# COMMUNICATION & SOCIETY

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**How to cite this article:**
Túñez-López, J. M., Fieiras Ceide, C. & Vaz-Álvarez, M. (2021). Impact of Artificial Intelligence on Journalism: transformations in the company, products, contents and professional profile. *Communication & Society, 34*(1), 177-193.

# Impact of Artificial Intelligence on Journalism: transformations in the company, products, contents and professional profile

## Abstract

**Artificial Intelligence (AI) is one of the most promising innovation frameworks with the potential to transform our relationship with technology. Particularly in journalism, AI is beginning to make its way transversally into the news production process and into the structure and functioning of the media. This article aims to anticipate how AI will impact on the Spanish media ecosystem and explain the medium-term transformations that are already being felt. The research approach is of an exploratory and descriptive nature, with a qualitative methodology based on Delphi-like in-depth interviews, encompassing an intentional sample of academic representatives, relevant associations and leading companies in the field of technology and communication. The results point out that AI will allow the extension of the current automated text news to audio and video on demand, it will favour that news can have a non-linear unstructured consumption, it will promote changes in the business model through new ways of relating with the audience and distribution of the product. Also, variations in the professional profile with a less operative journalist who will avoid routines –even of personal nature– that can be imitated by the machine and increase its cognitive contribution to the news production.**

## Keywords
**Automation, journalism, artificial intelligence, professional profile, Public Media, fake news.**

## 1. Introduction

The analyses of the relationship between journalism and artificial intelligence (AI) have in many cases been oriented to consider in a restrictive way the use of what is called weak (or narrow) AI, because it deals with news production as the activity of a machine that only executes the actions which it has been programmed for. AI has not only burst into the written press or with automated textual news, but it is extending to all phases of *newsmaking*. It is a silent process that is increasingly oriented to be executed with strong (or general) AI, adjusting the machine to imitate the way humans process information and even to be able to react and provide solutions. (Túñez, Toural & Frazão, 2020).

It is not a particularity of journalism, but rather part of the advances of AI in general, which has evolved from being applied to purely reactive machines that neither accumulated

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experience nor learned from themselves, to machines with the capacity to store information, and to make decisions based on their experiences. The next step for them is to learn from themselves, with the potential to make their own projections into future actions and to program *bots* that can understand other people's emotions and manifest their own. Artificial journalism (Tuñez, Toural & Valdiviezo, 2019 ) or automated journalism (Carlson, 2015; Graefe, 2016), algorithm journalism (Diakopoulos, 2014; Dörr, 2016), robot journalism (Oremus, 2015) or, as synthesized by Vállez and Codina (2018, p. 761): computer-assisted reporting (Houston, 2014; Meyer, 1999), augmented journalism (Marconi; Siegman, 2017); and data journalism or data-driven journalism (Parasie; Dagiral, 2013) is an emerging reality that has yet to be studied, although it is altering the ways in which information is obtained, stored, processed, transmitted and consumed.

This research is presented as a contribution to identify the transformation that journalism is expected to experience due to the impact of AI on its business models, the relationship with the audience, the effects on contents and formats and the repercussion on the professional profile of journalists through semi-structured in-depth interviews with a wide group of researchers and company managers who lead the work on AI.

In 2019, the Spanish government released a document on AI R&D&I which recognizes that AI will imply a "technological and social revolution" (p. 9) and states that it will be a "strategic axis of the Spanish society in the 21st century" (2019, p. 9) which will affect "the labour market, the educational model, the legislation in force and the relations within society itself with the new services and systems developed" (2019, p. 9). It also sets priorities and recommendations among which it foresees a National AI Observatory, establishing strategic areas, intensifying AI literacy, and strengthening the application of AI in education. There are no specific mentions of communication beyond what could be derived from "the transfer of knowledge and its return to society" (p. 9) and other generic mentions.

The document of the Spanish Executive is an initiative linked to the EU recommendations derived from the inclusion of AI as a priority in the industry transformation context and to the 'Declaration of cooperation in Artificial Intelligence (AI)' that the member states, in addition to Norway and Switzerland, signed during the second half of 2018. In February 2020, the EU published its White Paper on AI, which was defined as the term that "applies to systems that manifests intelligent behaviour, as they are able to analyse their environment and take action –with a certain degree of autonomy– in order to achieve specific objectives" (COM (2018) 237, p. 1).

The beginning of automation in journalism dates back to the technological transformation of newsrooms and broadcasting in the last three decades and has intensified in recent years. In Spain, Vocento's Medusa project, which aimed to automate soccer information from Second Division B matches for *Sport* magazine, and the agreement between EFE and RTVE, through the company Narrativa, are three staggered examples of the penetration of algorithms as text editors that are transmitted as news.

Some representative projects in the international sphere are the RADAR (*Reporters and Data and Robots*) project, promoted by Google to artificially generate thousands of texts oriented to local media with information generated from public data, or the decision of major agencies to publish algorithmically created news, which in the case of Reuters already accounts for more than a third of its production, and in the case of the Associated Press (AP) are both textual and video.

In the Spanish media, the algorithmic elaboration of news is not visible and, contrary to what pioneers like AP do, this data is not cited in the credits nor is there any annotation that informs the consumer that it is, in fact, facing machine-generated news. Most of the information is basically textual, about economy, sports or meteorology, and visual elements are added to support them, although these are still testimonial. The impact is, however, not only on the product. Currently, in addition to writing news, algorithms are already working

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on locating news events through images that are transformed into natural language, and crawl social networks or servers to index images and facilitate the selection of content in extensive footages (football matches, parliamentary debates ...), for example.

Making a projection on the impact of AI in journalism is a timely contribution, as throughout the in-depth review of scientific literature on journalism and artificial intelligence, no works have been found that bring together the voices of experts in the field to evaluate the specific impact on the area. There are mainly reports that identify media that automate content, the areas in which *bots* are producing news, the design of the algorithms, the perceptions of the audience or the reactions of journalists and the impact of the advances in technology. The well-known works of Kim *et al*, 2007; Matsumoto *et al*, 2007; Flew *et al*, 2012; Napoli, 2012, van Dalen, 2012; Clerwall, 2014; Diakopoulos, 2014; Edge, 2014; Karlsen & Stavelin, 2014; Stavelin, 2014; Carlson, 2015; Oremus, 2015; Lecompte, 2015; Dörr, 2016; Graefe, 2016; Hansen *et al*, 2017; Lindén, 2017; Marconi & Siegman, 2017; Oppenheimer, 2018; and Wölker, 2018.

Among the most recent studies are the contributions of Soffer (2019) on the changes of algorithmic personalization in communication flow theories; Gran, Booth and Bucher (2020), who wonder if talking about the level of knowledge of algorithms would allow to discuss a new digital divide. Diakopoulos (2019) explains how machine learning and data mining have transformed investigative journalism and Saurwein (2019) reflects on 'distributed responsibility' when designing and applying algorithms to automate actions or recommendations in classifications, ratings, programs, content production and decisions.

Yanfang (2019) emphasizes the comparison of news written by humans and by machines and the perception of objectivity and credibility of both texts. Following up on truthfulness, Fletcher, Schifferes and Thurman (2019) describe how journalists can be trained in using AI to assess the credibility of online content. Wu, Tandoc and Salmon (2019) resort to Bourdieu's theories to analyse how applying technological automation designed by companies outside the informative field can drastically transform journalism. Dierickx (2019) emphasises this aspect and highlights the need to incorporate journalists from the very first moment of ideation in the *newsmaking* process.

Helberger (2019) analyses threats and opportunities represented by news reporters in the democratic role of media. Ford and Hutchinson (2019) investigate the use of the Australian Broadcasting Corporation's (ABC) chatbot in their relations with the audience, especially in social networks. Jones and Jones (2019) address the issue and explain how the BBC's audience-oriented bots "are laying the foundations for the development of more interactive news formats with an increasingly conversational tone." Slaček and Tomanic (2019) review the *algorithmization* process of journalistic work at the Slovenian Press Agency (STA) with an emphasis on the influence of technological development on the work of journalists.

At the same time, Caswell (2019) argues that the computational approach to news, in which we can integrate AI, is a very unfinished product that has occurred in a case-by-case opportunistic adoption of technologies that originate in other fields, and has resulted in a wide and interesting set of tools for journalism, but lacks an integrated framework that allows for analysing and understanding 'computational journalism'. Broussard (2019) adds to AI's deficits that the fact that we have been so eager to include these technologies in as many contexts as possible has resulted in poor design which is often not optimised and does not perform in the way it promised to. Caswell's and Broussard's point of convergence here has to do with coherence and purpose. While technology advances and tends to occupy an increasing number of processes in news-making, it is important to deliver effective tools that help create quality journalism, whilst being able to define and understand its place as a discipline. Another big challenge that comes into action when assessing algorithms are the ethical implications of AI (Dörr, Hollnbucher, 2017) in terms of professional deontology and responsibility.

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Among the reports from entities linked to the public sector, the analysis of the EBU (European Broadcasting Union, 2019) stands out, as it considers that not all stages of journalism will be automated, although the whole process needs editors with a better understanding of the technology. The reports of private entities (IDC, SASM Intel and Deloitte, 2019) on the impact of artificial intelligence combined with the Internet of Things and the annual studies by Reuters and the University of Oxford, which present AI on its impact topics in 2020 with "transcription services, machine translation and audio/text or text/audio are going to be some of the technologies with artificial intelligence adopted *en masse*"(Newman, 2020, p. 8 ), predict a decade aimed at recovering confidence in journalism, closer relations with audiences and the impact of the next wave of technological disruption in automation, *big data* and new visual and voice-based interfaces (Newman, 2020).

In Spain, the scientific production on the subject is recent. There is, however, an important number of bibliographical reviews, journalist's opinions, evaluations of specific cases, notes that approach ethical discussions and studies on companies that work with bots that write news, mainly. In this area, some works stand out, such as those of Salazar (2018), Túñez-López, Toural-Bran & Cacheiro-Requeijo (2018), Vállez & Codina (2018), Flores (2019), Rojas & Toural (2019), Rojas-Torrijos (2019), Segarra-Saavedra, Cristòfol & Martínez-Sala (2019), Túñez-Lopez, Toural-Bran & Valdiviezo (2019), Ufarte & Manfredi (2019) and Valdiviezo-Abad & Bonini (2019).

## 2. Methodology

The absence of in-depth studies that project the viewpoint of AI experts on journalism encourages a descriptive and exploratory research that deepens in the current situation and identifies the evolutionary forecasts of the impact of AI in journalism. Qualitative methods are used through in-depth personal interviews, using the Delphi format, in two rounds. An intentional convenience sample was chosen, incorporating twelve experts from the main Universities in Spain, heads of relevant associations in the sector and companies that stand out for their work with AI products in the field of journalism, as well as experts linked to AI management. We work with a semi-structured questionnaire to carry out personal interviews via Skype or in person, always at the request of the interviewee, while previously sending a questionnaire with the sections that make up the structured part of the interview:
- AI challenges applied to communication
- AI applications in information companies and application rates in public and private companies
- Expected impact on content development
- Expected impact on content consumption
- Expected impact on audience relations
- Adjustments that AI will cause in the journalist's professional profile
- AI projects in journalism being developed

The sample is extended through a snowball method based on the contributions of the interviewees. A second consultation was carried out to evaluate the first results. Finally, contributions from 16 interviewees were validated. The interviews were carried out between November and December 2019. The second round took place in March 2020. The transcription and evaluation of results was carried out in April 2020, assisted by Atlas.ti. Thus, the final sample consists of:
- (1/AA) Amparo Alonso Betanzos. President of the Spanish Association of Artificial Intelligence (AEPIA). Professor at the Department of Computer Science and Information Technology in the University of A Coruña.
- (2/CS) Carles Sierra. Director of the Artificial Intelligence Research Institute (IIIA) of the Spanish National Research Council (CSIC) and Adjunct Professor at Western Sydney University.

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- (3/JAL) José Antonio Lozano, Director of the Basque Center for Applied Mathematics (BCAM). Professor at the UPV/EHU.
- (4/SB) Senén Barro. Professor. Director of the Centre for Singular Research on Intelligent Technologies (CiTIUS), University of Santiago de Compostela (USC).
- (5/RL) Ramón López de Mántaras. Researcher at the Artificial Intelligence Research Institute (IIIA-CSIC), where he has also been director.
- (6/OC) Oscar Cork. Professor at the Department of Artificial Intelligence in the Universidad Politécnica de Madrid (UPM).
- (7/FM) Ferrán Marqués. Researcher of the IDEAI group at the Technical University of Catalonia (UPC).
- (8/RD) Richard Duro. Professor of the Department of Computer Science at the University of A Coruña (UDC).
- (9/JLLA) Josep Lluís Arcos. Researcher at the Artificial Intelligence Research Institute (IIIA-CSIC).
- (10/DLL) David Llorente. CEO of the company Narrativa, a reference in algorithmic solutions for information content.
- (11.SA) Sixto Árias. CEO of the Capaball platform. Educational technology company that offers a personalized online content service based on AI.
- (12/RC) Rafaela Campani. Responsible for the consulting area of Prodigioso Volcán, a consulting firm focused on accompanying the digital transformation of the media.
- (13/EJ) Elena Jin. Head of Communications at Taiger: Spanish company dedicated to AI and digital software located in Singapore, with a basic orientation to financial environments.
- (14/XF) Xavier Fisa. Director of Lavinia Voice, an area of the Lavinia Group focused on the design and production of conversational experiences with voice (voiceapps for virtual assistants such as Alexa or Google Assistant) and new online audio narratives.
- (15/FT) Francesc Tarrés. Executive Director of Ugiat Technologies SL. Spinoff of the Universitat Politècnica de Catalunya dedicated to the insertion of intelligent advertisements, facial recognition and development of mobile applications of personalized image recognition.
- (16.AG) Ángel García Crespo. Director of Softlab. Professor of Computer Science and Artificial Intelligence. Polytechnic University of Madrid.

A methodological triangulation was performed through the review of databases, carrying out a bibliographic sweep to construct the state of the matter, alongside the analysis of management and public policy documents on AI. The research is presented in an exploratory and descriptive manner with blind hypotheses to identify impactful trends on the application of AI in journalism and its foreseeable repercussion on products, professional profiles and relations with users (audiences).

## 3. Results

The evaluative and prospective contributions of experts are grouped together to synthesize the impact of AI in journalism into three blocks: the company, contents and formats, and the professional profile.

It is assumed that journalism is one of the areas in which important changes are expected, although everyone agrees that the "revolution" will be visible when significant advances are made in the current challenge of identifying cognitive processes that enable to program software that imitates them.

> (16/AG) *"[We need] to understand how information is stored (learning) to improve the way we adjust to that procedure, so that machines learn and then teach how to learn. We are still at the beginning."*

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> (5/RL) *"The functioning of the brain and AI are totally different. There are researchers working on neuromimetic circuits to try and reproduce behaviour similar to that of the brain, to that of the neuronal systems, through software."*

It also highlights the need to familiarize oneself with its application through technological literacy initiatives for the assimilation of changes derived from the daily life applications of AI.

> (8/RD) *"When today's children turn 30 years old, any system will include AI. Mastering it will be as important as knowing how to write. Those who do not have an understanding of these concepts and technologies will find it difficult."*

> (11/SA) *"It's like Netflix. We generate our own content and we also use algorithms to find content on the web (videos, documents, presentations...) We talk about training and learning, not formalised education or study. We don't give certificates but rather constant updating."*

There is an agreement in that we should think about the impact of Artificial Intelligence while erasing the idea that it is the application of solutions made by machines programmed only to execute actions, because we are working on designing machines with the capacity to learn with increasingly higher levels of autonomy, and to participate in the final elaboration of the product or in the handling of the relations with users/recipients.

> (5/RL) *"AI is a technology that allows automation. Until now, automation has been associated with tools or machines, not with unpredictable environments. There is no flexibility to adapt to changes, these are controlled environments."*

> (4/SB) *"The increasingly more humane part of automatic news construction, with better narratives and more records, is a subject on which great progress will be made in the coming years."*

> (5/RL) *"When we talk about AI, we enable the machine, by means of sensorization, to make more complex decisions that would not be possible in classical automation. It has greater flexibility, and the system will be more able to adapt to changes in the environment. It's a sophistication of the automation system."*

**Table 1**: AI trends.

| IA | |
|---|---|
| **Effect** | **Action** |
| Facilitate, not replace | Identify cognitive processes to create software that imitates them. Algorithms that learn, not just execute commands |
| AI Education | |
| Intelligent machines | |

Source: Own elaboration.

In Journalism, it starts from basic standards of textual news to which illustrations are incorporated, but there is work on projects for the creation of multimedia products on demand, and with the possibility of being available in several languages not only to work on databases, as is currently the case, but also for unexpected situations.

### 3.1. *The journalistic company*

AI will bring changes in business models: new languages, a multiplication of the content catalogue and an increased offer for personalized products.

3.1.1. There will be a shift from subscriptions to receive a ready-made product, to subscriptions that demand a specific product made on the spot.

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(2/CS) *"The user who wishes to be informed will use the AI to perform the function of a journalist. You will be able to ask: make me a 3-minute video summary of Madrid's match yesterday, or a text that can be read in 5 minutes on the summary of all first division matches that day. The AI will help the user to get the information he wants."*

(5/RL) *"Progress will be made in aspects related to the search for information, to compile information on a routine basis. Also, in the personalization of contents, there is a lot of potential."*

3.1.2. Microsegmentation of the audience through *Data Mining*. A tendency towards interaction as opposed to the current bidirectionality that will lead to adjustments in the business model. The media will be able to attend specific requests as individualized and immediate services, which will lead to a shift from their role as mediators who select and categorize to a new role as information outlets at the user's demand.

(12/RC) *"With AI we can learn more about the user's habits to understand and offer exactly the right subscription at the right time."*

(14/XF) *"Focusing on the field of speech and conversation is mainly a cultural challenge. The interaction with new technologies, both in the way of producing content and in offering it to the audience, will play a very important role. New ways of working internally and new ways of interacting with audiences will have to be understood."*

(10/DLL) *"The media don't have much information about their own readers. Other industries have everything, the media has very little. So, the level of personalization is limited, but now that they start setting up pay walls or logins, they will start collecting more data and will be able to implement or improve content personalization."*

3.1.3. The changes will lead to new relationships with the audience in which the media will combine roles of proactivity, reactivity and passivity to target their content (products) to their audiences:
-   Proactive: towards individualization without the express request of the user.
-   Reactive: through web content recommendations, not only in the entertainment areas.
-   Passive: through external virtual assistants (Alexa, Siri, Google voice...).

(9/JLLA) *"The same content can be told in different ways depending on whom we are addressing. This can be achieved through AI. With this [...] we are heading towards an 'a la carte' consumption that improves the user experience."*

(16/AG) *"Emotions are received from the user according to his/her behaviour patterns. From there, one or another solution is offered to direct them towards a pleasant experience."*

(13/EJ) *"Another project is the analysis of feelings. We do it through facial recognition. It is applied both to what is broadcasted on the screen (a presenter) and to the user who is watching the TV. It is also capable of recognizing text, that is, depending on the words used and the style, feelings can be identified that are evoked by its reading."*

(1/AA) *"Progress will be made in explainability, in natural language generation and in image recognition by intelligent software. The research in explicability is very strong, we will try to have less and less opaque algorithms with time. We are all walking towards it. And the use and recognition of images will be increasingly linked to virtual assistants".*

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3.1.4. Thematic & geographical specialisation. Local as an element of differentiation in order to single out subjects, while there aren't simplified, low-cost alternative applications.

(10/DLL) *"Costs are bearable for smaller media, but larger media will be able to scale up and offer more appropriate content. We are talking about database-driven content. The unique stories will still be written by the journalist".*

(10/DLL) *"All the data-based content I see is very complicated for a media corporation to differentiate itself... either it is very specialized and very niche, or it just shows information that other media can show. Automation is more of a threat to thematic specialization than geographic specialization".*

3.1.5. Public & private media: reluctance to change

(15/FT) *"We are currently doing a work for TVE that consists in detecting a certain type of advertising and replacing it with another. We are constantly analysing the video stream, detecting the ads, and adapting it to the region where the product is being distributed."*

(10/DLL) *"There is reluctance to change because it means giving up control over the contents. There is still a lack of confidence by public media in automation and they feel they are losing a little bit of control over what is generated. That is a factor, yes. It is a reasonable fear, which I do not share."*

(9/JLLA) *"Public media use AI on the recommendations side. They are trying to personalize and work on the consumer's side on demand."*

**Table 2**: Impact of AI on media companies.

| IA IN THE NEWSPAPER COMPANY | | |
|---|---|---|
| **Effect** | | **Action** |
| Offer | | On-demand subscriptions for specific products made on the spot in any language |
| Audience relations | Proactive | *Data Mining*. Synchronous bidirectionality |
| | Reactive | Consumption orientation |
| | Passive | External virtual assistants |
| Orientation | | Global thematic coverage, not local |
| Public resources | | Reluctance to change to avoid control transference |

Source: Own elaboration.

## 3.2. *The products and contents*

AI is applied in all three phases of news-making, not just in the elaboration of the message. It is projected towards a variation in the quality standards of human work, with a greater weight of cognitive contributions over the completion of productive routines (automatable and therefore not differentiating). However, cognitive automation is placed in a near horizon.

Artificial journalism is visible in elaborated news because it is the end product that contacts the audience, but its applications are studied and applied in various areas: collection and analysis of information and data, text, image and voice recognition systems in files; generation of news in multi-support and multimedia; labelling; distribution and consumption analysis.

AI actions are intensified for topic verification and *fake news* detection; the orientation of the informative diet with, as mentioned, the intelligent recommendation of contents, and the automatic generation of personalized products (with possible changes in linguistic register) that allow the design of a personalized and on demand consumption of journalism.

The projection of AI on contents and formats has been synthesized in four contributions:

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3.2.1. Credibility and the boundaries between fiction/non-fiction In NLP (Natural Language Processing) are highly studied in communication, and it comes not only with understanding the content, but also the context around it, to avoid affecting the understanding of the message.

> (9/JLLA) *"We had a debate between what will be advanced in fiction and non-fiction. In fiction, there will be advances in the transformation of images, swapping faces from one person to another, or voices [...] What is more complex is the non-fiction part, separating verified news from unverified news."*

> (10/DLL) *"Verify, not just create. In data generated news it would be very easy to extend the use of our technology to verify. Sources and credibility are hard at work."*

> (7/FM) *"There is a very basic way to alleviate this, where one should start: education. Educate people not to lie and analyse everything they read and receive."*

In non-fiction, the alteration of codes to create fake real-world references through the assembly of authentic symbols and the use of journalistic conventions generates *fake news*. The false news story appropriates the advances of AI. It is fought with the same techniques, but the process enters a loop on the dark side of AI, oriented to neutralizing these hoax detectors and improving the fake product to make it difficult to identify them as fake news. It extends to all languages: visual, auditive and textual.

> (15/FT) *"Fighting the fake news, that's a war. On the one hand, there are those who work to combat them, but on the other, there are those who work to create a system so that they cannot be detected. They are being the countermeasures of the measures. Just as we are working to avoid them, they are working to prevent them from being avoided."*

> (5/RL) *"Facebook, for example, one of their concerns are this fake news. There is an international group that I am a part of, and Facebook brought us together at its headquarters last year. We have had two meetings, one face-to-face and one digital. The conclusion was that nobody knows how to end this problem."*

> (1/AA) *"It's going to be hard to detect fake news because something that's not 100% true is also false."*

3.2.2. Automated visual storytelling. We work to achieve informative programming that automatically generates multimedia news from databases, images and audios.

> (5/RL) *"...it was based on highlighting the most relevant facts of a match and that the system was able to make the summary by selecting the images. We are not yet at a point where the computer is advanced enough to be able to know what is happening based on the images without anyone telling it. In the short term, I have doubts that we will get there, [but] in the medium term, five or six years, I don't see it as totally impossible."*

> (9/JLLA) *"We are working on tools to help documentary filmmakers. From a voice, the system locates material in its database and presents other documents we have from it. The same thing happens with images, with people's faces."*

> (2/CS) *"When you write a text, you can enter metadata about the emotion that the text conveys. This allows you to generate a speech that has an emotional element when it is expressed. We work with talking heads, graphic representations that speak and express emotions. It allows us to read news or books for blind people, for example. These systems are also able to change the tone according to the metadata given to them."*

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3.2.3. Ethics and professional deontology. The discussion about the need for a professional AI deontology appears beyond the notes that have already been made about the need for *robotics* (Salazar, 2018). This deontological concern is extended to the process of building the algorithm, as the functions of selection and hierarchization of data for storytelling rely on it, and that will then become the audience's reference for current affairs. This discussion is also present in programming for relation management with users and audiences.

The debate does not exclude the fact that by automating news writing, the criteria for building databases and designing the algorithm will be the nodes on which the spin of information can be applied, and ideological biases might be introduced. "The demands for rigour and honesty and the demand for impartiality in the news could no longer be made to the text itself but to the previous phases of data storage and arrangement and to the computer creation of the algorithm in charge of interpreting these data and turning them into an informative story" (Túñez, 2018, p. 1416).

> (5/RL) *"Work and research are being done on nudging –towards the ethics of the robot–, in subliminal manipulation. The conversational AI system, the chatbot or even a robot that a person talks to, is known to be able to manipulate humans."*

> (1/AA) *"The dissemination of news, the fight against the handling of public opinion on a large scale by the media and the false news circulating on social networks will be complex."*

3.2.4. Alternatives to the linear consumption of information. The news story is de-structured so that the consumption begins in any of its parts or data and is not organized following a consumption/reading pattern marked by the sequential development of the information as it was elaborated, but rather introducing the reader in the narrative through any of its parts.

> (14/XF) *"Until now, on-demand consumption was associated with any device and at any time, however, the parts themselves were usually linear. What the BBC is doing is de-structuring the news so that the user can consume the news in a linear way or, in the absence of it, ask for a specific piece of unstructured news, making the system take you to the part of the information you want."*

> (10/DLL) *"There will be much more information, priorities in life will change and this will allow to adjust to the priorities of each one [...] Distinction is what is going to mark the future of all the media."*

**Table 3**: Impact of AI on journalistic content and products.

| IA IN PRODUCTS AND CONTENTS | |
| --- | --- |
| **Effect** | **Action** |
| Credibility | Fiction/non-fiction borders: fake news |
| Audiovisual Narrative | Automated multimedia news |
| Ethics and deontology | In creating algorithms and relationship management |
| Non-linear unstructured consumption | Start of news consumption from any of your data or parts |

Source: Own elaboration.

### 3.3. *The profile of the journalist*

The changes in the sector and in the profession have a direct impact on the role of the journalist. Artificial Intelligence will also cause changes in the professional profile of the informant, among which the experts point out:

3.3.1. Adjustments in the use of a new infrastructure. The tendency is for digitalization to keep introducing changes towards infrastructures that facilitate mobility and hyper-connection, even from computers with a virtual keyboard and holographic screens. This is not considered

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immediately possible, but holography is also projected as another means of processing and transmitting information.

3.3.2. A new attitude: from ignoring to living with bots.

(12/RC) *"It is a cultural issue. There is a natural rejection of technology by journalists. They think their work is going to be stolen. It happened with the printing press, computers, social networks. They see themselves more as an enemy than an ally. That barrier must be broken."*

(10/DLL) *"The bot is going to be the new journalist in the newsroom who will be in charge of improving the news they generate from the point of view of data and speed... they are going to benefit a lot from having a new partner in the newsroom."*

3.3.3. More training in natural language generation technology.

(6/OC) *"It is essential that journalists acquire much more advanced digital training. It is not only what the journalist has to do, but also what he has to know on how to manage large amounts of data, do analyses..."*

(5/RL) *"For very repetitive tasks, why not use AI to save time in their execution? This way you could spend more time improving the product, being more critical and adding value to the piece. The journalist's own work is irreplaceable, but it changes. The key is that the training of communicators must take this transformation into account."*

3.3.4. Less operational and more cognitive work. Greater active participation in the identification of news stories and in the variation of both the coding/writing of the message and the use of formats or genres.

(16/AG) *"What will happen is that the good journalist will be more difficult to imitate. That is to say, that a cognitive work will be reached by the software. Still, I think that will be accessible in about five years, the landscape will change a lot. The more the machine learns, and the more data is fed into it, the more it will be able to keep doing things."*

(12/RC) *"All work where the journalist does not add value can be automated. For a story that is written by all the media I am not interested in having a busy journalist, a machine can do it. The journalist, meanwhile, is dedicated to in-depth research and making a difference in value. In this way, the work and the journalistic quality will grow. This also applies to layout and computer graphics."*

3.3.5. Enriched contents. The journalist will have to devise the value contribution to the content, which means functions that go beyond the elaboration of the content.

(10/DLL) *"Minerva is an algorithm of ours that helps us be more productive. It extracts structures and styles from the news media and helps give variability to the sentences. The only thing it doesn't do is generate opinion because we believe it shouldn't, that is human for humans."*

(15/FT) *"The most routinely tasks will be done by the machines. The journalist will give the final quality to the news."*

(10/DLL) *"These are intelligent machines that learn from their mistakes. Templates are created based on examples. They are dynamic templates, very small, and you can use them to compose the final sentences and then compose those sentences in a longer text... Launching a new type of news can take us two weeks, so very short periods."*

(12/RC) *"AI will also help you repackage information, according to who consumes it, and generate new product. It will be able to bring together all the information related*

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*to a certain subject and offer it together in a way that makes it look like special tailor-made content.”*

(6/OC) “*Semantic image annotation techniques would also provide much more richness to the content offered.*”

3.3.6. Registration or patenting of personal brands to avoid the replication of the journalist's uniqueness, such as his voice or his appearance, and to use them for the packaging and transmission of content.

(13/EJ) *“The machine identifies and replicates singularities.”*

(10/DLL) *“We can do it now. One of the algorithms that we have what it does is extract the style. In the end we will tend to have people record their style, or their voice, or their image because the technologies that are being used can already replicate them […] there is going to be a tendency towards a new market which is the licensing of your own image, or voice, or journalistic style.”*

3.3.7. Informative speed. The same work but in less time, with the support of the bot to generate news. AI is associated with time optimization that generates higher productivity rates. It is not so much a question of speeding up the process by going faster but rather by referring everything that slows down the elaboration of the news to the *bot*.

(12/RC) *“It will change both the relationship with the readers and the internal workflows in the newsrooms. AI will not kill the work of journalists; it will eliminate routinely tasks that slow down the work of the journalist.”*

(3/JAL) *“[Also demanded are] fast consumption contents in which the user is given access to the information he wants at any time.”*

3.3.8. Trust and quality. Personal credibility and personal fingerprint increase their weight in the definition of a profile backed by a good reputation, but also by the real impact rates of your journalistic production, because of the changes in the already detailed online metrics.

(2/CS) *“With AI, the quality of the journalistic product improves. What a journalist will look for is that his or her creation is of sufficient quality for AI to catch, use and adapt to what the user wants. There are many parameters that will be taken into account to select the pieces: the reputation of the journalist, the reputation of the media for which he works or the success he had in his content in the past to inform the user.”*

(8/RD) *“AI is making the boundary between what is true and what is a lie disappear. Communication is going to have to be redefined to become more reliable. Reliable sources, certified for the quality of their information, must be established. What in telecommunications is the 'quality of service'. Journalists must establish a credibility fund.”*

**Table 4**: Impact of AI on the professional profile of the Journalist.

| IA IN THE JOURNALIST'S PROFILE | |
|---|---|
| **Effect** | **Action** |
| Attitude | From ignoring to living with the *bots* |
| Training | Strengthening knowledge in technologies |
| Cognitive participation | Less operational, more strategic |
| Patent image and voice | Personal brand registration to protect against copycat bots |
| Information speed | News in less time. Increased productivity |
| Enriched content | Adding value to the content |
| Personal Reputation | Fingerprint as a guarantee of credibility |

Source: Own elaboration.

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**Table 5**: Changes in journalism resulting from the impact of AI.

| IA IN JOURNALISM | | | |
|---|---|---|---|
| **Impact** | **Effect** | | **Action** |
| **GLOBAL** | Facilitate, not replace | | Identifies the cognitive processes to create software that imitates them. Algorithms that learn, not just execute commands |
| | AI Education | | |
| | Intelligent machines | | |
| **IN THE COMPANY** | Offer | | Subscriptions for specific product demand made on the spot in any language |
| | Audience relations | Proactive | *Data Mining*. Synchronous bidirectionality |
| | | Reactive | Consumption orientation |
| | | Passive | External virtual assistants |
| | Orientation | | Global thematic coverage, not local |
| | Public resources | | Changes due to the transfer of control |
| **IN PRODUCTS AND CONTENTS** | Credibility | | Fiction/non-fiction borders: fake news |
| | Audiovisual Narrative | | Automated multimedia news |
| | Ethics and deontology | | Journalistic ethics in creating algorithms and relation management *bots* |
| | Non-linear consumption | | News consumption from any of the data or parts |
| **IN THE JOURNALIST'S PROFILE** | Attitude | | From ignoring to living with the bots |
| | Training | | Strengthening knowledge in technologies |
| | Cognitive participation | | Less operational and more strategic |
| | Patent image and voice | | Personal brand registration to protect against style, voice and appearance copycat *bots* |
| | Information speed | | News in less time with bot support. Greater productivity |
| | Enriched content | | Adding value to the content |
| | Credibility and personal reputation | | Fingerprint and reputation of the author as a guarantee of truthfulness |

## 4. Discussion and conclusions

The impact of AI on journalism will be the result of the area's permeability to global advances in the generation of algorithms that increasingly mimic the way a human brain behaves and reacts. The changes became visible when the automation of the final product (news) or its staging (*bots* that present or retransmit) was reached, but they extend throughout the whole process of management of the news media and the ideation, creation, diffusion and consumption of its products, both entertainment and news.

It is recognized that among the limitations of this research is its interpretative nature, projected towards a changing environment and the range of aspects on which AI will impact. The future offers an almost unlimited range of possibilities, but not specific to communication or journalism but to social transformation: emotion recognition in relationship management, micro-segmentation of audiences to design/provide products in an individualized way, the possibility of creating products on demand in an immediate and personalized way, or instant availability of multilingual content, even with settings programmed to be broadcast with different types of voice or presented with different prototypes of people.

In news generation, automation will impact more on structured data-based thematic coverage than on local events. It is noted that the algorithm will replicate everything that is repetitive, so the reinforcement of personal contributions by the journalist is encouraged, so that his or her function is focused on strategic implementation and that routine actions (the operational) are delegated to the machine. It is equivalent to a greater involvement in the construction of the agenda, with more prominence over the cognitive contributions of the journalist so that both companies and editors can escape from solutions that by repetition can be replicated by the machine.

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The area that seems to be a priority is the identification of fiction elements that are presented as true news stories in order to transmit false content. AI is double-edged because experts recognize that while working to detect *fakes*, they are also working on programming ways to evade these recognitions, that is, to shield the fake news from the verifiers. The fight against fake news generated by *bots* should be reinforced with social education in AI, a change in content consumption habits and a professional effort to reinforce truthfulness through the reputation of the author and the medium. This will happen by joining efforts in the promotion of truthfulness and trust between the medium, the support, the content, the author and the evaluations/comments of the audience.

This ubiquity of AI, as Broussard expressed in general terms, is a tendency that we are very much able to observe in journalism, as these technologies expand throughout the different news-making processes, but also different news-making formats. This asks for a clear conception of the different spheres in which AI can be applied in order to be able to produce effective development frameworks and guidelines that ensure the quality and ethics of AI applied to journalism and journalists.

With all, as the processes in news-making are driven toward this more agile, more personalized, accurate future, other aspects of journalism must keep up the pace of these transformations; as the social, professional and ethical context will be key for the successful implementation of AI in the profession. A growing discussion is taking place on the balance between progress and assessment on Artificial Intelligence. Personalization is projected as a key feature of the media's future content offer, but this personalization must also take into account certain aspects of diversity and transparency, in order to prevent the user from falling into personalized 'echo-chambers' and the media also being able to preserve its editorial capacity. At the same time, the production of automatic texts might bring up question on accountability and responsibility, not just for the journalist that might use this software to perform, but perhaps also on the engineer that might design it or the database from which it collects its information, especially as we move towards an increasingly cognitive AI, as our results suggest. In the realm of fake news, this technological dichotomy that states that the better we get at recognising fake news, the more difficult it is to detect them for the same reason, is something that we are likely to see in other aspects of AI; the more advanced, the bigger the social and ethical challenges for its implementation. Therefore, while AI is promising great advances for journalism and news-making, ontological discussions on the relation between AI and its impact on society are much needed to develop a balanced informative environment.

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