (1984) *duality of structures* model—but Field theory's emphasis on tensions allows for a critical reading that is most welcome in the context of datafication and artificial intelligence: according to Anderson (2013: page 1013), it brings "a vector of power dynamics to an area of socio-technical life (technological innovation) too often understood from within an 'all boats will rise' mentality."

Based on the research gaps identified (the shortage of studies focusing on journalists' views on the impact of automated news on journalism practice and on the skills required to work with it), our research questions are therefore the following:

RQ1. What is the impact of the implementation of automated news on the key skills and the type of capital that journalists are expected to develop?

RQ2. What do these considerations entail for journalism practice and for journalism as a whole?

4. Methodology

In their Field theory analysis of algorithmic automation in journalism, Wu, Tandoc and Salmon (2019b) wrote that, to account for both structure and agency, it is in fact critical to look at some key dimensions, including the new forms of cultural capital that journalists are expected to acquire. To explore these new forms of capital, we conducted a total of 30 semi-structured interviews (average length: 00:35:30) in a strategic sample of 23 leading news organisations in Europe, North America and Australia, representing a range of Western media systems: 13 interviews with editorial staff (like journalists and editors), 14 with executives (like directors and C-level managers) and 6 with technologists (like software specialists)[1].

The organisations selected for this study are 10 news agencies/services, 7 newspapers, and 6 public service media (PSM), three media types we selected based on their use of automated new. Eight of the interviews were conducted at the BBC as access was facilitated by a secondment undertaken by one of the authors as part of his PhD. Some of the insights collected during this phase of research also contributed to a white paper written for the BBC (see Danzon-Chambaud, 2021b). The online appendix provides details on the selected organisations and interviewees. Although cross-country comparative analysis is beyond the scope of this study, the strategic sample was selected

---

[1] Three interviews were conducted with two participants simultaneously, resulting in a total of 33 interviewees instead of 30.

to encompass media types and systems that conspicuously use news automation technologies.

Interviewees were selected through expert and snowball sampling (by finding or asking in each organisation who were the staff members working with automated news) and contacted by email, social media, or through common contacts. Interviews were conducted between June 2020 and April 2021 and, because of the COVID-19 pandemic, these had to be conducted remotely via Zoom and similar video conferencing tools. Anonymisation was granted to the interviewees to enable them to speak more freely.

To determine questions to be asked, we relied on important themes that were identified in a previous study (see Danzon-Chambaud & Cornia, 2021): we selected those that were most appropriate to the news organisation or the professional profile of the interviewee, then adapted these themes into individualised questionnaires that included factual questions as well. To complement these interviews, material published online (e.g., blog posts, trade publications, etc.) and made available by the interviewees was also analysed. We then tapped into these interview data using thematic analysis, which helped identify the key patterns that concern the forms of cultural capital that journalists need to acquire. The manual coding was supported by the use of NVivo to facilitate data organisation and the thematic analysis. In this article, the quotes are attributed to the sources according to their position and media organisation at the time of interview to respect their anonymity.

5. Findings

In Danzon-Chambaud and Cornia (2021), we showed that journalists working with automated news are expected to develop a computational thinking mindset, i.e. the ability of solving problems through applying a form of abstract reasoning that is close to computer programming (see Gynnild, 2014 and Wing, 2008). In the research results that follow, we will detail how this computational thinking spirit translates, first, into adopting a "structured journalism" approach when conceiving automated news products and, second, into embedding the specifics of a media organisation's own polices and of journalistic professional knowledge and standards into computer scripts for automated news.

5.1 Structured journalism to work with abstraction concepts

Setting up automated news very much requires a computational thinking mindset as media practitioners need to address editorial considerations in the code they are writing (see Dierickx, 2023), relying for that on a type of abstract reasoning that is used in computer programming. In practice, this is made possible through taking a "structured journalism" approach, a process of "atomizing the news" (Jones and Jones, 2019) whereby narratives are turned into predetermined templates and databases (Caswell and Dörr, 2018; Anderson, 2018). As raised by a BBC manager, this change in mindset implies thinking about stories no longer as individual pieces, but rather as regular "patterns that emerge":

> The skill (...) that's central to writing those templates is basically the ability to work with stories abstractly, instead of just in terms of the specific story, right? So, some journalists they just (...) think in terms of the specifics, not in terms of the patterns that emerge, whereas when you're creating those templates, it's still writing, you're still writing language, basically. But you're doing it at the level of the pattern of stories, of all the possible stories, (...) not just at the level of the specific, that's the key, the key thing.

> (Manager, BBC, United Kingdom)

A BBC editor mentioned that—rather than authoring an article that is ultimately perceived as "your beautiful piece of work that's completely owned by you and [has] nothing to do with anybody else"—working out templates for automated news is similar to an improvisation technique known as "the story spine": it involves, first, listing out recurring elements like "Once upon a time..." and "But, one day...," then using them as prompts to generate the story's specifics (Adams, 2013).

When setting up automated news, having a structured journalism mindset works best when envisioning baseline scenarios, first by envisaging an ideal story, then by dividing it up into little components that can be reused in many versions of that same core story. "If you didn't have any automation involved, what would be the story you, as a human being, would want to write, or what would be the elements of the story that

you would want to write?" flagged the BBC editor. "Having established that, we then looked at what data we could get to fill that." As an example of this, in the run-up to the 2019 election in the United Kingdom a BBC computational journalist remembered looking for all the bits of information that could be anticipated: "You don't know in advance who is going to win the national general election, you don't know who is going to win each seat, but you know all the possibilities in advance," he said. These could be, for instance, who may win the constituency, how the victory margin compares with that of last election, what to do in case of a dead heat, qualifying the outcome as either a gain or a loss, working out the candidates' ranking and determining whether they can have their deposit back. The computational journalist indicated that, eventually, this process leads up to having six to seven fundamental sentences that constitute the "bare bones" of the automated piece, which can then be reemployed across many versions of it.

The same process of envisioning what an ideal story would be like and then breaking it down into reusable elements could also be seen at other media organisations. Hence, a similar "working backwards" approach was mentioned by an executive at the Associated Press: "What does the story need to look like? And what are all of the possibilities? You know, earnings go up, earnings go down, earnings stay flat. There's all of the branches that follow depending on the data that you're using," she said. This thought process was also at play at the Bavarian broadcaster Bayerischer Rundfunk when creating templates for automated basketball stories: "We usually start with an ideal article, (...) for example a perfect basketball match report, and then we kind of try to *templatise it*—make it into a template—and find out what's possible and what's not possible," said a senior technologist. This whole business of abstraction took an even bigger turn at the *Washington Post*, where—during the 2020 presidential election—the engineering team partnered with Northwestern University to probe journalists as to what type of details they would like to see included in automated backgrounders. To carry out this task, a computational journalism scholar conducted interviews and made a prototypes in order to figure out what media practitioners consider newsworthy:

> The work that was particularly hard that he needed to do (...) was not programming necessarily—though some of that was difficult. It was essentially trying to figure out how a reporter or an editor arrives at a heuristic for what is interesting or what is newsworthy. And he did that through a series of interviews, through multiple prototypes and try rounds. We finally came up with something that captured essentially the process that our reporters and editors would go through.
>
> (Executive, *The Washington Post*, United States)

Having said that, some news staff seemed to have had a more difficult time than others to come to grips with this process of abstraction. A BBC senior technologist, for example, mentioned that, in some of the trainings that were organised to make journalists more comfortable with NLG concepts, some participants were able to engage with what he calls a "complex tree of a story," whereas others experienced difficulties in seeing all the possible permutations:

> To composite blocks that may be combined in different ways, some people couldn't reason what that story would be and that became more difficult (...) whereas other people (...) were instantly really engaged with the idea that "Oh, if this happens, it could have this whole branch of the story that only exists under certain conditions." That seemed to be the distinguishing thing: some people were kind of in tune with that complex tree of a story and other people were much more reluctant to do that.
>
> (Senior technologist, BBC, United Kingdom)

In the same vein, an editor at the German newspaper *Stuttgarter Zeitung* remarked that, during a workshop held by AX Semantics to explain how its self-editing tool worked, some of his colleagues had a harder time comprehending the abstraction concepts at play:

> There were three, four colleagues who (...) also participated (...) in this initial workshop. (...) You could see on their faces that they dropped out after one, two hours, because it was too complicated for them and they had real problems to think like a computer would do, like a program would do.

(Editor, *Stuttgarter Zeitung*, Germany)

To palliate this, some newsrooms reported having changed or adapted their recruitment policies so as to make sure that news staff involved in automated news or computational journalism projects do possess these abstraction skills. In fact, the BBC manager indicated that, before joining News Labs, journalists have to take a small test where their comfort to work with abstraction is evaluated. Having journalists who are comfortable working with numbers and abstraction onboard is especially seen as an asset at RADAR, as the news organisation's media clients do not necessarily have this type of expertise in-house, nor have the time to invest in it. "We have to recruit people who are very comfortable working with numbers, much more comfortable than the average journalist," said an editor at RADAR, who himself worked as a business analyst before going into journalism. The Norwegian news agency NTB pushed these prerequisites even further and focused on hiring journalists with a programming background. "We tried also to teach other journalists, especially the template coding, but it's easy to get a developer to understand journalism than the other way around," said an editor at NTB. His executive colleague further stressed the importance of having the "right people" on the team:

> It's quite easy if you have the right people with the right ... *heads*. (...) It might be like 80% of the programmers would have never been able to understand journalism and those who will ... it's much, much better to work with them than to try to teach a journalist coding.

(Executive, NTB, Norway)

5.2 Embedding journalistic knowledge into code

Another aspect that is linked to the acquisition of a computational journalism mindset has to do with embedding the journalism profession's and the media organisation's own standards and practices into code for automated news. According to a BBC manager, doing so required being very specific about these rules:

> If it's an editorial requirement that you can deal with in writing then, by definition, because of the way these tools are structured, (...) you can deal with it in the template. The challenge is—and we came across this very much in (...) the lead up as we were preparing for the election— in articulating very specifically (...) what those editorial rules are (...) and a lot of them are written down, like in (...) the policy guides and the style guides and all the rest of it. But some of them are not.
>
> (Manager, BBC, United Kingdom)

This could involve, for instance, reflecting on the right choice of words to qualify an electoral win: "If it's by 50 votes, then you might call that [a] very narrow win or whatever; if it's by 50% of the votes, you might call that an enormous win," said the manager. "You've got to figure out where the boundaries are for the words that you use." On the night of the general election in the United Kingdom, the implementation of a "combined journalism" or "human-in-the-loop" form of workflow (see Wölker and Powell, 2021) where journalists are asked to check automated drafts before publication showed that, when it comes to delineating victory margins, there was still room for improvement. A technologist with a journalism background who worked on verifying these stories on the night said that, sometimes, correcting some of the headlines was necessary, as those were only indicating a win with over 50% of the votes when the leading party secured over 75% of votes:

> I was, like, "this isn't as accurate as it could be" (...) I just was aware of how complicated election coverage is and ... how frequently the BBC is accused of bias? So I just didn't want an under-reporting of the margin of victory to be taken as bias.
>
> (Technologist, BBC, United Kingdom)

Editorial issues like these could be found across media organisations using automated news to cover election or referendum results. The editor at the Norwegian news agency NTB remembered having to decide on which small parties to report on individually—and not for example under the label "others"—which implies making a

call as to which threshold to use: "when should you decide that they should be reported separately? (…) So all those kinds of judgements you have to make based on the data, which is quite hard sometimes."

Similarly to BBC News Labs' collaboration with political experts to delineate edge cases ahead of the UK 2019 general election (see Danzon-Chambaud, 2021b), editorial staff at the *Washington Post* were asked to contribute their political expertise so as to come up with potential "edge cases" within the United States' electoral system:

> For those really odd outcomes where things go to a runoff, for example, or where there is no winner declared on election night or a variety of edge cases like this, we needed a ton of extra help from reporters and editors to essentially figure out what those edge cases were and then how we would like to handle them using *Post*'s style.
>
> (Executive, *The Washington Post*, United States)

Likewise—in the case of a double majority referendum that, in Switzerland, requires the support of most citizens and also at least half of the cantons—a senior computational journalist at Tamedia mentioned having to watch out for unlikely outcomes, like when a proposal is backed by popular vote, but not by a majority of cantons:

> That's an edge case because that happens very rarely. Usually if the popular vote is above 50%, so if the majority accepts it, usually the majority of cantons will also accept it. And so when developing these templates, I could have forgotten about this edge case. And then the text would have said "well, the vote was accepted because (…) 52-53% (…) of the people accepted it," but that text would have been plain wrong because it would still have been refused.
>
> (Senior computational journalist, Tamedia, Switzerland)

Designing automated news also triggered reflections on journalistic ethics. In a project on determining the level of high street shopping at the BBC, the computational journalist recounted asking a business representative for quotes in advance. Two types of answers were provided to him: one where retail activity is higher than average, the other where it is lower. "So basically they were able to give me a quote for both scenarios.

So places where the high street had more kind of activity or retail than before (...) or where it was declining," he said. "And based on which scenario matched the streets, it would then use the correct quote in the template." To him, this is best suited to stories where performances are being recorded, like in those determining whether hospitals, police or waste collection services meet their targets. "You have a certain number where they have met the target or they haven't met the target. So you say, 'If they haven't met the target, what are the typical reasons for that?' And they would give you their analysis," said the journalist.

Similarly, taking News Labs' first experiment with automated news (i.e., A&E waiting times stories) as an example, the senior BBC technologist debated whether a professional association—like a doctors' union—should be asked to comment:

> So you may go to a union representing doctors and say "what would you say if this target wasn't met?" and "what would you say if the target was met?" And then we can include those quotations, but that did raise some... an editorial... difficulties about how do you include a quotation that's attributed to a person if they haven't actually responded to the thing that happened? They basically hypothetically responded.
>
> (Senior technologist, BBC, United Kingdom)

According to the computational journalist, though, it is editorially valid given that journalists are transparent and explain to the interviewee the logic of getting quotes in advance for automated news:

> It's just making sure that you're not going to misquote the person by putting it in the wrong scenario or context. So basically that you are going to do what you've told them you're going to do with that quote, or why that quote is relevant. So that you don't throw it in somewhere where it's irrelevant and it basically looks like they don't know what they're talking about.
>
> (Computational journalist, BBC, United Kingdom)

At last, another aspect of encoding journalistic standards and practices into code has to do with a news organisation's own style and tone. The executive at the Associated Press

stressed that, as such, there can be "no wiggle room" when it comes to embedding the specifics of the news agency's stylebook into computer scripts for automated news:

> We need to be able to have a template that conforms to how we need that story to read. (…) I mean, we have master lists of what we call every company on first reference, on second reference, you know, do you shorten the name of the company on second reference? All of that is in columns of data that tells the template what language to use.
>
> (Executive, Associated Press, United States)

Similar concerns were raised at *The Times* and France Bleu regarding rounding up numbers rather than giving exact figures (*The Times*), and avoiding using the same phrasing twice in the title and lead (France Bleu). At Sudpresse, debating on stylistic issues brought a healthy discussion with the firm automating content for them: an executive at Sudpresse remembers opposing LabSense's suggestion that—when a football team would lose zero to five—the corresponding story would read as if the team has been "crushed": this, he said, could be interpreted as a "pseudo-editorial" decision. Moreover, according to Belgium's football rules, a score of zero to five can also be attributed in situations where one of the teams forfeits the game:

> At some point, LabSense came to us with [these] suggestions and we declined them as they were pseudo-editorial. (…) We didn't really want to go that way because it's just data and we don't know what happened on the playing field. So we didn't want this to backfire. (…) So we decided to remain quite "cold" and neutral.
>
> (Executive, Sudpresse, Belgium, translation)

6. Conclusion

To answer RQ1, the analysis of the impact of automated news on journalism reveals the development of a new type of thought process where journalism is considered both as a one-off endeavour—or, to put it in the words of the BBC editor, as a "beautiful piece

of work that's completely owned by you and [has] nothing to do with anybody else"—and as a structured process that can be deconstructed in an abstract way close to computer programming. This, in turn, calls for a new type of cultural capital (journalistic *and* technological) that media practitioners need to acquire, which we call here *distinct-abstract* capital. This emerging type of capital supplements journalists' unique ability to produce singular stories while adhering to professional standards. It involves, too, the adoption of a more abstract way of reasoning, which enables them to master algorithmic production and to ensure that its outputs meet established professional standards and organisational norms and practices.

Possessing this type of capital can translate into an easiness to engage with new technology-oriented forms of computational journalism that are progressively gaining traction within newsrooms (e.g., advanced data journalism practice, data mining techniques for investigative journalism, or even algorithmic accountability reporting), thereby creating a new form of *news habitus* (Schultz, 2007) which is most likely to be picked up among new entrants like computational journalists, who best know how to mingle the specifics of journalism practice with abstraction concepts brought by computer programming.

That being said, the growing emphasis that is put on acquiring this new type of *habitus*—as exposed in some of new recruiting strategies described above—could result in creating a situation of *hysteresis*, where practitioners who acquired their dispositions using a more traditional form of journalistic capital (e.g., storytelling, finding "exclusives," etc.) and who are unable to adapt to this new context may be lagging behind. In line with Örnebring et *al.* (2018) observation that a player's position within the journalistic field also depends on symbolic resources recognised as valuable, we suggest that the possession of *distinct-abstract* capital likely affects individual journalists' positions within this evolving field, particularly their access to newsroom resources and secure job positions.

Looking now at whether these computational journalists—or teams of journalists working with technologists—contribute to either changing or reinforcing the journalistic *doxa*, it becomes evident that organisational practices like embedding journalistic standards and knowledge into code for automated news point out to the influence that the technological field is having on the journalistic one. We can therefore

posit, as an answer to RQ2, that the deployment of automated news within newsrooms implies a relevant *change* for journalism practice and for journalism as a whole, as it contributes to modifying the prevailing *doxa* in the field. Attempts to make the outputs of automated processes more adherent with established professional and ethical norms, together with the observed difficulties some journalists face in developing this *distinct-abstract* capital, suggest that the process of implementation of automated news within newsrooms is still in its early days, and the consequences for the journalistic profession should further be investigated once this practice becomes more widespread and consolidated.

At the same time, it is also worth reflecting on whether the technological *doxa* complements computational journalists' own. Wu, Tandoc and Salmon (2019c) describe the technological *doxa* that surrounds algorithmic automation as being rooted in a "Silicon Valley ethos" that places a high value on open data, client feedback and collaboration with other technological firms, as well as on digital literacy and awareness. There are then obvious connections to be made with computational journalists' own ideals of public access to information and collaboration outside the newsroom (see Parasie and Dagiral, 2013; Borges-Rey, 2016), which constitute in themselves a departure from standard journalism practice where "exclusives" are highly sought-after and where journalists generally act as gatekeepers in news selection. Even though Wu, Tandoc and Salmon indicated that there may be commonalities between the technological and journalistic *doxas*—most notably around audience needs—this is nonetheless clear evidence of technological *heteronomy* within the journalistic field, which may become even more pervasive as they stress that the digital turn within newsrooms could eventually result in technologically-minded agents becoming more dominant in the field.

A first limitation to this research relates to not being able of conducting direct observations because of COVID-19. This implies that we have not been able to hear bits of conversation and observe participants' behaviours to have a more genuine appreciation of media practitioners' views on automated news, in contrast to the more conventional tone used during interviews. A second limitation is the lack of focus on differences across countries and media types. Some of the differences that emerged were

related to the extent to which news organisations implemented changes in their automated news systems and adopted in-house technological solution, an aspect that was addressed in other publications (Danzon-Chambaud, 2023) and that is beyond the scope of this study. Another limitation concerns the very much Western-centric selection of news organisations, since at the time interviews were conducted automated journalism was still a relatively new development and seemed to be mostly adopted by outlets in the West. Some Asian newsrooms were using automation too, but this could not efficiently be researched because of language limitations. Finally, our study does not focus on the latest developments of generative AI, notably the use of Large Language Models (LLMs). Although recent studies suggest these developments are reshaping publishers' dependence on platforms by extending it from news distribution to news production (see e.g. Simon, 2024), LLMs use become widespread and popularised after we collected the empirical material for this study.

7. References

Adams K (2013) Back to the Story Spine. *Aerogramme Writers' Studio*, 5 June. Available at: https://www.aerogrammestudio.com/2013/06/05/back-to-the-story-spine/ (accessed: 8 September 2022).

Anderson CW (2011) Between creative and quantified audiences: Web metrics and changing patterns of newswork in local US newsrooms. *Journalism* 12(5): 550–566. DOI : 10.1177/1464884911402451.

Anderson CW (2013) Towards a sociology of computational and algorithmic journalism. *New Media and Society* 15(7): 1005–1021. DOI : 10.1177/1461444812465137.

Anderson CW (2018) *Apostles of Certainty: Data Journalism and the Politics of Doubt*. Oxford: Oxford University Press.

Benson R and Neveu E (2005) Introduction: Field Theory as a work in progress. In: Benson R and Neveu E (eds) *Bourdieu and the Journalistic Field*. Cambridge : Polity, pp.1–25.

Benson R (2006) News media as a 'Journalistic Field': what Bourdieu adds to New Institutionalism, and vice versa. *Political Communication* 23(2): 187–202. DOI : 10.1080/10584600600629802.

Borges-Rey E (2016) Unravelling data journalism: a study of data journalism practice in British newsrooms. *Journalism Practice* 10(7): 833–843. DOI : 10.1080/17512786.2016.1159921.

Bourdieu P (1997) *Méditations pascaliennes*. Paris: Les Éditions du Seuil.

Bourdieu P (2002) *Le Bal des Célibataires : Crise de la Société Paysanne en Béarn*. Paris: Les Éditions du Seuil.

Bourdieu P (2005a) *The Social Structures of the Economy*. Cambridge: Polity.

Bourdieu P (2005b) The Political Field, the Social Science Field, and the Journalistic Field. In Benson R and Neveu E (eds) *Bourdieu and the Journalistic Field*. Cambridge: Polity, pp.29–47.

Boyles JL and Meisinger J (2020) Automation and adaptation: reshaping journalistic labor in the newsroom library. *Convergence* 26(1): 178–192. DOI : 10.1177/1354856518772542.

Carlson M (2015) The Robotic Reporter. *Digital Journalism* 3(3): 416–431. DOI : 10.1080/21670811.2014.976412.

Caswell D and Dörr K (2018) Automated Journalism 2.0: Event-driven narratives. *Journalism Practice* 12(4): 477–496. DOI : 10.1080/17512786.2017.1320773.

Danzon-Chambaud S (2021a) A systematic review of automated journalism scholarship: guidelines and suggestions for future research. *Open Research Europe* 1(4). DOI : 10.12688/openreseurope.13096.1.

Danzon-Chambaud S (2021b) *Automated news at the BBC*. White paper for BBC Research and Development. Available at: https://www.bbc.co.uk/rd/publications/automated-news-at-bbc-algorithmic-journalism (accessed: 14 August 2024).

Danzon-Chambaud S (2023) Automated news in practice: a cross-national exploratory study. *Open Research Europe* 3(95). DOI : 10.12688/openreseurope.16040.3.

Danzon-Chambaud S and Cornia A (2021) Changing or reinforcing the "rules of the game": a Field theory perspective on the impacts of automated journalism on media practitioners. *Journalism Practice* 17(2), 174–188. DOI : 10.1080/17512786.2021.1919179.

Diakopoulos N (2019) *Automating the News: How Algorithms Are Rewriting the Media*. Cambridge, MA: Harvard University Press.

Dierickx L (2023) News automation, materialities, and the remix of an editorial process. *Journalism* 24(3): 654–670. DOI : 10.1177/14648849211023872.

English P (2016) Mapping the Sports Journalism Field: Bourdieu and broadsheet newsrooms. *Journalism* 17(8): 1001–1017. DOI : 10.1177/1464884915576728.

Giddens A (1984) *The Constitution of Society: Outline of the Theory of Structuration.* Cambridge: Polity.

Graefe A (2016) *Guide to Automated Journalism*. Report for the Tow Center for Digital Journalism report. Available at: https://academiccommons.columbia.edu/doi/10.7916/D80G3XDJ (accessed: 29 July 2021).

Gynnild A (2014) Journalism innovation leads to innovation journalism: the impact of computational exploration on changing mindsets. *Journalism* 15(6): 713–730. DOI : 10.1177/1464884913486393.

Jenkins R (2005) Bourdieu, Pierre. In Ritzer G (ed.) *Encyclopedia of Social Theory: Vol. 1* Thousand Oaks, CA: SAGE, pp.67–71. DOI : 10.4135/9781412952552.n31.

Jones R and Jones B (2019) Atomising the news: the (in)flexibility of structured journalism. *Digital Journalism* 7(8): 1157–1179. DOI : 10.1080/21670811.2019.1609372.

Leppänen L (2023) *Methods for automated generation of natural-language reports*. PhD thesis. University of Helsinki, FI. Available at: http://hdl.handle.net/10138/356752 (accessed: 9 May 2023).

Mari W (2018) Technology in the newsroom: adoption of the telephone and the radio car from c. 1920 to 1960. *Journalism Studies* 19(9): 1366–1389. DOI : 10.1080/1461670X.2016.1272432.

Meyen M and Riesmeyer C. (2012) Service providers, sentinels, and traders: journalists' role perceptions in the early twenty-first century. *Journalism Studies* 13(3): 386–401. DOI : 10.1080/1461670X.2011.602909.

Milosavljević M and Vobič I (2021) 'Our task is to demystify fears': analysing newsroom management of automation in journalism. *Journalism* 22(9): 2203–2221. DOI : 10.1177/1464884919861598.

Mullin B and Grant N (2023) Google tests A.I. tool that is able to write news articles. *New York Times*, 19 July. Available at: https://www.nytimes.com/2023/07/19/business/google-artificial-intelligence-news-articles.html (accessed: August 27 2023).

Örnebring H, Karlsson M, Fast K and Lindell J (2018) The Space of Journalistic Work: A Theoretical Model. *Communication Theory* 28(4): 403–423. DOI: https://doi.org/10.1093/ct/qty006

Parasie S and Dagiral E (2013) Data-driven journalism and the public good: "Computer-assisted-reporters" and "programmer-journalists" in Chicago. *New Media and Society* 15(6): 853–871. DOI : 10.1177/1461444812463345.

Powers M (2012) "In forms that are familiar and yet-to-be invented": American journalism and the discourse of technologically specific work. *Journal of Communication Inquiry* 36(1): 24–43. Available: https://doi.org/10.1177/0196859911426009.

Schapals AK and Porlezza C (2020) Assistance or Resistance? Evaluating the Intersection of Automated Journalism and Journalistic Role Conceptions. *Media and Communication* 8(3): 16–26.

Schultz I (2007) The journalistic gut feeling. *Journalism Practice* 1(2): 190–207. DOI : 10.1080/17512780701275507.

Siapera E and Spyridou LP (2012) The Field of Online Journalism: a Bourdieusian analysis. In: Siapera E and Veglis A (eds) *The Handbook of Global Online Journalism*. Hoboken, NJ: Wiley, pp.77–97.

Simon FM (2024) Escape Me If You Can: How AI Reshapes News Organisations' Dependency on Platform Companies. *Digital Journalism* 12(2): 149-170.

Stefanikova S (2019) Czechs get to grips with AI-powered journalism, *European Journalism Observatory*, 20 November. Available at: https://en.ejo.ch/digital-news/technology/czechs-get-to-grips-with-ai-powered-journalism (accessed: January 3 2022).

Tandoc EC and Jenkins J (2017) The buzzfeedication of journalism? How traditional news organizations are talking about a new entrant to the Journalistic Field will surprise you! *Journalism* 18(4): 482–500. DOI : 10.1177/1464884915620269.

Thurman N, Dörr K and Kunert J (2017) When Reporters Get Hands-on with Robo-Writing. *Digital Journalism* 5(10): 1240–1259. DOI: 10.1080/21670811.2017.1289819

Usher N (2017) Venture-backed news startups and the field of journalism, *Digital Journalism* 5(9): 1116–1133. DOI : 10.1080/21670811.2016.1272064.

Vos TP, Craft S and Ashley S (2012) New media, old criticism: bloggers' press criticism and the Journalistic Field. *Journalism* 13(7): 850–868. DOI : 10.1177/1464884911421705.

Wing JM (2008) Computational thinking and thinking about computing. *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences* 366: 3717–3725. DOI : 10.1098/rsta.2008.0118.

Wölker A and Powell TE (2021) Algorithms in the newsroom? News readers' perceived credibility and selection of automated journalism. *Journalism* 22(1): 86–103. https://doi.org/10.1177/1464884918757072.

Wu S, Tandoc EC and Salmon CT (2019a) Journalism reconfigured: assessing human–machine relations and the autonomous power of automation in news production. *Journalism Studies* 20(10): 1440–1457. DOI : 10.1080/1461670X.2018.1521299.

Wu S, Tandoc EC and Salmon CT (2019b) A Field analysis of journalism in the Automation Age: understanding journalistic transformations and struggles through structure and agency. *Digital Journalism* 7(4): 428–446. DOI : 10.1080/21670811.2019.1620112.

Wu S, Tandoc EC and Salmon CT (2019c) When journalism and automation intersect: assessing the influence of the technological field on contemporary newsrooms. *Journalism Practice* 13(10): 1238–1254. DOI : 10.1080/17512786.2019.1585198.

Zelizer B (1995) Journalism's "last" stand: wirephoto and the discourse of resistance. *Journal of Communication*, 45(2), pp. 78–92. DOI : 10.1111/j.1460-2466.1995.tb00729.x.

Online appendix. Details of interviewees' news organisations, roles and gender as well as interview date and duration.

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

27	AFP	News agency	France	Manager; Senior journalist	M; M	07/04/2021	00:34:52
28	BBC	PSM	UK	Technologist (2)	F	16/04/2021	00:33:00
29	Reuters	News agency	UK	Editor	M	20/04/2021	00:44:38
30	BBC	PSM	UK	Editor	M	28/04/2021	00:28:34

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