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# ARTIFICIAL INTELLIGENCE IN JOURNALISM: AN AUTOMATED NEWS PROVIDER

## INTELIGENCIA ARTIFICIAL EN PERIODISMO: UNA PROVEEDORA DE NOTICIAS AUTOMATIZADAS

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**Abstract:** The purposes of this article are to examine (1) how Narrativa OÜ – an automated news provider with headquarters both in Spain and the United States– works from a business point of view, (2) how their managers and technologists perceive and relate to journalism, and (3) how their technology operates in newswork. Unlike countries like the United States, where Narrativa plans to expand in the short and medium term, the company's implementation of artificial intelligence technologies in Spain is still low despite of being the only provider with clients in this country at present. This seems more linked to the economic crisis and journalists' lack of knowledge and mistrust than to a low efficacy of the product. The findings lead to reflect on the supposed transforming role of automated service providers in journalism, at least for the time being. They also raise the need to take into greater account that the economic situation and the idiosyncrasies of each country can significantly influence the implementation of artificial intelligence in journalism.

**Keywords:** artificial intelligence; automated journalism; news automation; business model; technology; Narrativa

**Resumen:** Los objetivos de este artículo son examinar (1) cómo Narrativa OÜ, una proveedora de noticias automatizadas con sede en España y en Estados Unidos, funciona desde un punto de vista comercial; (2) cómo sus gestores y tecnólogos perciben y se relacionan con el periodismo; y (3) cómo funciona su tecnología en el trabajo periodístico. A diferencia de países como Estados Unidos, donde Narrativa tiene previsto expandirse a corto y medio plazo, la implantación de tecnologías de inteligencia artificial por parte de la compañía en España es aún baja pese a ser la única proveedora con clientes en este país en la actualidad. Esto parece más ligado a la crisis económica y al desconocimiento y desconfianza de los periodistas que a una baja eficacia del producto. Los hallazgos llevan a reflexionar sobre el supuesto papel transformador de las proveedoras de servicios automatizados en el periodismo, al menos por el momento. También plantean la necesidad de tener en cuenta que la situación económica y la idiosincrasia de cada país pueden influir significativamente en la implementación de la inteligencia artificial en el periodismo.

**Palabras clave:** inteligencia artificial; periodismo automatizado; noticias automatizadas; modelo de negocio; tecnología; Narrativa.

## 1. Introducción

Faced with economic difficulties, media companies are seeking sustainable competitive advantages to help them survive and even prosper in a time of uncertainty (Chan-Olmsted, 2019). While managers have to reassess from editorial workflows to business models and technological platforms (Lewis and Westlund, 2015), artificial intelligence (AI) technologies are no longer 'next generation' technologies. They are fast becoming a core part of a modern news operation at every level – from newsgathering and production to distribution (Newman, 2022: 35). Although it is unclear whether AI will offer the same disruptive utilities in the media sector as in other industries (Chan-Olmsted, 2019), 69 percent of news leaders in 52 countries say these technologies will have the biggest impact on journalism over the next years (Newman, 2022: 7).

Using AI to automatically write news stories – so-called «robot journalism» (Van Dalen, 2012) – is not such a priority as uses like personalization, content recommendations or newsgathering, but it is where many of the future-focused publishers are focusing (Newman, 2022: 35). Most media outlets must rely on external service providers to implement news automation systems, which are slowly making their way into newsrooms (Kjellman, 2021: 4) with profound implications. This is partly due to factors external to journalism, like rapid technological developments and, most importantly, rapidly growing amounts of open digital data. Other influencing factors are internal ones, affecting diminished revenue and a need to reduce costs while simultaneously meeting a growing demand for content (Graefe, 2016: 30-31). But even AI news needs the intervention of a professional journalist (Levy, 2012), and this relationship reinforces the associations between human and non-human actants in the co-creation of journalism (Primo and Zago, 2015).

When news organizations turn to automation companies, they expose the journalistic field to external influence from these non-traditional actors (Tandoc, 2019) and their AI technological artefacts – actants. It is not surprising, therefore, that a need for research into journalism's transformation has arisen, focusing on technology firms that are assuming an increasingly critical role in this field (Hepp and Loosen, 2021), and considering business elements are crucial to institutional news production (Lewis and Westlund, 2015).

Research has dealt mainly with the use of AI for news detection, automated news writing and fact checking, the impact of new technology on employment, and ethical issues arising from technological innovations (Parratt *et al.*, 2021). Some studies (e.g., Lewis and Westlund, 2015; Wu *et al.*, 2019; Sirén-Heikel *et al.*, 2019) have found insufficient attention in this literature towards the role of technological firms in supplying newsrooms with automation and,

therefore, influencing news production. The few that have explored this perspective (e.g., Carlson, 2015; Dörr, 2016; Wu *et al.*, 2019; Ufarte and Manfredi, 2019; Sirén-Heikel *et al.*, 2022) either provide a general overview of several firms or focus on journalists' reactions to the automated services rather than on the services themselves. Others were carried out during the early stages of automation and are thus outdated.

In this article we take a case study approach focused on Narrativa OÜ, a company with an Estonian legal structure, and with headquarters in Spain and the United States. It was founded in 2015 and uses AI technology to provide automated content services, including automated news stories for media organizations. Its singularities are that it is the only provider of these services in its home country and in Spain; that it has many foreign clients; and that it has not been examined by previous research on technological firms and/or technologists (such as Dörr, 2016; Wu *et al.*, 2019; Sirén-Heikel *et al.*, 2022). Our goal is to advance on this and fulfil the need – noted by Tandoc (2019) – to understand how these external actors perceive journalism, as well as to examine how their technology for generating automated news operates. Another goal is to overcome the limitations – pointed out by Sirén-Heikel *et al.* (2022) – imposed by interviewing only one representative from several companies, which lacks a deep analysis.

## 2. Automated journalism

Automated journalism was defined by Carlson (2015) as computer-written news involving «algorithmic processes that convert data into narrative news texts with limited to no human intervention beyond the initial programming». It refers to the application of NLG (Natural Language Generation), a sub-field of AI and computational linguistics methods (Reiter and Dale, 2000), to well-understood news domains such as finance, sports, and elections, that report strictly on an event or quantifiable facts. NLG systems convert structured data, either rule based, or machine learning based, into text (Sirén-Heikel *et al.*, 2019). Other media scholars (such as Diakopoulos, 2017; Waddell, 2017; Wu *et al.*, 2019) more recently broadened the definition to include all automated processes in the news production process that do not need human intervention to operate, like sifting through data to discover trends and determining which information should be prioritized.

Chan-Olmsted (2019) overviews the uses of AI by some organizations and service automation service providers. Associated Press, for example, has been using AI to create news content using templates and fill-in-the-blanks to collect relevant data and keywords and generate unique content. *Forbes* has

implemented an AI story-writing tool that creates rough article drafts for contributors to polish up. *The Washington Post* has a data crunching program called Heliograf which is used to expand its election coverage. Reuters uses semantic technology, Graphiq, for its data visualization in real-time to provide data-driven news stories. Other examples, noted by Ufarte-Ruiz and Manfredi-Sánchez (2019), are the news agencies DPA (Germany), ANP (Holland), STT (Finland), AFP (France), APA (Austria), Ritzau (Denmark), Lusa (Portugal), NTB (Norway), and TT (Sweden), that offer content generated by robots.

## 3. External service providers

Innovative technologies are increasingly seen by media organizations as solutions for improving business and attracting audiences (Beckett, 2019; Min and Fink, 2021). Also, commercial pressures and higher profit expectations often result in a trend to lower the variable costs involved in news production. Robot journalism fits in with this trend (Van Dalen, 2012; Coddington, 2015), producing content in virtually no time and with low additional costs for articles that can be produced in large quantities (Van Dalen, 2012).

As stated above, the lack of newsroom infrastructures and financial resources for development often leads media organizations to buy these services from external sources (Dörr, 2016). In this regard, actors «who are not (yet) considered as journalists» (Tandoc, 2019) and do not fit into the traditional definition of journalists, but are involved in producing journalism (Wu *et al.*, 2019), have emerged recently. Also known as «interlopers», «emergent» (Eldridge, 2018), «strangers» or «peripheral actors», they work with technologies that were not developed specifically for journalism while directly contributing to the creation and distribution of news (Holton and Belair-Gagnon, 2018: 73).

This is the case with firms that provide automation services to news organizations (Wu *et al.*, 2019), many of which began as technology startups. Some studies identify relevant cases in the United States, Germany, United Kingdom, France, Russia, China (Dörr, 2016; Graefe, 2016) and, more recently, Sweden and Israel (Ufarte-Ruiz and Manfredi-Sánchez, 2019). Most of them have between five and 80 employees and offer their services in one language, although some do so in several languages – over one hundred in the case of the German company AX Semantics. Some have external funding, but the majority are privately held (Dörr, 2016).

Automated service providers' technology is applicable to any industry rather than providing journalistic content (Graefe, 2016). In fact, as these companies differ in size, assets, and product portfolio, they decrease their dependency on one market segment when offering NLG solutions. This is because of the complexity of NLG, the limited availability of data, the time-consuming

individualization of journalistic products due to high-quality standards in journalism, and the general view that journalistic products alone are hardly profitable (Dörr, 2016).

However, even when some NLG providers do not have news organizations as their main clients, they still claim they can be important customers for their products. Furthermore, when automation is reported in the press, or when a news organization successfully implements it, this can improve a technological firm's position within the technological field and potentially across others, e.g. consumer products, marketing, healthcare, e-commerce, finance, the oil industry, or the agricultural sector (Wu *et al.*, 2019).

At the same time, financial restraints make smaller organizations reluctant to adopt automation, while the larger ones are held back by inflexible organizational structures (Wu *et al.*, 2019). In this regard, Dörr (2016) stated that although service providers reported they were constantly negotiating with well-known media organizations, few products had been launched officially – mainly in finance and sports reporting. His study concluded that «with few service providers, limited and resembling journalistic products available, algorithmic journalism is likely found either in an experimental market phase or in an early stage of market expansion phase». Considering that this is a recently expanding field, this conclusion – which was reached seven years ago – should be checked.

## 4. Technological and journalistic fields

Peripheral actors' influence has mostly been examined from the newsroom's point of view (Belair-Gagnon and Holton, 2018). Still, some studies do present a less newsroom-centric approach and focus on the way technologists and managers at automation companies understand journalism's place in the technological field. Dörr (2016) conducted interviews with representatives of relevant service providers. He concluded that though there were still few providers and journalistic products available, NLG could already perform tasks of professional journalism at a technical level.

Also seeking to understand news production from the perspective of these firms, Belair-Gagnon and Holton (2018) examine how web analytics companies shape news production but do not assume journalistic responsibilities. In a similar way, app designers claim to work between technology design and journalism, influenced by both but not entirely obliged to either (Ananny and Crawford, 2015).

Non-traditional actors «may not define their engagement with news as journalism, but their practices may be significant in their interaction with others to shape the news coverage» (Domingo and Wiard, 2016: 40). Positioning

themselves as outsiders (Sirén-Heikel *et al.*, 2022) and being reluctant to label themselves as journalists, even when acknowledging their work is directly related to journalism, raises the question of whether for the technological field, journalism is at the periphery (Tandoc, 2019).

The complexities of AI technologies often cause tension between developers and users (Dhanorkar *et al.*, 2021; Wolf and Blomberg, 2019). For example, technologists think that media organizations' concerns regarding the reliability of the AI technology are connected to their inability to understand it (Sirén-Heikel *et al.*, 2019), whereas journalists seem to view this technology more as «competition» (Wu *et al.*, 2019).

Technological firms believe that automation can transform the journalistic field by offering deeper insights and analysis to stories and freeing up journalists to work on more in-depth reports. Their attitudes are more inclined toward fostering a greater collaboration and the co-development of ideas and innovations. However, this seeming lack of a domineering attitude does not mean they have a lesser influence on transforming the journalistic field. In fact, their focus on audience needs, their enabling of widespread access to data, and their tendency towards easy-to consume products are clearly in line with journalism's shift towards data-centric and short, easy-to-digest content that meets with audience preferences (Wu *et al.*, 2019).

All the above led many scholars (among others, Micó *et al.*, 2013; Anderson, 2013; Primo and Zago, 2015; Lewis and Westlund, 2015) to argue that the question «who does journalism?» should be reformulated as «who and what do journalism?». This is because journalism is no longer a practice restricted to professional journalists (Primo and Zago, 2015) and solely produced by the relationships between editors, journalists, and sources, but is also created by non-human – technological – actants (Plesner, 2009). Technology-oriented journalism suggests a sort of symbiotic relationship in which human and machine are interdependent: for example, both human journalists and automated news algorithms may carry out news work (Lewis and Westlund, 2016: 347). The role of these artifacts is best perceived in the so-called «post-human practices of journalism» (Träsel, 2013).

Our study draws on previous research by Dorr (2016), who sets the basis to analyze challenges for journalism research at the intersection of technology and big data. He does so by explaining NLG within the framework of algorithmic selection and along its technological functionality, as well as focusing on its economic potential; Wu *et al.* (2019), who use field theory to map out the principles and practices of the technological field and the pressures and powers it exerts on the journalistic field; and we also note how Sirén-Heikel *et al.* (2022) apply

institutional logics to examine how technologists and their AI technologies situate themselves in relation to newswork.

## 5. Objectives and methods

This study has three objectives. Firstly, to learn how a technological firm supplying newsrooms with automation works from a business point of view. Secondly, to observe how its technology for generating automated news operates; and finally, to understand how this «external actor» perceives and relates to journalism.

The research questions, explored through a case study of the service provider Narrativa OÜ, are the following:

RQ1. What are Narrativa's business features?

RQ2. How do the technological artifacts used by Narrativa for generating automated news operate?

RQ3. How do Narrativa´s managers and technologists relate to journalism and perceive their role in its transformation?

Following the perspectives adopted by Dörr (2016), Wu *et al.* (2019) and Sirén-Heikel *et al.* (2022), and since business elements «are crucial to the overall framework of institutional news production» (Lewis and Westlund, 2015), we have undertaken the above-mentioned case study. The logic behind this approach is that there may be «insights to be gained from looking at the individual case that can have wider implications and, importantly, that would not have come to light through the use of a research strategy that covers a large number of instances» (Denscombe, 2010: 53).

In order to address Narrativa's know-how and its relationship with journalism, it was necessary to describe and size the company first, since it is our object of study. For this, and to answer succinctly to RQ1, economic and financial information published in the Orbis database was used. We also used two qualitative techniques: (1) non-participant observation for RQ2 and (2) semi-structured interviews to answer RQ3.

### 5.1. Interviews

Interviews are used for collecting data based on opinions, feelings, emotions, and experiences that «need to be explored in depth and in detail rather than simply reported in a word or two» (Denscombe, 2010: 174). Narrativa was informed about the purpose of the interviews and the interviewees authorized to reveal their positions in the company. To prepare them, we reviewed the company's website, and it showed that they provide AI services for many sectors, including data processing and NLG for news organizations.

We conducted semi-structured interviews via Teams with the president (I1), whose headquarters are in the United States; the founder and CEO (I2); the public relations and marketing manager (I3); and an engineering technologist (I4) chosen by the company from among its staff members – these three in Spain. We interviewed the first three to find out more about the business side of the company and to understand how they relate to the field of journalism through their interactions with news organizations and journalists. Also, in response to the need –pointed out by Tandoc (2019)– for understanding how these external actors perceive journalism, we asked the four of them several open questions about their role in its transformation (see Table 1).

**Table 1. Summary of personnel sources interviewed**

| Name/ position/ Location | Date | Platform | Duration | Subject blocks | No. of questions |
|---|---|---|---|---|---|
| CEO of Narrativa/ Madrid (Spain) | 30/03/2022 | Teams | 0:51:15 | *BI_Descriptive, organizational, income and finance block BII_Productive block BIII_Prospective and evaluative block* | 36 |
| President of Narrativa/ Santa Mónica, CA (USA) | 5/05/2022 | Teams | 0:27:00 | *BI_Descriptive, productive and client block BII_Organizational block BIII_Prospective and evaluative block* | 28 |
| Marketing Director of Narrativa/ Madrid (Spain) | 30/03/2022 | Teams | 0:34:00 | *BI_Descriptive, organizational, income and finance block BII_Productive block BIII_Prospective and evaluative block* | 15 |
| Company Technician/ Madrid (Spain) | 30/03/2022 | Teams | 0:28:71 | *BI_Productive and evaluative block* | 4 |

Source: prepared by the authors.

The interviews were conducted between March and May 2022, and they lasted between 27 and 51 minutes. As for the method for the qualitative data analysis,

transcripts of the interviews were manually edited, organized and analyzed in the context of thematic patterns.

### 5.2. Observation

To examine how the technology for generating automated news operates, we complemented the semi-structured interviews with observation. This is a method where the researcher's identity as a researcher «is openly recognized – thus having the advantages of gaining informed consent from those involved […], witnessing at first hand and in detail the events of interest» (Denscombe, 2010: 207).

We adopted non-participant observation, one of the five types established by Spradley (2016: 58-59) that occurs when the researcher has no involvement with the people or activity studied, but this activity still holds possibilities for research. One of the researchers observed the creation of an automated news article by an engineering technologist. The process lasted two hours.

## 6. Findings and discussion

### 6.1. Organization and business structure of Narrativa

Following, is shown the economic and financial information about Narrativa (RQ1), which is necessary to fully understand the results of its know-how and its relationship with journalism.

It is a company whose core business is AI. It was founded in Estonia, where its CEO lived for many years. As he says, «currently, the parent company is located there» (I1), although one of its headquarters is in Spain and this is where most of its production activity is concentrated. In the beginning they opened a «permanent establishment» in Spain, which, from a technical perspective, neither has its own legal identity nor is different in any way from that of its head office (Agencia Tributaria, 2021). As their business activity grew, this was eventually incorporated as a Limited Company. These issues can be identified on their web page (Privacy Policy section), where it is stated that their site is «owned and operated by Narrativa OÜ» (the legal form OÜ is Estonian). In addition, they are planning in the short term «to move to the United States in order to receive investment from there». In this respect, the data from the Spanish subsidiary (see Table 2) show that achieving this goal may prove difficult. 2020 was a difficult time in terms of profitability for Narrativa in Spain. Company sources state that they have between 20 and 30 employees, including staff and external collaborators, with prospects for growth in the near future.

**Table 2. Economic and financial data of the Spanish subsidiary of Narrativa OÜ**

| Narrativa Inteligencia Artificial, S.L. (Spain) | | | | | |
|---|---|---|---|---|---|
| Economic-financial concepts | | 2020 | | 2019 | |
| | | USD | EUR | USD | EUR |
| Balance | Active = PN + Passive | 111,416.27 | 90,796.41 | 75,981.92 | 67,635.68 |
| Profit and loss statement | Operating income | 286,135.48 | 233,180.25 | 175,465.77 | 156,191.71 |
| | EBITDA | -14,613.87 | -11,909.27 | 33,807.46 | 30,093.88 |
| Ratios (%) | ROA (Return on Assets) | -11.10 | | 32.79 | |
| | ROE (Return on Equity) | -66.27 | | 87.74 | |

Source: Orbis / prepared by the authors.

Although it is not a term with which the CEO feels particularly comfortable, everyone in Narrativa defines the company as an international startup, since their primary strategic objective «is to grow, innovate, invent and create a new need, a new market, and to have a dominant position within it» (I1). In terms of labor policy, both flexibility and remote work are key in the management of Narrativa. Likewise, their «obsession is to create value and offer it to the customer» (I1).

a) Product and rationale for its market positioning

Within a global market paradigm and with services divided into four large blocks (Life Science, Financial Services, Marketing and Entertainment), there are several companies that Narrativa considers rivals or direct competitors in its sector. For example, in the United States, Narrative Science – recently acquired by Salesforces – and Automated Insights; in Europe, AX Semantics and Arria NLG.

Their common expertise and experience clearly show that NLG is a viable business. However, as I1 points out, the strategy they are following is to «verticalize», i.e., specializing in sales and marketing by sector and industry, because, although this may require some investment, it is the path to profitability.

The service that is achieving the best strategic results is Life Sciences. In particular, the service they offer to the pharmaceutical sector, focused on writing clinical studies. These are currently the main target of Narrativa's activities – or at least, the most profitable ones. Although the application of AI in the media has indisputable optimization possibilities, it is not generating the same level of revenue, which confirms the results of previous research (see Chan-

Olmsted, 2019; Dörr, 2016; Graefe, 2016).

Regarding media organizations, Narrativa´s main job is to develop «the complete cycle from data analysis to text generation» (I1). They do so with their robot Gabrielle, «the AI software the team has developed since 2015 specifically pertaining to media; there are many areas the company covers that are already having a direct impact on media, and content as a whole is number one» (I2). Their automatically generated content is primarily in the form of content like news articles, but they are also now providing automated video in animated form.

Narrativa mainly produces financial and economic news articles. For this, it uses three versions of Spanish, two of English, two of Arabic, French, Italian and German, unlike most providers, who «tend to work with only one language» (Dörr, 2016). Its work model, which was initially based on the Content as a Service logic, i.e., automation and content supply, is becoming more of a SAAS (software as a service) in the media sector, which is more oriented towards the supply of a platform for autonomous use by journalists and is closer to what some of its competitors offer.

Despite its efforts to engage more closely with media market, which means «educating in our service» (I3), Narrativa has not yet achieved significant immersion in this market at a revenue level. Before the crisis caused by Covid-19 in the Spanish economy there had been green shoots in the implementation of AI, but the setbacks caused by the pandemic slowed down this market. Traditionally, Spain has shown a higher level of reticence towards the implementation of AI solutions than newsrooms in other countries (I1), especially when compared to English-speaking countries. This could be due to national idiosyncrasies, the unstable situation of Spanish media sector, or a combination of both.

In any case, media outlets in Spain had not yet fully recovered from the economic crisis of 2007 and were hit once again by the consequences *of the 2020 global pandemic. As a result, several of the previously initiated long-term investments came to a standstill, including the implementation of various AI projects guided by Narrativa. In the face of adversity, a short-sighted and conservative managerial vision tends to prevail.

This does not help to break down the prejudices held by a part of the workforce, concerned about being replaced by machines for news writing, as previous studies (such as Primo & Zago, 2015; Wu *et al.*, 2019) have shown. However, this is not the case in data analysis, where data journalists are more inclined to accept and exploit these technological services.

The corporate message, in short, does not seem to be getting through to the industry: «AI technology can scare some people, but I think they should look

at it as a way to improve their job and give them more time to focus on the higher value tasks: the things that they enjoy more than just digging through research and trying to find the data» (A2). In other words, Narrativa presents itself as the provider of a technological product that is at the service of journalists. Despite the undeniable imprint of algorithms in the result, it has no pretensions other than that of being a technological company; the selection, supervision and presentation of content should depend exclusively on the journalist.

b) Corporate strategies

At a strategic level, Narrativa is working primarily on two strategic lines: on the one hand, financing. On the other, expansion into the United States.

Its revenue structure is based on payment for services provided by clients like CRTVE (Corporación Radio Televisión Española), *El Español* and Prensa Ibérica in Spain; Infobae in Latin America; *The Wall Street Journal* in the United States; and the *Financial Times* in the United Kingdom. In this sense, «Narrativa is currently profitable» (I2). Still, «we'll be entering a next funding round, hopefully at the end of 2022 or early 2023 with larger investors who are currently particularly interested in funding» (I2). This strategy is expected to be a boost to taking off in a more secure and effective way both globally and in the United States (I1 and I2).

This interest in establishing in the U.S. market came from the greater demand in the American media sector due to the consequences of the pandemic. In Spain, contrary to the U.S. market, this has proved to be a deterrent: «In the U.S. things need to increase faster technology wise, there are more companies now open to using our AI solutions. To have *Wall Street Journal* and *Dow Jones* as some of our early clients, has definitely opened more doors because they are so well known in the U.S. market and globally» (I2). It therefore seems that, as pointed out above, the idiosyncrasies of each country played an important role.

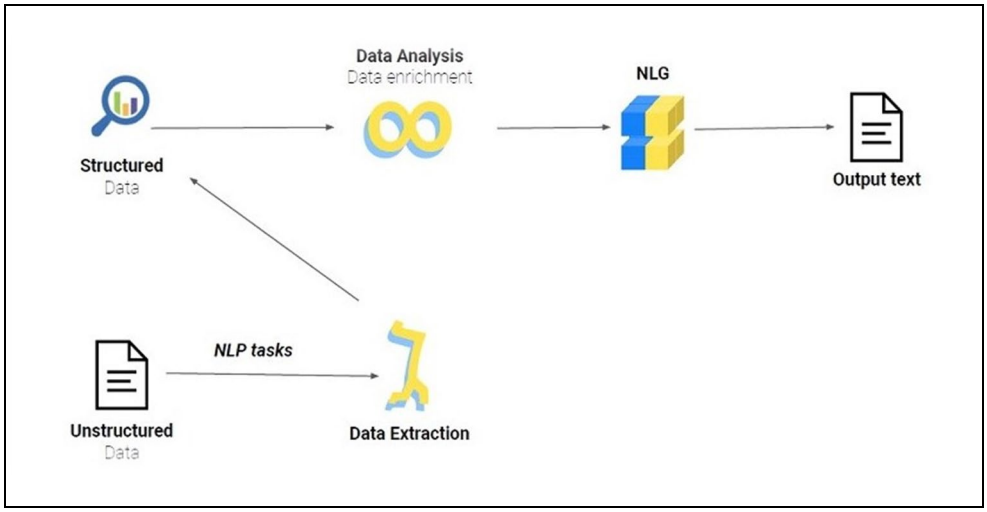
## 6.2. The know-how of Narrativa's automated news generation

To examine how Narrativa's technology for generating automated news operates (RQ2), we carried out non-participant observation. One of the researchers met with a company technician – an engineer – who showed them how he created an automated news article on stock information published in *The Wall Street Journal* on 24 May 2021.

Firstly, it was necessary to know the meaning of some key terms and to graphically visualize the process of creating automated news (see Figure 1 below). NLP (Natural Language Processing) studies the interactions between humans and machines using natural language. It refers to the mechanisms by

which a machine «takes in», decomposes and understands the meaning of unstructured information. Through either rule-based or machine learning based NLG (Natural Language Generation), computer systems convert structured data into texts written in human language. In this case, mainly financial, economic and sports news articles.

**Figure 1. Process of converting data into texts**

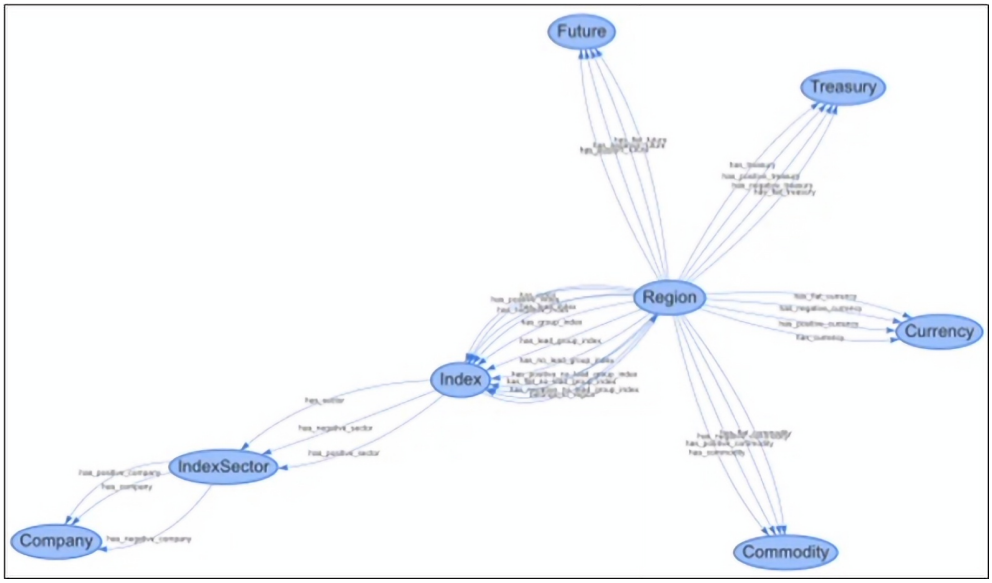



Source: Narrativa.

Systems based on machine learning learn by observing significant amounts of material, whereas systems based on rules generate text based on a series of man-made rules (Sirén-Heikel *et al.*, 2019). Narrativa uses a hybrid model depending on the task to be carried out. For example, for the machine to be able to determine who has won after finding out the result of a football match, it needs to have previously implemented rules.

The graphic shown in Figure 2 below refers specifically to the *The Wall Street Journal* stock news article mentioned above and displays the market data structure used by Narrativa's technicians. It shows the stock indices related to aspects like regions (i.e., Europe, Asia, etc.) and commodities (i.e., petroleum, metal); and sectors (i.e., banking, engineering, in Ibex-35) and the companies within each sector. This scheme, created *ad hoc* for each domain, is used so that the system knows how to navigate through all this information.

**Figure 2. Market data structure**

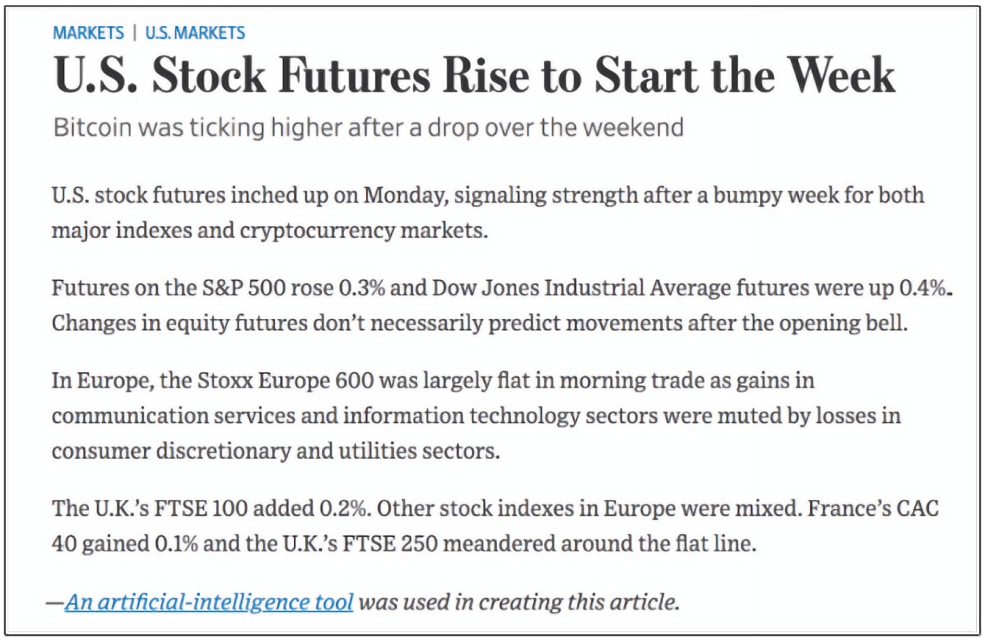



Source: Narrativa.

Firstly, the technician has data files acquired from data providers from which he selects the ones that his client demands. He also has schemes or internal representations of how to create texts, which vary depending on the scenarios and the data. In this case, the machine takes the data, analyses it according to the scenarios – i.e., oil is rising on the stock market – and chooses the linguistic representation of «oil is rising».

The news article that *The Wall Street Journal* finally published (see Figure 3 below) contains text created by Narrativa, such as the second paragraph, which was improved by a journalist from WSJ by adding, for example, the first paragraph. The note «An artificial-intelligence tool was used in creating this article» is added at the end of the text. This is done in the first version the newspaper publishes. Then, as they update the information throughout the day and the artificial content decreases, they remove the note. This is something that media organizations in Spain are reluctant to do.

**Figure 3. Reduced version of WSJ news article partially created by Narrativa**



MARKETS | U.S. MARKETS

# U.S. Stock Futures Rise to Start the Week

Bitcoin was ticking higher after a drop over the weekend

U.S. stock futures inched up on Monday, signaling strength after a bumpy week for both major indexes and cryptocurrency markets.

Futures on the S&P 500 rose 0.3% and Dow Jones Industrial Average futures were up 0.4%. Changes in equity futures don't necessarily predict movements after the opening bell.

In Europe, the Stoxx Europe 600 was largely flat in morning trade as gains in communication services and information technology sectors were muted by losses in consumer discretionary and utilities sectors.

The U.K.'s FTSE 100 added 0.2%. Other stock indexes in Europe were mixed. France's CAC 40 gained 0.1% and the U.K.'s FTSE 250 meandered around the flat line.

—*An artificial-intelligence tool was used in creating this article.*

Source: Narrativa.

## 6.3. Narrativa's relation with journalism

To answer RQ3, we asked the interviewees about how they relate to the field of journalism and how they perceive their role in its transformation.

The media often contact Narrativa to request interviews, but this is not so much to talk about their own experience with NLG, but rather because they want to know «how all this is going to affect journalism» (I1). When Narrativa contacts the media, the reaction of journalists is usually one of reluctance, largely due to their lack of knowledge on the subject – as Sirén-Heikel *et al.* (2019) found to be the case for other suppliers. But «when they realize that we create data-driven news, which is not even done by journalists themselves as a matter of time, and that this is going to take manual work away from them, they start to see that this can actually be useful» (I3). Therefore, the first step should be to train journalists in the service they want to offer, and «it would be of great help to start educating on artificial intelligence at university» (I3).

The initial reluctance of journalists is also due, as we noted above, to the fear of AI affecting their jobs. However, «everyone thought news journalists were gone, but they changed into a new type of role that would adapt with the technology». They explain this to them, as a form of reassurance, and also that they are going to be «more of a copy editor, more than just a writer» (I2). The

possibility of appearing in the first results of Google is even shown to be a competitive advantage «while you can focus on a news story, conducting research with your sources, which is really what you want to do, rather than writing about the weather in any given city» (I3).

As for the interaction between journalists and technicians in the process of automated news writing, it could be described as collaborative work, consistent with the lack of domineering – but not necessarily less influential – attitude from the latter noted by Wu *et al.* (2019). It is a relationship in which journalist and machine are more or less, interdependent on one another, as claimed by Lewis and Westlund (2016: 347), and one which reinforces the associations between human and non-human actants in the co-creation of journalism (Primo and Zago, 2015).

«Technology generates perfect text and does not make mistakes. But that does not mean the news article is interesting or that it has journalistic quality. And we don't know how to do that» (I4). The technicians working in Narrativa have no prior knowledge of journalism and, in line with Sirén-Heikel *et al.* (2022) findings, they are mostly data scientists, although others are NLG experts, computer engineers, people with a deep knowledge of mathematics or with a hybrid profile. Hence, «the technology depends on the work done by the technicians, but the quality of the output depends above all on the journalists» because they «give us examples of news, then the machine extracts from them the structure, style, etc.» and later «the media, not the technician, makes an editorial review» (I4).

This may explain why these non-traditional actors do not define their engagement with news as journalism (Domingo and Wiard, 2016: 402). Rather, it would coincide with more recent studies showing that some providers position themselves and their technology as outsiders in relation to newswork (Sirén-Heikel, Kjellman and Lindén, 2022).

All the feedback obtained by Narrativa's technicians from journalists helps the company to improve its service because, unlike other industries, «the editorial part of the media is very important, the richness of the language and the variability they demand made us work a lot on the technology in this area» (I1). However, it does not benefit the company as much at the visibility level. Contradicting Wu *et al.* (2019), who claim that when a news organization successfully implements automation it can improve a technological firm's position, this does not apply to Narrativa «because journalists don't usually want people to know that there is automated news, especially in Spain» (I1).

As for managers and technologists becoming a potentially transformative

force in influencing news production (Wu *et al.*, 2019), Narrativa does not identify itself as performing such a role. As said before, the engineers are responsible for the technical part of the work – which is an automatic process – but it is the journalists who make the decisions about how the news will finally be published. In other words, «the journalists tells us (technicians) what they want, and they are the ones who help us train the machine that will create the text» (I4).

This would place the technicians as «interlopers», «emergent» (Eldridge, 2018), «strangers» or «peripheral actors». They work with technologies that were not developed specifically for journalism, while directly contributing to the creation and distribution of news (Holton and Belair-Gagnon, 2018: 73), yet not assuming journalistic responsibilities (Belair-Gagnon and Holton, 2018) and as such «are not (yet) considered to be journalists» (Tandoc, 2019).

Journalism will not be transformed by AI providers, but by the journalists who use AI, and who will adapt «just like in the dotcom era when everyone was going into the Internet in the 90s and early 2000s, and people thought that media companies like newspapers were never going to be read again» (I2). Narrativa as a company would like to perform this transformative role in Spain, but as already mentioned, both the economic situation of the media and the mentality of people in this field is leading them to focus on more profitable areas, like pharmaceuticals (I1). This fact, along with their technicians' reluctance in labelling themselves as journalists, seems to answer the question posed by Tandoc (2019) as to whether for the technological field, journalism is at the periphery. «For years it was our obsession to try to change journalism, but we have not succeeded. There has been huge reluctance. We do contribute to change, but we are not going to be the main driver» (I1). It appears that change in journalism will come with a change in the business model that will help to do many other things, «and the NLG will be a part of them» (I1).

## 7. Conclusions

In this paper, we examine the automated news provider Narrativa OÜ from three perspectives. First, from a business model. Secondly, to understand better how technology firms perceive and relate to journalism. And last, to examine how artificial intelligence (AI) technology operates in newswork. Although partially supported by their theoretical principles, this study goes deeper than existing research on technologist's points of view (Dörr, 2016; Wu *et al.*, 2019; Sirén-Heikel *et al.*, 2022) and seeks to overcome the constraints pointed out by Sirén-Heikel *et al.* (2022) by adopting a case study approach. By doing so, it uncovers some limitations of news automation services upon which to reflect.

Unlike in the U.S., where Narrativa plans to expand in the short and medium term, the company's implementation of AI technologies for news automation in Spain is low despite being the only provider with clients in this country. When Dorr (2016) found news automation to be in an early market expansion phase, he wondered if providers having few media organizations as their clients was for reasons of commercial confidentiality. The interviews of our study allow us to verify that this is not that simple in the case of Spain. Rather, it is mainly due to Spain's economic situation and to journalists' worries about being replaced by machines.

It is therefore not surprising that Narrativa is approaching other areas such as pharmaceuticals and the Life Sciences sector, which are «more lucrative domains» (Wu *et al.*, 2019). This contradicts previous studies showing that – at least for the time being – AI has benefits for media from a business perspective (Sirén-Heikel *et al.*, 2022) and that using AI to automatically write news stories is where many of the most future-focused publishers are focusing (Newman, 2022: 35). It also differs from those who claim that external service providers to implement news automation systems are slowly making their way into newsrooms (Kjellman, 2021: 4) influencing the transformation of the journalistic field (Wu *et al.*, 2019).

However, the findings do reveal that Narrativa's clients in the Spanish media sector, though few, are committed to incorporating AI into their business and have innovation as one of their highest priorities. This reinforces the idea that its limited implementation is more linked to the economic crisis and journalist's mistrust than to a low efficacy of the product.

Our study also finds that news articles generated by Narrativa for Spanish outlets, contrary to the U.S., do not indicate that they have been created with AI. This reveals two things. On the one hand, a general attitude of secrecy from newsrooms, probably for fear of readers disapproving of automated news. On the other, it does not contribute to increasing Narrativa's visibility as a company.

Journalists' initial reluctance to the service offered by Narrativa is also due to their lack of knowledge about news automation. Hence, the company believes it is necessary to provide journalists with training. This supports previous evidence that scarcity of resources in news organizations and the inadequate skills of their workforce cause the slow adoption of automation in many newsrooms (Wu *et al.*, 2019).

On the other hand, although the interaction between journalists and Narrativa's technicians in the news creation process is collaborative, the latter have

no prior knowledge of journalism and do not consider their work to be journalistic. Neither technicians nor managers see themselves as a potentially transformative force. In fact, the latter admit they have failed there and claim that it will be journalists who use AI and will adapt to changes who will undertake such a transformation. Ultimately, these findings cast doubt on whether technologists may become dominant agents in the journalistic field capable of driving significant change over time, as suggested by Wu *et al.* (2019).

In short, the findings of this case study lead us to reflect on the supposedly transformative role of automated service providers in journalism, at least for the time being. It raises the need for future research to study more deeply taking into greater account that the economic situation and the idiosyncrasies of each country can significantly influence the implementation of AI in journalism.

As for the limitations of this study, it would be interesting to further examine Narrativa's output by having a sufficiently representative sample of the automated news they produce. In addition, the research could be extended in the medium term to verify whether a) the reluctance encountered in the Spanish media disappears; b) media organizations will take a secondary place among Narrativa´s clients indefinitely; c) the company will focus its expansion on the United States and Latin America, and d) the trends outlined here can be extended to other news automation service providers in Spain and in other countries.

## References

AGENCIA TRIBUTARIA (4 de noviembre de 2022). *Definición de establecimiento permanente*. **https://tinyurl.com/4f6dbxz7**

ANANNY. M. & CRAWFORD, K. (2015). A liminal press: Situating news app designers within a field of networked news production. *Digital Journalism*, *3*(2), 92-208. **doi.org/10.1080/21670811.2014.922322**

ANDERSON, C. W (2013). *Rebuilding the News*. Temple University Press.

BECKETT, C. (2019). *New powers, new responsibilities: A global survey of journalism and artificial intelligence*. Polis, London School of Economics and Political Science. **https://tinyurl.com/bdhr4ywh**

BELAIR-GAGNON, V. & HOLTON, A. E. (2018). Boundary work, interloper media, and analytics in newsrooms: An analysis of the roles of web analytics companies in news production. *Digital Journalism*, *6*(4), 492-508. **doi.org/10.1080/21670811.2018.1445001**

BUREAU VAN DIJK (5 de noviembre de 2022). *Orbis*. **https://tinyurl.com/3xyn73hj**

CARLSON, M. (2015). The Robotic Reporter. *Digital Journalism*, 3, 416-431. **doi.org/10.1080/21670811.2014.976412**

CHAN-OLMSTED, S. M. (2019). A Review of Artificial Intelligence Adoptions in the Media Industry. *International Journal on Media Management*, *21*(3-4), 193-215. **doi.org/10.1080/14241277.2019.1695619**

CODDINGTON, M. (2015). Clarifying journalism's quantitative turn. *Digital Journalism*, *3*(3), 331-34. **doi.org/10.1080/21670811.2014.976400**

DEMSCOMBE, M. (2010). *The Good Research Guide: for Small-Scale Research Projects*. Open University Press.

DHANORKAR, S., WOLF, C. T., QIAN, K., XU, A., POPA, L., & LI, Y. (2021). Who needs to know what, when?: Broadening the explainable AI (XAI) design space by looking at explanations across the AI lifecycle. In W. JU, L. OEHLBERG, S. FOLLMER, S. FOX & S. KUZNETSOV (Eds.), *Designing Interactive Systems Conference 2021 (DIS '21)* (pp. 1591-1602). Association for Computing Machinery. **doi.org/10.1145/3461778.3462131**

DIAKOPOULOS, N. (2017). Enabling Accountability of Algorithmic Media: Transparency as a Constructive and Critical Lens. In T. CERQUITELLI, D. QUERCIA & F. PASQUALE (Eds.), *Transparent Data Mining for Big and Small Data,* (pp. 35-43). Springer. **doi.org/10.1007/978-3-319-54024-5_2**

DOMINGO, D. & WIARD, V. (2016). News Networks. In T. WITSCHGE, C. W. ANDERSON, D. DOMINGO & A. HERMIDA (Eds.), *The SAGE Handbook of Digital Journalism* (pp. 397-409). Sage.

DÖRR, K. N. (2016). Mapping the Field of Algorithmic Journalism. *Digital Journalism*, *4*(6), 700-722. **doi.org/10.1080/21670811.2015.1096748**

ELDRIDGE, S. A. (2018). *Online Journalism from the Periphery*. Routledge.

GRAEFE, A. (2016). *Guide to automated journalism. Technical report.* Tow Center for Digital Journalism. **https://tinyurl.com/bdcsea2u**

HEPP, A. & LOOSEN, W. (2021). Pioneer journalism: Conceptualizing the role of pioneer journalists and pioneer communities in the organizational re-figuration of journalism. *Journalism*, *22*(3), 577–595. **doi.org/10.1177/1464884919829277**

HOLTON, A. E. & BELAIR-GAGNON, V. (2018). Strangers to the game? Interlopers, intralopers, and shifting news production. *Media and Communication*, *6*(4), 70-78. **doi.org/10.17645/mac.v6i4.1490**

JANUARY, M. K. (2021). *"Automation will save journalism" News automation from the service providers' point of view* [Masters dissertation, University of Helsinki]. **https://tinyurl.com/mrxhv5ds**

LEVY, S. (2012). Can an Algorithm Write a Better News Story than a Human Reporter? *Wired*. **https://tinyurl.com/3urz9atb**

LEWIS, S. C. & WESTLUND, O. (2015). Actors, Actants, Audiences, and Activities in Cross-media News Work. *Digital Journalism*, *3*(1), 19–37. **doi.org/10.1080/21670811.2014.927986**

LEWIS, S. C. & WESTLUND, O. (2016). Mapping the Humane-Machine Divide in Journalism. In T. WITSCHGE, C. W. ANDERSON, D. DOMINGO & A. Hermida (Eds.). *The SAGE Handbook of Digital Journalism* (pp. 341-353). Sage.

MICÓ, J. L., MASIP, P. & DOMINGO, D. (2013). To wish impossible things: convergence as a process of diffusion of innovations in an actor-network. *The International Communication Gazette*, *75*(1), 118-137. **doi.org/10.1177/1748048512461765**

MIN, S. J. & FINK, K. (2021). Keeping up with the technologies: Distressed journalistic labor in the pursuit of "shiny" technologies. *Journalism Studies*, *22*(14), 1987-2004. **doi.org/10.1080/1461670X.2021.1979425**

NEWMAN, N. (2022). *Journalism, Media, and Technology Trends and Predictions 2022*. The Reuters Institute for the Study of Journalism. **https://tinyurl.com/5e95d9tu**

PARRATT-FERNÁNDEZ, S., MAYORAL-SÁNCHEZ, J., & MERA-FERNÁNDEZ, M. (2021). The application of artificial intelligence to journalism: an analysis of academic production. *Profesional de la información*, *30*(3), e300317. **doi.org/10.3145/epi.2021.may.17**

PLESNER, U. (2009). An actor-network perspective on changing work practices: communication technologies as actants in newswork. *Journalism*, *10*(5), 604-626. **doi.org/10.1177/1464884909106535**

PRIMO, A. & ZAGO, G. (2015). Who And What Do Journalism?. *Digital Journalism*, *3*(1), 38-52. **doi.org/10.1080/21670811.2014.927987**

REITER, E. & DALE, R. (2000). *Building Natural Language Generation Systems*. Cambridge University Press.

SIRÉN-HEIKEL, S., KJELLMAN, M. & LINDÉN, C. G. (2022). At the crossroads of logics: automating newswork with artificial intelligence—(re)defining journalistic logics from the perspective of technologists. *Journal of the Association for Information Science and Technology*, 1-13. **doi.org/10.1002/asi.24656**

SIRÉN-HEIKEL, S., LEPPÄNEN, L., LINDÉN, C. G. G. & BÄCK, A. (2019). Unboxing news automation: Exploring imagined affordances of automation in news journalism. *Nordic Journal of Media Studies*, *1*(1), 47-66. **doi.org/10.2478/njms-2019-0004**

SPRADLEY S, P. (2016). *Observant Participation*. Waveland Press.

TANDOC JR, E. C. (2019). Journalism at the Periphery. *Media and Communication*, *7*(4), 138-143. **doi.org/10.17645/mac.v7i4.2626**

TRÄSEL, M. (2013). Toda resistência é fútil: o jornalismo, da inteligência coletiva à Inteligência Artificial [All resistance is futile: journalism, from collective intelligence to artificial intelligence]. In A. PRIMO (Ed.). *Interaçoẽs em rede* (pp. 191-210). Sulina. **https://tinyurl.com/t6d9pt36**

UFARTE-RUIZ, M. J. & MANFREDI-SÁNCHEZ, J. L. (2019). Algorithms and bots applied to journalism. The case of Narrativa Inteligencia Artificial: structure, production and informative quality. *Doxa Comunicación*, 29, 213-233. **doi.org/10.31921/doxacom.n29a11**

VAN DALEN, A. (2012). The algorithms behind the headlines. *Journalism Practice*, *6*(5-6), 648-658. **doi.org/10.1080/17512786.2012.667268**

WADDELL, T. F. (2017). A robot wrote this? How perceived machine authorship affects news credibility. *Digital journalism*, *6*(2), 236-255. **doi.org/10.1080/21670811.2017.1384319**

WOLF, C. T. & BLOMBERG, J. L. (2019). Evaluating the promise of human-algorithm collaborations in everyday work practices. *Proceedings of the ACM on Human-Computer Interaction*, 143, 1-23. **doi.org/10.1145/3359245**

WU, S., TANDOC JR, E. C. & SALMON, C. T. (2019). When journalism and automation intersect: Assessing the influence of the technological field on contemporary newsrooms. *Journalism Practice*, *13*(10), 1238-1254. **doi.org/10.1080/17512786.2019.1585198**