

# Research on the quality of automated news in international scientific production: methodologies and results

## Investigación sobre la calidad de las noticias automatizadas en la producción científica internacional: metodologías y resultados

### *Pesquisa sobre a qualidade das notícias automatizadas na produção científica internacional: metodologias e resultados*

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**ABSTRACT** | The Fourth Industrial Revolution makes it necessary to think about theoretical and methodological approaches suitable for the objects of study of automated journalism. We conducted a meta-analysis and a global study to detect the dominant methodologies around the quality of automated news. We applied the systematic review of scientific literature (SLR) technique to a search of articles on the terms journalism and artificial intelligence (N=670) from 2008 –when data journalism as we know it today emerged– until 2022. After several screenings, 18 articles published in Scopus and WoS analyzing the quality of automated news between 2014 and 2022 were identified; we then conducted a content and comparative analysis of formal, quantifiable aspects (authors, journals, year of publication, country, among others), and methodological aspects, such as the chosen orientation and techniques. Among the most outstanding results is the predominance of experiment as the preferred method. The countries most focused on this technique are the United States (N=6), Spain (N=5), and Germany (N=4). The former and the latter focus on the studies of perception and Sundar’s (1999) first categories. In Spain, various approaches are adopted, in the Czech Republic (N=1) they experiment with their own algorithmic creation, and in the Netherlands (N=1) and Singapore (N=1), they apply the experimental approach.

**KEYWORDS:** automated news; artificial intelligence; research methodologies in communication; journalism; experimental design.

#### HOW TO CITE

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**RESUMEN** | *La IV Revolución Industrial obliga a pensar en enfoques teóricos y metodológicos adecuados para los objetos de estudio del periodismo automatizado. Se realiza un metaanálisis y un estudio global para detectar las metodologías dominantes en torno a la calidad de las noticias automatizadas. Se aplica la técnica de la revisión sistemática de la literatura científica (SLR) a una búsqueda de artículos sobre los términos periodismo e inteligencia artificial (N=670) entre 2008 –cuando surge el periodismo de datos tal y como lo conocemos hoy en día– y 2022. Se identificaron 18 artículos publicados en Scopus y WoS que analizan la calidad de las noticias automatizadas entre 2014 y 2022, y se llevó a cabo un análisis de contenido y comparado de los aspectos formales, cuantificables (autores, revistas, año de publicación, país, entre otros), y de corte metodológico, como la orientación escogida y las técnicas. Entre los resultados más destacados está el predominio del experimento como método preferente. Los países más centrados en esta cuestión son los Estados Unidos (N=6), España (N=5) y Alemania (N=4). El primero y el último fijan su mirada en los estudios de la percepción y las primeras categorías de Sundar (1999). En España, se adoptan diversos enfoques, en la República Checa (N=1) experimentan con su propia creación algorítmica y en los Países Bajos (N=1) y en Singapur (N=1) se aplica el enfoque experimental.*

**PALABRAS CLAVE:** *noticias automatizadas; inteligencia artificial; metodologías de investigación en comunicación; periodismo; diseño experimental.*

**RESUMO** | *A Quarta Revolução Industrial obriga-nos a pensar em abordagens teóricas e metodológicas adequadas aos objetos de estudo do jornalismo automatizado. Uma meta-análise e um estudo global são realizados para detectar as metodologias dominantes em torno da qualidade das notícias automatizadas. A técnica de Revisão Sistemática da Literatura (SLR) é aplicada a uma pesquisa de artigos sobre os termos 'jornalismo' e 'inteligência artificial' (N=670) entre 2008, quando surgiu o jornalismo de dados tal como o conhecemos hoje, e 2022. Após a análise, foram identificados 18 artigos publicados em Scopus e WoS analisando a qualidade das notícias automatizadas entre 2014 e 2022. Foi realizada uma análise de conteúdo e comparativa dos aspectos formais e quantificáveis (autores, revistas, ano de publicação, país, entre outros), de aspecto metodológico, como a orientação e técnicas escolhidas. Entre os resultados mais destacados está a predominância da experiência como o método preferido. Os países mais interessados nesta questão são os Estados Unidos (N=6), a Espanha (N=5) e a Alemanha (N=4). O primeiro e o segundo centram-se nos estudos da percepção e nas primeiras categorias de Sundar (1999). Na Espanha, são adoptadas diferentes abordagens, na República Checa (N=1) experimentam a sua própria criação algorítmica, e nos Países Baixos (N=1) e em Singapura (N=1) é aplicada a abordagem experimental.*

**PALAVRAS CHAVE:** *notícias automatizadas; inteligência artificial; metodologias de pesquisa em comunicação; jornalismo; desenho experimental.*

## INTRODUCTION

Klaus Schwab (2016) dates the beginning of the Fourth Industrial Revolution (4IR) to the beginning of the 21st century and notes that it is based on the digital revolution. The 4IR is characterized by artificial intelligence (AI) and machine learning and, above all, by greater cognitive power that increases human productivity. Since the digital era, journalism has been dramatically affected by a number of economic, technological, and social factors. John Pavlik (2022) groups them around digital technologies and crowdsourcing, the new economic underpinnings of news production and distribution, and cultural and political changes that fuel social division and political polarization.

With the irruption of big data and, to a large extent, as an extension of data journalism, the media industry began to innovate and apply AI to news production with great interest, “altering the ways of obtaining, storing, elaborating, transmitting, and consuming information” (Túñez-López et al., 2021, p. 178). Consequently, journalism is shaped by a complex technological context (López-García & Vizoso, 2021), in which AI refers to technologies that work as communicators, rather than mediators of human communication (Guzman & Lewis, 2020), requiring new methodological approaches, in which “scholars and practitioners need to develop a human-centric perspective on AI for journalism” (Broussard et al., 2019, p. 174), as “permanent transformations in practices, technologies and contexts require questioning and updating our methods and the way we approach the study of communication” (Flores-Márquez & González-Reyes, 2023, p. 2). In fact, since the emergence of the Internet, the construction of a new arsenal of epistemologies and responses capable of explaining new communicational phenomena has been lacking (Orozco & González, 2011).

IA incorporation in this sector “is modifying journalism in all its areas, from the conception of the profession and the development of informative work to the consumption model, including the media structures and functions” (Sanahuja Sanahuja & López Rabadán, 2021, p. 446). Media companies are looking for increasingly efficient automated models in the different phases of the news processes (López-García & Vizoso, 2021), and the quality of the news produced by AI-involving automation processes such as machine learning, deep neural networks or NSL (Natural Language System)-, is one of the issues receiving the greatest attention.

Researchers have produced a myriad of studies, shown in previous literature reviews (Calvo-Rubio & Ufarte-Ruiz, 2021; Parratt-Fernández et al., 2021; Túñez-López et al., 2019; Zhou & Liao, 2020), and in roadmaps including interesting and varied methodologies, where this phenomenon is beginning to emerge (Kothari & Cruikshank, 2022; Moravec et al., 2022). Researchers analyze the

heterogeneous applications of AI in journalism oriented to automatic content creation from structured data, personalization, interaction with the public – moderation and chatbots– (Rojas & Toural, 2019), and to perform verification processes (Fieiras-Ceide et al., 2022).

The research on users' perceptions of the quality of news written by robots internationally identified in this study belongs to this field, among which the first experiments by Clerwall (2014) and van-der-Kaa and Krahmer (2014), further developed by Graefe and colleagues (2018) and first published in 2016, stand out.

In a detailed analysis of communication research in Spain between 1990 and 2014, with a corpus of 1098 articles, Manuel Martínez and his colleagues (2019) conclude

that Spanish research has mainly focused on the study of communication's own phenomenal reality, and has been less concerned with reflection and discussion of the approaches, perspectives and methods from which scientific knowledge in this field is generated (p. 56).

They also criticize the lack of self-criticism and exhaustive analysis of the scientific production conducted in Spain. The following analysis aims to contribute to fill part of this gap by identifying methodological approaches globally and in Spain. The results of this research are not meant to be extrapolated to the entire scientific production carried out around the application of AI to journalism, since a random sampling (Otzen & Manterola, 2017) has not been made on the totality of articles dealing with AI and journalism, but on a specific topic on which the media and researchers show great interest.

### **Literature review**

Within the framework of Mapcom research in Spain, it has been found that communication research in the digital environment is avoided (Gómez-Escalonilla, 2021). The complexity of the journalistic context in the face of the incorporation of high technology (López-García & Vizoso, 2021) and the difficulty of research in communication, media and audiences have pushed research to the limit (Orozco & González, 2011). Gloria Gómez Escalonilla (2021) points out that, in Spain, research on communication phenomena that take place in the offline scenario is prioritized (53%) over fully digital phenomena (24%) and, the rest, over both scenarios (23%). Manuel Martínez and his colleagues (2019) highlight that, while the Internet and digital media field since the beginning of the 21st century booms exponentially as an object of study, there is a notable decrease in articles devoted to journalism, while those on audiovisual communication increase. Nevertheless, in Spain there is a rich methodological pluralism in the field of journalism, as can be seen from Echeverría's (1999) classification proposal: deductive and inductive methods;

those of analysis and synthesis; experimental methods; the axiomatic method; mathematical methods; methods of observation, measurement, classification; heuristics; the hypothetico-deductive method; computational methods, and the method based on the understanding of the phenomena studied (Echeverría, 1999, cited by Gómez-Escalonilla, 2021, p. 116). However, this variety could be insufficient in the times of AI, due to the lack of transversality (Parratt-Fernández et al., 2021), since this new era is defined by uniting industries and disciplines previously delimited in a precise way (Schwab, 2016).

The European Commission's High Level Expert Group on AI (Smuha, 2018) definition of AI is adopted in this study, for which it is software (and possibly also hardware) systems designed by humans that, given a complex objective, act in physical or digital dimensions, perceiving their environment by collecting data, interpreting themselves (whether structured or unstructured), reasoning about the knowledge or processing the information derived from these and deciding the best action or actions to take to meet the given objective. Likewise, these systems can adapt their behavior by analyzing how the environment has been affected by their previous actions.

Regarding the concept of automated journalism, although there is a wide terminological variety to designate the generation of journalistic content from algorithms such as robot journalism, algorithmic journalism, or computational journalism, among others, this term is the most used in approaches close to the sociology of communication. Lindén (2017) has described how these labels refer to the same process, which he defines as automated processes driven by algorithms using structured data sets. Carlson (2015) considers that it refers to the generation of journalistic reports through software and algorithms without any human input, except for the initial programming. More and more news agencies (Fanta, 2017) and media outlets are incorporating algorithm-generated news. They started in North America, China, Japan, and Europe, and have been spreading around the world (South Korea, Singapore, among others), although in Central and Eastern Europe some media have encountered barriers that have delayed their use, due to difficulties in Slavic languages, such as the Czech (Moravec et al., 2020). In Spain, the company Narrativa Inteligencia Artificial has extensive experience offering its services based on NLG (natural language generation) and machine learning to a multitude of national and foreign media companies and in different languages (Ufarte Ruiz & Manfredi Sánchez, 2019). Túniz and colleagues (2018) identified 50 initiatives in 2018 worldwide.

The following are some milestones in the history of robotic storytelling in journalism, which has been around for more than 40 years (Meehan, 1977),

although it was not until the era of big data, and partly as an extension of data journalism (Sandoval & La-Rosa, 2018), that its expansion occurred. It was used in weather reports in the 1960s (Glahn, 1970), and continued with sports, medical, and financial reports, in the 1990s (Dörr, 2015). It is from the extensive use of this technology –from which the Los Angeles Times’ Quakebot emerged in 2014 (López-García & Vizoso, 2021), and the advances in automated reporting by Automate Insights and Associated Press, with *The Washington Post*’s Heliograf– that the incorporation of AI in the media has gradually become a reality. Automated processes are being offered and developed in the media industry in a wide range of solutions, ranging from

simple code that extracts numbers from a database, which are then used to fill in the blanks in pre-written template stories, to more sophisticated approaches that analyze data to gain additional insight and create more compelling narratives. The latter rely on big data analytics and natural language generation technology (Graefe, 2016, p. 12).

The first international research on the quality of automated news emerged in the middle of the last decade and focuses on how algorithms are able to write news by themselves (Carlson, 2015), the level of automation in newsrooms (LeCompte, 2015), the processes of content production and consumption (Napoli, 2014), and on how news written by robots are perceived, using indicators to measure their quality (Clerwall, 2014; Haim & Graefe, 2017; Moravec et al., 2020; Zheng et al., 2018). Others identify similarities and differences between both types of texts (Murcia Verdú et al., 2022), or look for patterns in their structures (Ufarte Ruiz & Manfredi Sánchez, 2019), among other aspects that will be shown in the results section. Likewise, there has been prominent research on confirmation bias, i.e., the bias of the evaluator when he/she knows the text’s authorship (human-machine) (Jung et al., 2017; Waddell, 2019a, 2019b; Tandoc et al., 2020; Jia & Johnson, 2020; Wölker & Powell, 2018; Lermann Henestrosa et al., 2023).

The automated news quality is generally perceived as optimal, although with some limitations such as the impossibility of adding context, different points of view and interpretation, as reflected in the Results section of this research. So far, reports on different topics have been evaluated: financial, sports, weather..., although more complex articles of scientific journalism (Lermann Henestrosa et al., 2023), and of different genres such as the chronicle (Murcia Verdú et al., 2022) are beginning to be added, incorporating new nuances to the knowledge about the quality of these automated contents.



## Objectives

The research questions formulated at the beginning of the research (Orozco & Gonzalez, 2011) were clustered as follows: What methodological approaches do researchers in the world take to know the quality of automated news? Which ones predominate? Does one method dominate over the others? Which countries and which journals have published on this phenomenon? What is the situation in Spain? Are there notable differences between the methodological tools chosen or designed by Spanish researchers and those of the other countries? What are the main results on the quality of automated news? As for the general objectives of the research, these are the following:

1. Identify the dominant methodological orientations along with the most globally used research techniques for the scientific investigation of automated news quality.
2. To compare international trends with the practices undertaken by Spanish research teams in the field of quality of AI news.
3. To detect whether similar or disparate results are reached among the studies in the sample, in terms of the quality of the AI-generated journalistic content.

## METHODOLOGY

This research has a double nature: quantitative and qualitative, and involved two research techniques. Firstly, we conducted a systematic review of the scientific literature on AI in journalism, which after several sifts ended up forming the sample (N=18) and, subsequently, each article was coded by applying the content analysis technique - widely used by the research team previously. The data collection sheet along with the analysis protocol was submitted to the review of four expert judges (Cabero Almenara & Llorente Cejudo, 2013) from two fields: journalism and engineering. The tool was tested by three evaluators (Ph.Ds. in journalism) separately, and subsequently updated and pooled before proceeding to the final analysis for greater reliability and concordance in the coding process by the evaluators.

The analysis sheet included the identification of formal data related to the object of study (authors, title, journal, year, country of affiliation, name of the journal, language, citations received, DOI), and data related to the theoretical and methodological approach cited in each article (methodology and techniques), as well as the theories or authors considered for the methodological design and the most important results, among other aspects that might appear in the article and that were relevant to the research, which were noted in a section of observations.

As for the sample design, the process began with an exhaustive systematic search in English in the main academic databases, Web of Science (WoS) and Scopus, between January 2008 –the date of the first pieces of data journalism as it is known today, such as those published by *Propública*– and December 2022, through the words ('artificial intelligence') AND ('journalism'), limiting it to the areas of Humanities, Communication, and Social Sciences. Although the Scopus search commands already implied excluding any text that was not an academic article, in WOS the search had to be refined manually so that only academic articles from these fields of knowledge were shown, obtaining an initial result of 670 units of analysis after eliminating articles repeated in both databases. The initial search was limited to the aforementioned fields of knowledge to identify methodological orientations based on communication studies, especially journalism.

These initial results were recorded in a spreadsheet, from which the three main filtering processes that significantly reduced the sample were performed:

First filter: manual extraction of all publications whose source was not a scientific journal related to journalism or communication.

Second filter: all articles that did not include the terms journalism, and artificial intelligence in their titles, abstracts and keywords were automatically eliminated from the spreadsheet, which reduced the initial sample to 95 analysis units.

Third filter: reading of titles and abstracts of the 95 analysis units, excluding all those that did not include the word quality. This reduced the analysis corpus considerably to 18 articles. Due to this large reduction, we proceeded to confirm with a convenience search in Google Scholar (Martín-Martín et al., 2018) and Research Gate through authors and references obtained from the reading of the 18 units of analysis, without producing variations in the result.

## RESULTS

At the international level, experimental design (table 1) is the most common, based on reference authors from the digital era rather than the analog one; on few occasions theoretical frameworks from that period have been considered, nor have descriptive rather than experimental approaches have been adopted. The analysis technique chosen par excellence in most studies is the online questionnaire (table 1). These have been used in two ways: on the one hand, to collect the opinion of professionals and experts on the quality of automated news (marked with a 1 in table 1) and, on the other, for evaluators to rate the quality of these news items with indicators designed ex professo (marked with a 2 in table 1) within the framework of an experiment.



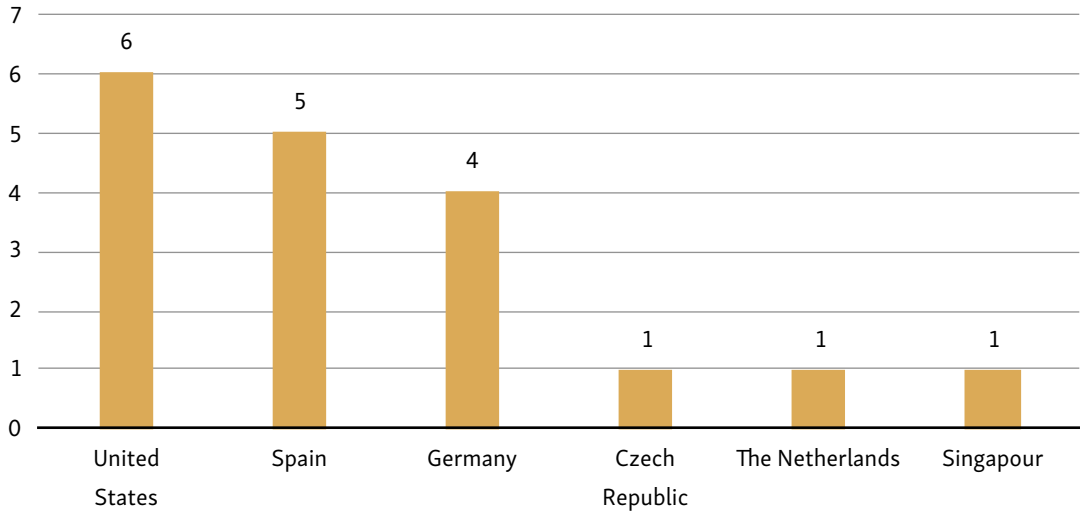
Authorship/ Country	Title	Journal	Methodology/Research techniques
Calvo-Rubio & Ufarte-Ruiz (2020) / Spain	Percepción de docentes universitarios, estudiantes, responsables de innovación y periodistas sobre el uso de inteligencia artificial en periodismo	<i>Profesional De La Información</i>	In-depth interviews. Online survey (1).
Clerwall (2014) / Germany	Enter the Robot Journalist. Users' perceptions of automated content	<i>Journalism Practice</i>	Experimental design. Survey (2).
Graefe & Bohlken (2020) / Germany	Automated journalism: A meta-analysis of readers' perceptions of human-written in comparison to automated news	<i>Media and Communication</i>	Meta-analysis, analytical summary, comparative analysis of experimental designs.
Graefe et al. (2018) / Germany	Readers' perception of computer-generated news: Credibility, expertise, and readability	<i>Journalism</i>	Experimental design. Online survey (2).
Haim & Graefe (2017) / Germany	Automated News: Better than expected?	<i>Digital Journalism</i>	Experimental design. Online survey (2).
Jia (2020) / U.S.A.	Chinese Automated Journalism: A Comparison Between Expectations and Perceived Quality (2020)	<i>International Journal of Communication</i>	Experimental design. Online survey (2).
Jia & Johnson (2021) / U.S.A.	Source Credibility Matters: Does Automated Journalism Inspire Selective Exposure?	<i>International Journal of Communication</i>	Experimental design. Online survey (2).
Moravec et al. (2020) / Czech Republic	The robotic reporter in the Czech news agency: Automated journalism and augmentation in the newsroom	<i>Communication Today</i>	Experimental design. Case study: survey (2), in-depth interviews, participant observation, and algorithmic creation.
Murcia Verdú et al. (2022) / Spain	Comparative analysis of the sports chronicle quality written by artificial intelligence and journalists	<i>Revista Latina de Comunicación Social</i>	Content and comparative analysis.
Sánchez Gonzales & Sánchez González (2017) / Spain	Bots as a news service and its emotional connection with audiences. The case of Politibot	<i>Doxa Comunicación.</i>	Documentary analysis. Case study: participant observation, in-depth interviews, and audience analysis.
Tandoc Jr et al. (2020) / Singapur	Man vs. Machine? The Impact of Algorithm Authorship on News Credibility	<i>Digital Journalism</i>	Experimental design. Online survey (2).

Túñez-López et al. (2019) / Spain	Automation, bots and algorithms in newsmaking. Impact and quality of artificial journalism	<i>Revista Latina de Comunicación Social</i>	Bibliographic study. Comparative analysis of a convenience sample.
Ufarte Ruiz & Manfredi Sánchez (2019) / Spain	Algorithms and bots applied to journalism. The case of Narrativa Inteligencia Artificial: structure, production and informative quality	<i>Doxa Comunicación.</i>	Case study. Interviews. Participant observation. Online survey (1).
Waddell (2018) / U.S.A.	A robot wrote this? How perceived machine authorship affects news credibility	<i>Digital Journalism</i>	Experimental design. Online survey (2).
Waddell (2019a) / U.S.A.	Can an Algorithm Reduce the Perceived Bias of News? Testing the Effect of Machine Attribution on News Readers' Evaluations of Bias, Anthropomorphism, and Credibility	<i>Journalism &amp; Mass Communication Quarterly</i>	Experimental design. Online survey (2).
Waddell (2019b) / U.S.A.	Attribution Practices for the Man-Machine Marriage: How Perceived Human Intervention, Automation Metaphors, and Byline Location Affect the Perceived Bias and Credibility of Purportedly Automated Content	<i>Journalism Practice</i>	Experimental design. Online survey (2).
Wölker & Powell (2018) / The Netherlands	Algorithms in the newsroom? News readers' perceived credibility and selection of automated journalism	<i>Journalism</i>	Experimental design. Online survey (2).
Wu (2019) / U.S.A.	Is Automated Journalistic Writing Less Biased? An Experimental Test of Auto-Written and Human-Written News Stories	<i>Journalism Practice</i>	Experimental design. Online survey (2).

**Table 1. Methodologies used in the 18 articles included in the sample**

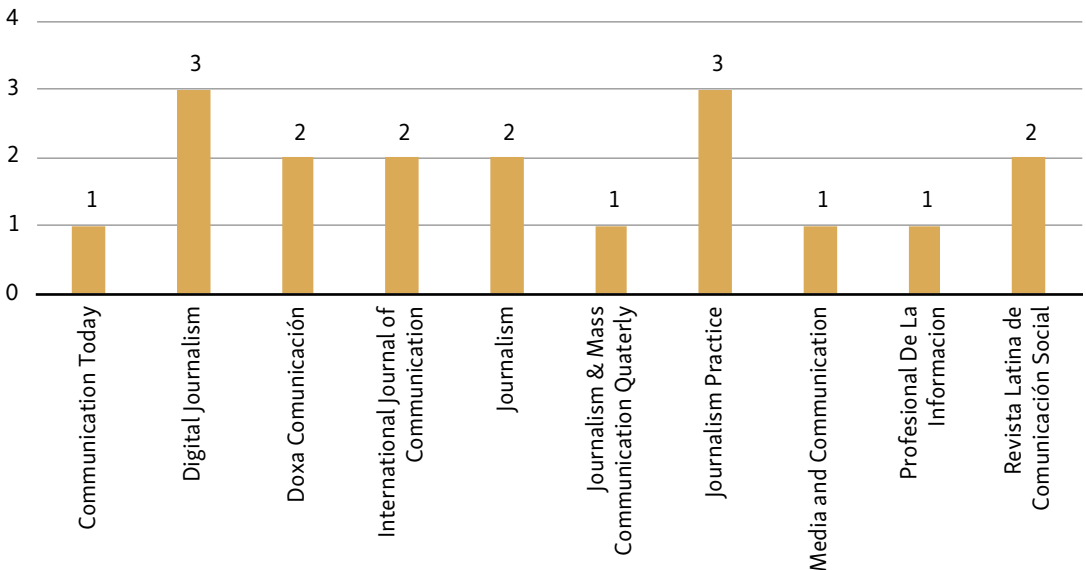
Source: Own elaboration.

As for the other variables analyzed, the countries where this type of study has been most developed are the United States (6), Spain (5) and Germany (4), followed by the Netherlands (1), the Czech Republic (1), and Singapore (1) (figure 1). The period in which the 18 articles that made up the sample were published was between 2014 and 2022, and they were distributed in 10 journals indexed in Scopus and WoS as follows (figure 2): *Journalism Practice* (3), *Digital Journalism* (3), *Internacional Journal of Communication* (2), *Journalism* (2), *Doxa Comunicación* (2), *Revista Latina de Comunicación Social* (2), *Communication Today* (1) *Journalism & Mass Communication* (1), *Media and Communication*, and *Profesional De La Información* (1).



**Figure 1. Scientific articles indexed in WoS and Scopus by country**

*Source: Own elaboration.*



**Figure 2. Scientific articles indexed in WoS and Scopus by journal**

*Source: Own elaboration.*

**Experimental dominance in quality analysis at the international level**

Although the quality of automated news can be tested from different approaches and techniques, most researchers have relied on Shyam Sundar’s 1999 research on the perception of print and online news and applied an experimental design (Table 1).

Through the open evaluation of news recipients, Sundar detected 21 variables, each one linked to four central factors: credibility, liking, quality, and

representativeness. In 2014, Clerwall measured quality based on the perceived credibility and readability of the message as the main factors, while van Der Kaa and Kraemer (2014) added the measurement of source credibility (authorship) by obtaining ratings of trustworthiness and journalistic expertise. In 2018 Graefe and colleagues were already using 17 of Sundar's (1999) 21 items, plus four others that were among those incorporated by Clerwall (2014) and van Der Kaa and Kraemer (2014): trustworthiness, completeness (integrity), descriptive, and fact-based. This model has been relied upon by most subsequent authors who have assessed quality from the end-user's perception. Although van Der Kaa and Kraemer (2014) were excluded from the sample as the results of their work were published in proceedings and not as an article, it is necessary to cite them for an understanding of the evolutionary process of this analysis model, whose exhaustive description is beyond the scope of this paper. It is also worth mentioning that the authors of this article applied and adapted this experimental method to the analysis of automated news about COVID-19 during the pandemic in 2020 and found that its application involves considerable complexity. However, since that research has not yet been published, it has also been excluded from the sample.

Graefe and Bohlken (2020) conducted a meta-analysis of empirical research published in indexed scientific journals –12 in total–, showing experimental evidence on readers' perception of human-written versus computer-written news in relation to credibility, readability, and expertise, yielding similar results regarding the quality of automated news (table 2).

Although the method used in these experimental designs was the same, there are some differences in terms of the topic, the declaration or modification of authorship, and the evaluators' profile (users or journalists).

At the international level, the in-depth interview appears only once (Moravec et al., 2020), in a case study. It is one of the few research works that involved a multidisciplinary team formed by two experts from Communication and two from Computer Engineering. It focuses on the creation of a proprietary algorithmic tool that transforms large amounts of data into stock news in *The Czech News Agency* (ČTK) and its testing by editors of this news agency. They also used other techniques: online survey and participant observation. The journalists highlighted as a positive aspect of the news generated by AI the speed (time saving) and accuracy of the texts, while they criticized the impossibility of adding context and elaborating more complex texts, so they considered that the developed tool did not generate content with the desired quality. In another interdisciplinary team, the German team formed by Graefe and Bohlken (2020), the areas of business management and journalism are intertwined.

## Variety of approaches in Spain

In Spain, the use of content and comparative analysis to detect similarities and differences between texts written by humans and by machines stands out (Túñez-López et al. 2019; Murcia Verdú et al., 2022), and the case study is chosen twice with, in addition, participant observation and interviews (Sánchez Gonzales & Sánchez González, 2017; Ufarte Ruiz & Manfredi Sánchez, 2019).

In the case of the article entitled *Automatización, bots y algoritmos en la redacción de noticias. Impacto y calidad del periodismo artificial* (Túñez-López et al., 2019) published in the *Revista Latina de Comunicación Social*, we find a detailed state of the art, and an analysis on sports news written by algorithms versus those elaborated by journalists. The authors focus on the search for a pattern in automated news (genre, structure, and writing practices are detected), and make explicit that, due to the lack of previous referential analysis, they propose an exploratory research “with descriptive intent” and “the objective is to find the matrix structure used by computer programs in the creation of informative texts” (Túñez-López et al., 2019, p. 1419). Murcia Verdú and colleagues, researchers at the University of Castilla la Mancha (2022) also perform, as the title itself indicates, a comparative analysis of the quality of sports chronicles elaborated by AI and journalists. These authors take into account the JAV (Journalistic Added Value) model to evaluate the quality of journalistic contents, designed by seven researchers from the School of Journalism of the Pontificia Universidad Católica de Chile (Alessandri et al., 2001). Murcia Verdú and colleagues (2022) use content analysis, creating an analysis sheet composed of 11 dimensions and 20 variables to “to find out whether these types of texts have the same quality standards as those of chronicles written by journalists” (p. 91).

One of the three hypotheses in another article published in the Spanish journal *Profesional De La Información*, which gathers another qualitative work by Luis Mauricio Calvo Rubio and María José Ufarte Ruiz (2020), focuses on the perception of the quality of AI in journalism, asking about it to people with different profiles. Although they are not made explicit, it is easily inferred that “contrast”, “interpretation”, “humanity and sensitivity”, and “wording” are the conditions used to measure reliability in this assessment of the quality of automated news. According to the text, the questionnaire provided was not accompanied by automated news to be evaluated. It is worth mentioning that this research team encountered difficulties in clearly detecting the methodology used.

In another publication coauthored by María José Ufarte Ruiz and José Luis Manfredi Sánchez (2019), in the journal *Doxa Comunicación*, a new analysis is conducted to measure the automated news quality, exposing 145 journalists to

two news items reported as produced by a robot. To elaborate the survey, the researchers consider the proposals of prestigious national and international experts, creating their own analysis tool. Ufarte Ruiz and Manfredi Sánchez (2019) mention, citing other authors, the intrinsic difficulty of investigating the quality of journalistic texts and present an objective dimension –quantifiable data– and a subjective one, which depends on the public’s perception, so that, they add, there is no unity of criteria for its development. The tool designed was evaluated by five expert judges to achieve an instrument with high reliability indexes. Finally, syntax, coherence in the exposition of ideas, cohesion in writing, grammatical correctness, newsworthiness, accuracy of information regarding events, diversity of points of view, quality of sources, context, and interpretation were analyzed.

Quality is an attribute that can be investigated in all automated news texts disseminated through any type of media, platform or application (app) and conditions the success or failure of any initiative in this field. Therefore, the first work published in Spain investigating users’ perception of the bots’ news quality, by researchers Hada Sánchez Gonzales and María Sánchez González (2017), was incorporated into the sample. This focused on the Politibot app, launched during the June 2016 election campaign in Spain. It investigates how bots’ news are rated and concludes that the “success has also been corroborated by the 73.13% response rate from users who have made reference to the quality of the information” (2017, p. 79).

Paper/Country	Most relevant results
Calvo-Rubio & Ufarte-Ruiz (2020)	Quality shows some important deficiencies of lack of contrast, lack of interpretation, lack of humanity and incorrect sensitivity and wording.
Clerwall (2014)	After measuring quality based on the perception of credibility and readability of the message as the main factors, it is concluded that readers are not able to distinguish between content written by journalists and content produced by machines.
Graefe & Bohlken (2020)	The results showed no difference in readers’ perceptions of credibility, a small advantage for human-written news in terms of quality, and clearly demonstrated a strong preference for human-written news in terms of readability.
Graefe et al. (2018)	Automated news stories were perceived as more credible and with greater journalistic expertise, even though the variation in authorship in the experiment showed a small and consistent bias in favor of those written by humans.
Haim & Graefe (2017)	There was little difference in the quality of human and AI news when only one text was evaluated. However, when two texts (one written by journalists and the other by AI) were evaluated at the same time, the quality of the human-written news was better perceived than that produced by AI in readability, while the perception of the automated news was better than that written by journalists in credibility.



Jia (2020)	The perception of the quality of human-written news fell short of the evaluators' expectations, while the evaluation of the quality of automated news exceeded their expectations. The actual perception of human-written news is significantly superior to that of automated news in terms of readability and expertise. No significant differences were observed in terms of credibility.
Jia & Johnson (2021)	The quality of automated news is taken as a starting point to conclude that selective exposure and avoidance occurs when the news is declared to be written by algorithms. People are more likely to select news consistent with their beliefs than news that challenges them, and to rate news consistent with the most credible attitude, whether it is written by algorithms or journalists.
Moravec et al. (2020)	The speed (time saving) is highlighted as a positive aspect of AI-generated news as well as the text accuracy, while the impossibility of adding context and elaborating analytical comments is criticized.
Murcia Verdú et al. (2022)	It does not provide a quality contribution in terms of the analytical and interpretative nature of the chronicle genre, being limited almost exclusively to the chronological exposition of the events that took place during a soccer match.
Sánchez Gonzales & Sánchez González (2017)	The informative quality and the emotional connection with the information received are the main strengths of these formulas. Personalized, agile, accurate, and politically unbiased information coverage due to its sources (own and external) is what characterizes the bot.
Tandoc Jr et al. (2020)	No significant differences found in quality parameters related to credibility in AI-generated, journalist-generated, and mixed texts.
Túñez-López et al. (2019)	There are no evaluative elements, typical of the sports chronicle, in the automated texts of Sport. The comparison of computer-generated and human-written content offers differences in approach and journalistic genre, but there are no major variations in structure and wording.
Ufarte Ruiz & Manfredi Sánchez (2019)	The text quality meets stylistic, structure, and composition parameters in simple information, although it fails in the sources, diversity of points of view, context and interpretation.
Waddell (2018)	Quality parameters related to credibility were perceived to be more biased in texts written by AI compared to texts written by journalists.
Waddell (2019a)	The IA and journalists (mixed) texts are better evaluated in terms of bias parameters than those supposedly written only by the IA. An evaluative bias is inferred.
Waddell (2019b)	Mixed articles, supposedly written by AI and journalists, were perceived as less biased than those written solely by AI.
Wölker & Powell (2018)	The perception of credibility-related elements in AI-generated texts was equal to those written by humans and those mixed (human and AI).
Wu (2019)	Within the quality parameters studied, the IA-produced texts have been evaluated as more objective, credible (both in the message and the medium), and less biased. However, there was evaluative bias in the indicators of these quality parameters when the authorship and source of the message were known.

**Table 2. Results of the automated news quality analysis in the 18 articles**

*Source: Own elaboration.*

## DISCUSSION AND CONCLUSIONS

Journalism is moving towards an artificial journalism caused by the disruptive change generated by the applications of intelligent technologies. Researchers specialized in this area of knowledge and other disciplines are making a remarkable effort to respond to the need to analyze the quality of automated news. This research work has identified the research methodologies used for their analysis. Among the most outstanding conclusions is the predominance of experimental design (on 12 occasions) and, as the predominant technique in both experimental (11) and non-experimental (7) research, the survey (used on 14 occasions).

Methodologies respond to different approaches. In some cases, it is the researcher who performs the quality assessment; in others, it is the journalism professionals and, in most cases, it is the end users who, without knowing that their authorship –human or machine– may have been modified, respond to a survey, participating in an experiment.

In general, automated news are perceived as informative pieces with sufficient quality for the type of reports in question, although they show some limitations, especially when compared to interpretative or evaluative journalistic texts, such as chronicles written by journalists.

Besides the survey, the interview is the second most frequently used technique, in most cases conducted with professionals and experts in journalism to find out their opinion on these new technologies, others to test them and evaluate their effectiveness.

The theoretical frameworks belong fundamentally to studies of the digital era, based on theoretical proposals and experiences of key authors. Few have tried to design a methodology appropriate to the complex current context in which these investigations are framed, others have tried to improve existing ones, and most are inspired by previous designs.

This work could have been enriched by conducting semi-structured interviews, a technique that was not initially considered, but which would be interesting to incorporate in a broader study.

Given that the emerging phenomena in the field of communication and journalism are marked by technology, it is necessary to apply current and consensual theories and methodologies, with a view to achieving greater interdisciplinarity in the research groups that address these issues.

Methodological adaptation to today's liquid world is indispensable for the progress of scientific knowledge.

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## REFERENCES

- Alessandri, F., Edwards, C., Pellegrini, S., Puente, S., Rozas, E., Saavedra, G., & Porath, W. (2001). VAP: un sistema métrico de la calidad periodística (JAV: A journalistic quality metric system). *Cuadernos.Info*, (14). <https://doi.org/10.7764/cdi.14.187>
- Broussard M., Diakopoulos N., Guzman A. L., Abebe R., Dupagne M., & Chuan C.-H. (2019). Artificial Intelligence and Journalism. *Journalism & Mass Communication Quarterly*, 96(3), 673–695. <https://doi.org/10.1177/1077699019859901>
- Cabero Almenara, J. & Llorente Cejudo, M. del C. (2013). La aplicación del juicio de experto como técnica de evaluación de las tecnologías de la información y comunicación (TIC) (The Expert's Judgment Application as a Tecnic Evaluate Information and Communication Technology (ICT)). *Revista Eduweb*, 7(2), 11-22. <https://revistaeduweb.org/index.php/eduweb/article/view/206>
- Calvo-Rubio, L. M. & Ufarte-Ruiz, M. J. (2020). Percepción de docentes universitarios, estudiantes, responsables de innovación y periodistas sobre el uso de inteligencia artificial en periodismo (Perception of teachers, students, innovation managers and journalists about the use of artificial intelligence in journalism). *Profesional De La Información*, 29(1). <https://doi.org/10.3145/epi.2020.ene.09>
- Calvo-Rubio, L. M., & Ufarte-Ruiz, M. J. (2021). Artificial intelligence and journalism: Systematic review of scientific production in Web of Science and Scopus (2008-2019). *Communication & Society*, 34(2), 159–176. <https://doi.org/10.15581/003.34.2.159-176>
- Carlson, M. (2015). The Robotic Reporter. Automated journalism and the redefinition of labor, compositional forms, and journalistic authority. *Digital Journalism*, 3(3), 416–431. <https://doi.org/10.1080/21670811.2014.976412>

- Carrasco-Campos, A. & Saperas Lapiedra, E. (2016). Cambio tecnológico, globalización neoliberal y hegemonías metodológicas en la investigación comunicativa internacional (Technological change, neoliberal globalization and methodological hegemonies in international communication investigation). *Ámbitos: Revista Internacional de Comunicación*, (32). <https://idus.us.es/handle/11441/66524>
- Clerwall, C. (2014). Enter the Robot Journalist. Users' perceptions of automated content. *Journalism Practice*, 8(5), 519-531. <https://doi.org/10.1080/17512786.2014.883116>
- Dörr, K. N. (2015). Mapping the field of Algorithmic Journalism. *Digital Journalism*, 4(6), 700-722. <https://doi.org/10.1080/21670811.2015.1096748>
- Echeverría, J. (1999). *Introducción a la metodología de la ciencia. La filosofía de la ciencia en el siglo XX* (Introduction to the methodology of science. The philosophy of science in the 20th century). Cátedra.
- Fanta, A. (2017). *Putting Europe's Robots on the Map: Automated journalism in news agencies*. Reuters Institute for the Study of Journalism.
- Fieiras Ceide, C., Vaz Álvarez, M., & Túniz López, M. (2022). Verificación automatizada de contenidos en las radiotelevisiónes públicas europeas: primeras aproximaciones al uso de la inteligencia artificial. *Redmarka. Revista de Marketing Aplicado*, 26(1), 36-51. <https://doi.org/10.17979/redma.2022.26.1.8932>
- Flores-Márquez, D. & González-Reyes, R. (2023). Editorial Dossier: Discusiones metodológicas en los estudios de comunicación digital (Dossier Editorial. Methodological discussions in digital communication studies). *Cuadernos.Info*, (54), I-VII. <https://doi.org/10.7764/cdi.54.56629>
- Glahn, H. R. (1970). computer-produced worded forecasts. *Bulletin of the American Meteorological Society*, 51(12), 1126-1131. [https://doi.org/10.1175/1520-0477\(1970\)051<1126:CPWF>2.0.CO;2](https://doi.org/10.1175/1520-0477(1970)051<1126:CPWF>2.0.CO;2)
- Gómez-Escalonilla, G. (2021). Métodos y técnicas de investigación utilizados en los estudios sobre comunicación en España (Research methods and techniques employed in Communication Studies in Spain). *Revista Mediterránea de Comunicación/Mediterranean Journal of Communication*, 12(1), 115-127. <https://www.doi.org/10.14198/MEDCOM000018>
- Graefe, A. (2016). *Guide to Automated Journalism*. Tow Center for Digital Journalism.
- Graefe, A. & Bohlken, N. (2020). Automated Journalism: A Meta-Analysis of Readers' Perceptions of Human-Written in Comparison to Automated News. *Media and Communication*, 8(3), 50-59. <https://doi.org/10.17645/mac.v8i3.3019>
- Graefe, A., Haim, M., Haarmann, B., & Brosius, H.-B. (2018). Reader's perception of computer-generated news: Credibility, expertise, and readability. *Journalism*, 19(5), 595-610. <https://doi.org/10.1177/1464884916641269>
- Guzman A. L. & Lewis S. C. (2020). Artificial intelligence and communication: A human-machine communication research agenda. *New Media & Society*, 22(1), 70-86. <https://doi.org/10.1177/1461444819858691>
- Haim, M. & Graefe, A. (2017). Automated News. Better than expected? *Digital Journalism*, 5(8), 1044-1059. <https://doi.org/10.1080/21670811.2017.1345643>
- Jia, C. (2020). Chinese Automated Journalism: A Comparison Between Expectations and Perceived Quality. *International Journal of Communication*, 14, 2611-2632. <https://ijoc.org/index.php/ijoc/article/view/13334>

- Jia, C. & Johnson, T. (2021). Source Credibility Matters: Does Automated Journalism Inspire Selective Exposure? *International Journal of Communication*, 15, 3760–3781.
- Jung, J., Song, H., Kim, Y., Im, H., & Oh, S. (2017). Intrusion of software robots into journalism: The public's and journalists' perceptions of news written by algorithms and human journalists. *Computers in Human Behavior*, 71, 291–298. <https://doi.org/10.1016/j.chb.2017.02.022>
- Kothari, A. & Cruikshank S. A. (2022). Artificial Intelligence and Journalism: An Agenda for Journalism Research in Africa, *African Journalism Studies*, 43(1), 17-33. <https://doi.org/10.1080/23743670.2021.1999840>
- LeCompte, C. (2015). Automation in the Newsroom. How algorithms can help reporters. *Nieman Reports*, 69(3), 32–45. <http://niemanreports.org/wp-content/uploads/2015/08/NRsummer2015.pdf>
- Lermann Henestrosa, A., Grieving, H., & Kimmerle, J. (2023). Automated journalism: The effects of AI authorship and evaluative information on the perception of a science journalism article. *Computers in Human Behavior*, 138, 107445. <https://doi.org/10.1016/j.chb.2022.107445>
- Linden, C.-G. (2017). Algorithms for journalism: The future of news work. *The Journal of Media Innovations*, 4(1), 60-76. <https://doi.org/10.5617/jmi.v4i1.2420>
- López-García, X. & Vizoso, A. (2021). Periodismo de alta tecnología: signo de los tiempos digitales del tercer milenio (High-tech journalism: a sign of the digital era of the third millennium). *Profesional De La Información*, 30(3). <https://doi.org/10.3145/epi.2021.may.01>
- Ruiz Acosta, M.J. y López Hidalgo, A. (2019). *El periodismo en tiempos de realidad virtual*. Salamanca: Comunicación Social. Ediciones y Publicaciones. Salamanca, Comunicación Social.
- López-Hidalgo, A. & López-Redondo, I. (2020). Riesgos y desafíos del periodismo inteligente (Risks and challenges of smart journalism). In M. J. Ruiz Acosta & A. López Hidalgo (Coords.), *El periodismo en tiempos de realidad virtual* (Journalism in times of virtual reality). Comunicación Social Ediciones y Publicaciones.
- Martín-Martín, A., Orduña-Malea, E., Thelwall, M., & Delgado-López-Cózar, E. (2018). Google Scholar, Web of Science, and Scopus: A systematic comparison of citations in 252 subject categories. *Journal of Informetrics*, 12(4), 1160-1177. <https://doi.org/10.1016/J.JOI.2018.09.002>
- Martínez Nicolás, M., Saperas Lapiedra, E., & Carrasco Campos, A. (2019). La investigación sobre comunicación en España en los últimos 25 años (1990-2014). Objetos de estudio y métodos aplicados en los trabajos publicados en revistas españolas especializadas (Communication research in Spain over the past 25 years (1990-2014). Objects of study and research methods in the papers published by Spanish peer-reviewed communication journals). *Empiria: Revista de metodología de ciencias sociales*, 42(37-69). <https://doi.org/10.5944/empiria.42.2019.23250>
- Meehan, J. R. (1977). Tale-Spin, an interactive program that writes stories. In *Proceedings of the Fifth International Joint Conference on Artificial Intelligence*, 1, 91-98. <https://www.ijcai.org/Proceedings/77-1/Papers/013.pdf>

- Moran, R. E. & Shaikh, S. J. (2022). Robots in the News and Newsrooms: Unpacking Meta-Journalistic Discourse on the Use of Artificial Intelligence in Journalism. *Digital Journalism*, 10(10), 1756-1774. <https://doi.org/10.1080/21670811.2022.2085129>
- Moravec V., Macková V., Sido J., & Ekštejn, K. (2020). The Robotic Reporter in The Czech News Agency: Automated Journalism and Augmentation in the Newsroom. *Communication Today*, 11(1), 37-52. <https://www.communicationtoday.sk/the-robotic-reporter-in-the-czech-news-agency-automated-journalism-and-augmentation-in-the-newsroom/>
- Murcia Verdú, F. J., Ramos Antón, R., & Calvo Rubio, L. M. (2022). Comparative analysis of the sports chronicle quality written by artificial intelligence and journalists. *Revista Latina de Comunicación Social*, 80, 91-111. <https://doi.org/10.4185/RLCS-2022-1553>
- Napoli, P. M. (2014). Automated Media: An Institutional Theory Perspective on Algorithmic Media Production and Consumption. *Communication Theory*, 24(3), 340-360. <https://doi.org/10.1111/comt.12039>
- Noain-Sánchez, A. (2022). Addressing the Impact of Artificial Intelligence on Journalism: The perception of experts, journalists and academics. *Communication and Society*, 35(3), 105-121. <https://doi.org/10.15581/003.35.3.105-121>
- Orozco, G. & González, R. (2011). *Una coartada metodológica* (A methodological alibi). Tintable.
- Otzen, T. & Manterola, C. (2017). Técnicas de Muestreo sobre una Población a Estudio. (Sampling Techniques on a Population Study). *International Journal of Morphology*, 35(1), 227-232. <https://doi.org/10.4067/S0717-95022017000100037>
- 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). <https://doi.org/10.3145/EPI.2021.MAY.17>
- Pavlik, J. V. (2022). *Disruption and Digital Journalism. Assessing News Media Innovation in a Time of Dramatic Change*. Routledge.
- Rojas Torrijos, J. L. & Toural Bran, C. (2019). Periodismo deportivo automatizado. Estudio de caso de AnaFut, el bot desarrollado por El Confidencial para la escritura de crónicas de fútbol (Automated sports journalism. The AnaFut case study, the bot developed by El Confidencial for writing football match reports). *Doxa Comunicación. Revista Interdisciplinaria De Estudios De Comunicación Y Ciencias Sociales*, (29), 235-254. <https://doi.org/10.31921/doxacom.n29a12>
- Sánchez Gonzales, H. & Sánchez González, M (2017). Bots as a news service and its emotional connection with audiences. The case of Politibot. *Doxa Comunicación. Revista Interdisciplinaria De Estudios De Comunicación Y Ciencias Sociales*, (25), 63-84. <https://doi.org/10.31921/doxacom.n25a3>
- Sanahuja Sanahuja, R. & López Rabadán, P. (2021). Ámbitos de aplicación periodística de la Inteligencia Artificial. Mapa conceptual, funciones profesionales y tendencias en desarrollo en el contexto de la pandemia global de la Covid-19 (Journalistic applications of Artificial Intelligence. Concept map, professional roles and developing trends in the context of the global Covid-19 pandemic). *Razón y Palabra*, 25(112), 432-449. <https://doi.org/10.26807/rp.v25i112.1827>



- Sandoval-Martín, M. T. & La-Rosa, L. (2018). Big Data as a differentiating sociocultural element of data journalism: the perception of data journalists and experts. *Communication & Society*, 31(4), 193-209. <https://doi.org/10.15581/003.31.4.193-209>
- Schwab, K. (2016). *La Cuarta Revolución Industrial* (The Fourth Industrial Revolution). Debate.
- Smuha, N. (Coord.). (2018). *A definition of AI: Main capabilities and scientific disciplines. Definition developed for the purpose of the deliverables of the High-Level Expert Group on AI.* [https://ec.europa.eu/futurium/en/system/files/ged/ai\\_hleg\\_definition\\_of\\_ai\\_18\\_december\\_1.pdf](https://ec.europa.eu/futurium/en/system/files/ged/ai_hleg_definition_of_ai_18_december_1.pdf)
- Sundar, S. (1999). Exploring Receivers' Criteria for Perception of Print and Online News. *Journalism & Mass Communication Quarterly*, 76(2), 373-386. <https://doi.org/10.1177/107769909907600213>
- Tandoc Jr, E. C., Yao, L. J., & Wu, S. (2020). Man vs. Machine? The Impact of Algorithm Authorship on News Credibility. *Digital Journalism*, 8(4), 548-562. <https://doi.org/10.1080/21670811.2020.1762102>
- Túñez-López, J.-M., Toural-Bran, C., & Cacheiro-Requeijo, S. (2018). Uso de bots y algoritmos para automatizar la redacción de noticias: percepción y actitudes de los periodistas en España (Automated-content generation using news-writing bots and algorithms: Perceptions and attitudes amongst Spain's journalists). *Profesional De La Información*, 27(4), 750-758. <https://doi.org/10.3145/epi.2018.jul.04>
- Túñez-López, M., Toural-Bran, C., & Valdiviezo-Abad, C (2019). Automatización, bots y algoritmos en la redacción de noticias. Impacto y calidad del periodismo artificial (Automation, bots and algorithms in newsmaking. Impact and quality of artificial journalism). *Revista Latina de Comunicación Social*, 74, 1411-1433. <https://doi.org/10.4185/RLCS-2019-1391>
- 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. <https://doi.org/10.15581/003.34.1.177-193>
- 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. Revista Interdisciplinar De Estudios De Comunicación Y Ciencias Sociales*, (29), 213-233. <https://doi.org/10.31921/doxacom.n29a11>
- van-der-Kaa, H. & Krahmer, E. (2014, October 24-25). Journalist versus news consumer: The perceived credibility of machine written news. In *Proceedings of the Computation+Journalism conference*. Columbia University. <https://research.tilburguniversity.edu/en/publications/journalist-versus-news-consumer-the-perceived-credibility-of-mach>
- Waddell, T. F. (2018). A Robot Wrote This? How perceived machine authorship affects news credibility. *Digital Journalism.*, 6(2), 236-255. <https://10.1080/21670811.2017.1384319>
- Waddell, T. F. (2019a). Can an Algorithm Reduce the Perceived Bias of News? Testing the Effect of Machine Attribution on News Readers' Evaluations of Bias, Anthropomorphism, and Credibility. *Journalism & Mass Communication Quarterly*, 96(1), 82-100. <https://doi.org/10.1177/1077699018815891>


- Waddell, T. F. (2019b). Attribution Practices for the Man-Machine Marriage: How Perceived Human Intervention, Automation Metaphors, and Byline Location Affect the Perceived Bias and Credibility of Purportedly Automated Content, *Journalism Practice*, 13(10), 1255-1272. <https://doi.org/10.1080/17512786.2019.1585197>
- Wölker, A., & Powell, T. E. (2018). Algorithms in the newsroom? News readers' perceived credibility and selection of automated journalism. *Journalism*, 22(1), 1-18. <https://doi.org/10.1177/1464884918757072>
- Wu, Y. (2019). Is Automated Journalistic Writing Less Biased? An Experimental Test of Auto-Written and Human-Written News Stories. *Journalism Practice*, 14(8), 1008-1028. <https://doi.org/10.1080/17512786.2019.1682940>
- Zheng, Y., Zhong, B., & Yang, F. (2018). When algorithms meet journalism: The user perception to automated news in a cross-cultural context. *Computers in Human Behavior*, 86, 266-275. <https://doi.org/10.1016/j.chb.2018.04.046>
- Zhou, Y. & Liao, H.T. (2020). A bibliometric analysis of communication research on artificial intelligence and big data. In *Proceedings of the 6th International Conference on Humanities and Social Science Research (ICHSSR 2020)*, pp. 456-459. <https://doi.org/10.2991/assehr.k.200428.097>

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