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The Information of Things: A Study on the Potential of Journalism with 5G Technology

Henrique Silva Afonso de Mendonça

Juan Jose Boté-Vericad

Juliano Maurício de Carvalho

Facultat d'Informació i Mitjans Audiovisuals

Universitat de Barcelona

Melcior de Palau, 140

08014 Barcelona

Authors: Henrique Silva Afonso de Mendonça, Juan Jose Boté-Vericad i Juliano Maurício de Carvalho

Collaborators: Carlos Lopezosa (researcher), Alma Hamza (proofreader)

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About the Authors

Henrique Silva Afonso de Mendonça is an undergraduate student of journalism at São Paulo State University (UNESP). He is a scholarship holder of the São Paulo Research Foundation (FAPESP) and member of the Laboratory of Studies in Communication, Technology, Education, and Creativity (Lecotec).

ORCID: 0000-0002-6573-4385

Contact: henrique.afonso@unesp.br

Juan-José Boté-Vericad is a professor at the Faculty of Information and Media (FIMA) at the University de Barcelona (UB). He got his PhD in Philosophy (Linguistics and Information Sciences) from the University of Hildesheim (2022) and a PhD in Information and Documentation in the Knowledge Society from the University of Barcelona (2013). He is a member of the faculty's equality and quality committees. He is also a member of the Inter-University Institute for Women and Gender Studies (IIEDG). He has served as an associate professor at various universities: UAB, VIU, UOC. He has participated in numerous research projects, including Open Science in Spain (RTI2018-094360-B-I00), the Archiver project, and currently, Women and Wikipedia.

ORCID: 0000-0001-9815-6190

Contact: juanjo.botev@ub.edu

Juliano Maurício de Carvalho is a full professor of Communication Policies, Media, and Creative Industries at São Paulo State University (UNESP). He completed his postdoctoral studies at the University of Seville and Carlos III University of Madrid. He is the vice-coordinator of the doctoral course in the Postgraduate Program in Media and Technology, a lecturer in the Journalism course, and the head of the Laboratory of Studies in Communication, Technology, Education, and Creativity (Lecotec).

ORCID: 0000-0001-8515-2457

Contact: juliano.mauricio@unesp.br

Abstract

This research conducted at the University of Barcelona explores the intersection of emerging technologies such as Artificial Intelligence (AI), mobile 5G, and the Internet of Things (IoT) within journalistic frameworks, aiming to uncover the evolving dynamics in newsrooms influenced by these advancements. By employing methodologies such as bibliographic research for a theoretical exploration of IoT, AI, 5G, and participant observation with the Research Group on Information, Communication, and Culture, the study aims to offer a qualitative insight into the integration of these technologies in journalism. The study focuses on how AI-driven algorithms, 5G connectivity, and IoT devices are collectively transforming journalistic content creation and dissemination, offering new opportunities for enhanced efficiency and creativity while also introducing challenges in real-time data handling, analysis, and distribution. The expected results include a deeper understanding of the impact and potential of these technologies in journalism, emphasizing the need for transparency, accountability, and ethical practices to uphold journalistic integrity and promote informed public discourse amidst these technological advancements.

Keywords

journalism, artificial intelligence, 5G, Internet of Things, regulation

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1. Introduction

Artificial Intelligence (AI) occupies a growing ground in journalistic newsrooms (Túñez López, Toural & Cacheiro, 2018; Vállez & Codina, 2018) as it generates greater productivity and efficiency in content production (Papadimitriou, 2016). They are computer systems fed by journalists through data and algorithms to automatically generate comprehensible information for the public from a previously programmed structure and formula (Barrat, 2013; Bunz, 2010). However, the intermediary role assumed over centuries by journalism is now partly taken over by algorithmic gatekeepers (Napoli, 2015) and based on economic criteria, in other words, the profit maximization of large companies (Morozov, 2018). The news industry is aware that it must keep up with the times and apply these techniques to traditional news generation methods (Hansen et al., 2017). AI offers an encouraging outlook for innovative quality journalism (Fernández Barrero, 2018), which will allow journalists to move away from the more repetitive and routine tasks and develop more creative ones that add value to journalistic work (Bunz, 2010; Ford, 2013; Graefe, 2016). In this context, there is research that focuses on automated writing and its impact on news production (Túñez, Parada & Toural, 2019) and the quality of automated news (Sandoval Martín et al., 2019). Other research shows that the public cannot differentiate between texts made by journalists and those generated by AI (Napoli, 2012; Van Dalen, 2012). According to Silverman (2013), AI improves the quality and accuracy of journalism because its use favors real-time verification, allows for rapid identification of errors, instant generation of timelines with factual data, detection of plagiarism or manipulation in texts, and efficiently brings together a considerable number of sources.

Nonetheless, it must be noted that there are several risks regarding its use, especially from a labor, business, and information quality point of view (Murcia & Ufarte Ruiz, 2019). One of the challenges points to the evolution of AI proposals that not only replace the mechanical or operational part of the data control process and its objective value, but also manage to transfer the cognitive part of journalistic work to the machine (Túñez & Toural, 2018). But whether its use is ethical does not depend on the scientific discipline that has developed over the years, but on the use that is made of it. According to Sancho Caparrini (2018), it is most definite that its use will radically change, and has already begun, the way we approach problem-solving.

In this context of change, Machado (2021) points to the risks that cyberjournalism can bring to democracies, such as the formation of informational bubbles, created by algorithms, where the user is constantly exposed to customized content according to his profile, values, and interests.

Our research aims to examine the state of studies on the implementation of new technologies in journalism, exploring the current technological terminology that may surround journalistic practice, examining challenges and opportunities of using high-intensity technology in the media. Employing a systematic review of this body of scholarly literature (Booth et al., 2012), we will analyze the quantitative aspects of available research to identify the predominant themes, objectives, and methodologies employed by scholars in this field. Furthermore, we will conduct a qualitative analysis of the literature to examine the most important findings presented in these studies on the gender gap in academic literacy.

2. Theoretical Framework

First and foremost, the explicability, transparency, intelligibility, and auditability of AI are fundamental points to be addressed since they are directly related to the production and dissemination of journalistic and media content. According to Salaverría and Santos (2020), to understand the future evolution of journalism, it is necessary to relate it to AI and all the technologies it involves. The reason is that AI technologies affect the three main phases of journalistic work: information gathering, processing and, most importantly, dissemination of news content. AI often makes complex decisions that can affect people's lives, but without it being clear how these decisions are made. This can generate distrust and concern in society, interfering in arbitrariness that undermines the democratic rule of law.

Being an algorithm-based AI, it can reflect the prejudices and biases that exist in society in which it originated. Machine learning algorithms can be shaped by biased data, resulting in discriminatory or unfair decision-making. A considerable challenge for AI developers is in turning non-mathematical questions into mathematical evaluations. Machine learning neural models perform millions of probabilistic operations to best construct an argument in rigor of the grammar, semantics, and context in which it was triggered. Mathematically, the machine is biased to the premise that there is only variation between true and false answers. But how can a machine be directed to produce non-mathematical results? For example, how can a machine determine whether certain conduct was ethical or not? Based on what values? Of which society? Of which period? Fundamentally, the role of journalists is to incorporate and ensure mediation in this ecosystem, preferably in the creation of content. The Reuters Institute has pointed out the use of AI in newsrooms in Asia and identified that the technology, through data mining, produces "low polemic" materials such as "tips for getting a driver's license" and "what to do on your first time at a certain airport".

The ability to make decisions, considering nuances and dilemmas inherent to each individual, is a fundamental and complex ability pertaining to all human beings. According to a UNESCO report, "Preliminary Study on the Ethics of Artificial Intelligence," (UNESCO, 2019) AI-based journalism raises issues of accountability, transparency, and copyright. Liability can pose a problem in determining faults in algorithm-based reporting — for example, in defamation cases. Transparency and credibility become problematic when consumers do not or cannot perceive when content is machine-generated, which sources it comes from, and how verified or even false the information is — with current discussions about "deep fakes" as extreme cases. In this context, journalism plays a crucial role of informing and analyzing events, contributing significantly to the cultural and identity formation of a given community. By fulfilling its role, journalism helps citizens to gain access to different perspectives, enabling them to make informed and conscious decisions.

In its report, "Recommendations on the Ethics of Artificial Intelligence", UNESCO outlines a set of recommendations that put particular focus on the ethical implications of AI systems in relation to UNESCO's core areas of action: education, science, culture, and communication and information. The document is objective in considering that the recommendations are addressed to member states, both as AI actors and as authorities responsible for developing legal and regulatory frameworks throughout the life cycle of the AI system and for promoting corporate responsibility. With the full automation of the

creative-production process, a number of challenges in the economic dimension of journalism is expected to arise.

These include capital flight, unemployment, and weakening of cultural activities. These economic impacts are especially alarming in multicultural societies such as Brazil. These issues should be of concern not only to professionals in the industry but also to public policy makers, who play a crucial role in mitigating these impacts and developing appropriate strategies. The assertion that the convergence of journalism and artificial intelligence is not a recent phenomenon is accurate. AI technology has become a valuable tool for improving the quality and efficiency of journalistic activities. With rapid technological advancement, media outlets are adopting AI-based solutions to assist in the collection, analysis, and dissemination of information. For example, the JournalismAI study lab at the London School of Economics (LSE) is an initiative that empowers news organizations to use artificial intelligence responsibly. They support innovation and capacity building in news organizations to make the potential of AI more accessible and tackle inequalities in global news media around AI. The organization's collection identifies a total of 112 newsrooms or journalism initiatives worldwide from 2017 to 2022 that are already employing this technology.

"Communication and information, as AI technologies play an increasingly important role in processing, structuring, and making information available; the issues of automated journalism, algorithmic news delivery, and content moderation and curation in social media and search engines are just a few examples that raise issues related to access to information, misinformation, false information, hate speech, emergence of new forms of social narratives, discrimination, freedom of expression, privacy, and media and information literacy (MIL), among others."

UNESCO, Recommendations on the Ethics of Artificial Intelligence, 2021

The AI models of restrictive standards available today, that is, models that correspond to a human drive, do not correspond to creative drives of authentic solutions. Journalism is a human activity, depending strictly on creativity. It is, according to Adelmo Genro Filho (1987) "a way of knowing the world that has no basis in universality. On the contrary, it is a form of knowledge based on singularity". According to Ciro Marcondes Filho (2009), "it is the exercise of daily reconstructing the world." Journalists' skills in listening, interpreting, and assimilating information contribute significantly to delivering news. They select sources, connect with reality, and investigate issues, which empowers citizens by providing them with a deeper understanding of their world. These uniquely human traits, like originality and empathy, cannot be duplicated by machines. It is a professional activity that consists of dealing with information, gathering it, selecting it, hierarchizing it, interpreting it, and transmitting it accurately and ethically to the public (Rossi, 1995). Since the beginning of the 20th century, journalism has gained a new purpose – to provide information, not propaganda. This new paradigm saw the birth of values that are still identified today: the news, the search for truth, independence, objectivity, and a notion of service to the public (Traquina, 2005).

The ability of journalists to inform, entertain, and respond intelligently to public interest is essential for the maintenance of democracy. It is the journalist's role to provoke change, promote experimentation, and incite action. Therefore, the journalist's credibility and responsibility are foundations to mediate the relationship with the information.

3. Objectives

3.1. General

Understanding the scenarios and trends of journalistic information and its relationship between the public and the media from the perspective of the potential of 5G and IoT.

3.2. Specific

- to understand the potential for interactivity and ubiquity between the public and journalists through IoT;
- to observe the tendency for society's participation in journalism to increase journalism with 5G technology;
- to explore current technological terminology that can be used in journalism; and
- to explore the challenges and opportunities for employing high-intensity technology in the media.

4. Methodology

For the purpose of carrying out the project, we have changed the materials and methods used in the initial project to include a scoping review, in addition to the participant observation already planned. A scoping review is a systematic type of evidence synthesis with the aim to determine, as rigorously as possible, the state of an area, a branch of science or a field of knowledge. To this end, it was carried out in accordance with the SALSA framework (Grant & Booth, 2009), where three different equations were manipulated in the Web of Science and Scopus databases. The articles were then selected and filtered, eliminating duplicate titles and/or those that deviated from the thematic axis. Finally, 94 articles selected for reading and the construction of bibliographic sheets. At this point, AI had been present in the work. Participant observation (Brandão, 1999) by the Research Group on Information, Communication and Culture (CRICC) was also used, as well as interviews with local actors, recording the knowledge acquired during their stay in Barcelona.

Participant observation, carried out by the CRICC, was also used and is a fundamental part of testing existing knowledge and producing new knowledge. Thus, according to Demo (1984, p.111), "in addition to dialoguing dynamically with reality and with ourselves, to the extent that we are also part of social reality." Consequently, without the participant observation and practical component, the reproduction of the academic alienation of seeing the world through the classroom would be perpetuated.

We have also included a gender survey of the authors selected for reading, based on the data available at Virtual International Authority File (VIAF), in cooperation with Gender Perspective in Information and Media Studies (GENDIMS) innovative teaching group at the University of Barcelona, which is included in the results and discussions of this report.

4.1. Scoping review

The evidence synthesis expertise of the scoping review was used, using protocols derived from systematic reviews. It differs from the systematic review in terms of research questions and objectives, which leads to different procedures in the selection, evaluation, analysis, and synthesis of documents but maintains the same principles as the reviews at all stages.

Specifically, the SALSA framework Grant & Booth (2009) states that the articles that form the evidence base must have traits of a well-planned search, in which the inclusion and exclusion criteria must be well established and use appropriate sources (e.g., academic databases). Subsequently, the documents thus obtained must be evaluated using explicit criteria and, where appropriate, those that do not meet the criteria of suitability for the project (research question) or the intrinsic quality of the research will be rejected. Only documents that pass this evaluation will be included in the evidence base or document bank. In the last two phases, each article must be analyzed by applying one or more schemes that will produce a series of tables and summaries (binders). Finally, the results will be synthesized and presented using the usual battery of tables, graphs, and narrative summaries.

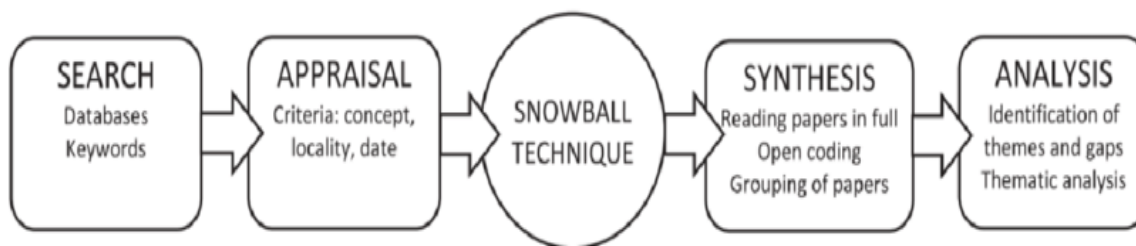


Fig. 1, Diagram on SALSA Framework Source, originally presented in Malinauskaite et al.'s study.

4.2. Equations

Equations drawn up following the SALSA theoretical framework.

Table 1. Equations manipulated in the Scopus databases, with their respective results

Scopus	EQ1	TITLE-ABS-KEY (journalism AND ("360° video reports" OR "5G Technology" OR ai OR "Artificial intelligence" OR "augmented reality" OR automated OR blockchain OR bots OR chatbots OR cyberjournalism)) AND (EXCLUDE (PUB YEAR , 2023)) AND (LIMIT-TO (PUBSTAGE , "final")) AND (LIMIT-TO (DOCTYPE , "ar")) AND (LIMIT-TO (SUBJAREA , "SOC")) AND (LIMIT-TO (LANGUAGE , "English") OR LIMIT-TO (LANGUAGE , "Spanish") OR LIMIT-TO (LANGUAGE , "Portuguese") OR LIMIT-TO (LANGUAGE , "Catalan")) AND (LIMIT-TO (SRCTYPE , "j"))	250
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	EQ2	TITLE-ABS-KEY ((journalism AND (drone* OR "High tech" OR "High technology" OR "Hi-tech" OR "Immersive Innovation" OR "Innovative Technology" OR "Internet of things" OR "IOT" OR "Journalistic metamorphose"))) AND (EXCLUDE (PUB YEAR , 2023)) AND (LIMIT-TO (PUBSTAGE , "final")) AND (LIMIT-TO (DOCTYPE , "ar")) AND (LIMIT-TO (SUBJAREA , "SOCI")) AND (LIMIT-TO (LANGUAGE , "English") OR LIMIT-TO (LANGUAGE , "Spanish"))	44
	EQ3	TITLE-ABS-KEY (journalism AND "Machine learning" OR robot* OR "smart speakers" OR "Text to Speech" OR "virtual assistants" OR "Virtual reality") AND PUB YEAR > 2010 AND PUB YEAR < 2023 AND (LIMIT-TO (SUBJAREA , "SOCI")) AND (LIMIT-TO (DOCTYPE , "ar")) AND (LIMIT-TO (PUBSTAGE , "final")) AND (LIMIT-TO (LANGUAGE , "English") OR LIMIT-TO (LANGUAGE , "Spanish") OR LIMIT-TO (LANGUAGE , "Portuguese"))	147

Table 2. Equations manipulated in the Web of Science databases, with their respective results.

Web of Science	EQ1	journalism AND ("360° video reports" OR "5G Technology" OR ai OR "Artificial intelligence" OR "augmented reality" OR automated OR blockchain OR bots OR chatbots OR ciberjournalism) (Tópico) and 2023 (Excluir – Anos da publicação) and Artigo (Tipos de documento) and Social Sciences Interdisciplinary or Communication (Categorias da Web of Science) and English or Spanish or Portuguese (Idiomas)	242
	EQ2	ALL= (journalism AND (drone* OR "High tech" OR "High technology" OR "Hi-tech" OR "Immersive Innovation" OR "Innovative Technology" OR "Internet of things" OR "IOT" OR "Journalistic metamorphose")) and 2023 (Excluir – Anos da publicação) and 6.185 Communication or 6.27 Political Science	64

	(Citation Topics Meso) and Artigo (Tipos de documento) and English or Spanish (Idiomas)	
E Q 3	journalism AND ("Machine learning" OR robot* OR "smart speakers" OR "Text to Speech" OR "virtual assistants" OR "Virtual reality") (Tópico) and 2023 (Excluir – Anos da publicação) and Artigo (Tipos de documento) and Communication or Social Sciences Interdisciplinary (Categorias da Web of Science) and English or Spanish or Portuguese (Idiomas)	160

5. Results

There were 151 unique authors in total. We verified their gender in different sources such as VIAF. The gender representation of authors is as follows:

Table 3. There is a predominance of authors who identify with the male gender (a ratio of almost 60 to40).

	Frequency	Percentage
Male	90	59.60%
Female	61	40.40%

The general results clearly show that research is being carried out in China, the United States, and European countries, which corroborates their scientific and economic potential and the distances between the epistemologies of the North and of the South. Readings by John Pavlik (American), Ramón Salaverría (Spanish), and Xiuli Wang (Chinese) were selected, which made it possible to insert other macro descriptors such as greater journalistic immersion through drones. Through the narrative review, the key concepts and authors supported the interpretation of the reports and thus contributed to the consideration of the potential of 5G and IoT for journalism, which will be discussed later in this report.

IoT and 5G technologies are creating new ways for the public and journalists to interact and connect everywhere. They are changing how news is gathered and shared, and they are also leading to the growth of haptic journalism, which lets people experience news through touch. (Pavlik & Feiner, 2018).

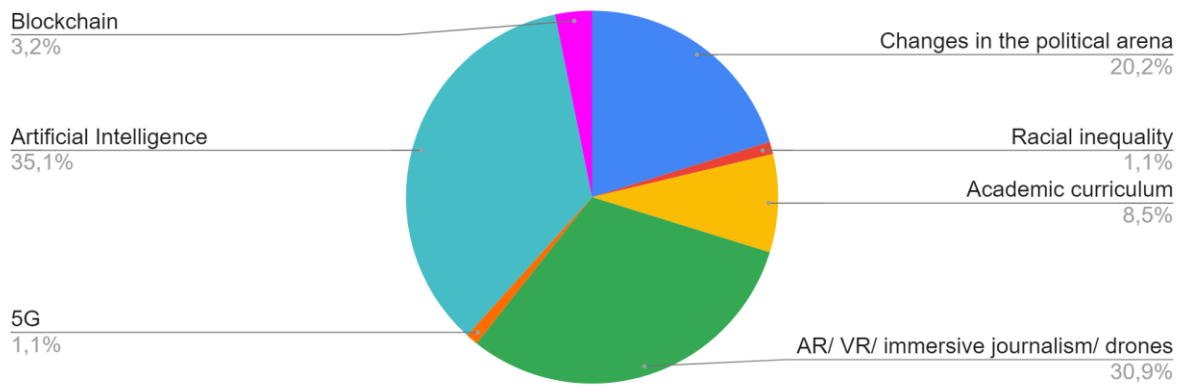


Fig. 2. Quantitative data trends in three major fields in academia

The graph above (Fig. 2) shows in quantitative data the trends in the approach of three major fields in academia, which converges with the applications verified with experts and scholars in the betting on the growth and strengthening of Digital Journalism on new fronts of investigation, such as IoT, 5G, and the use of drones for the development of journalistic content in the coming years. Source: Web of Science and Scopus. Own elaboration.

The form of publication was primarily through articles and book chapters. Based on the readings made, it was possible to answer the first specific objective of the research, understanding the potential for interactivity and ubiquity between the public and journalists through IoT, with the participation of new actors/players such as drones. It was also possible to envision a scenario for the second specific objective by observing the tendency to broaden social participation in journalism based on 5G technology, such as the change in the way information is collected and distributed, and the development of haptic journalism .

Contemplating documentary research, we also read the following reports: “Predictions for Journalism 2023” (Nieman Lab Predictions for Journalism 2023); “Trends and Predictions for Journalism, Media, and Technology 2020” (Newman, 2020); “The Mobile Economy Latin America 2022”¹ and “The Mobile Economy Europe 2022”² both from the *Global System for Mobile Communications (GSMA)*

The data collected from the reports has contributed to understanding possible impacts on journalistic information, observing the insertion of 5G into the IoT scenario and its implications for journalism.

Bill Grueskin (2022) states that local news will come to depend on AI. The professor believes that journalism is going through a period of transition and that there is still a lot of value in the work that journalists do, but that the industry will have to adapt to survive.

Grueskin's interpretation is not solitary; at least six other experts predict an intrinsic scenario between journalism, IoT and AI, especially ChatGPT as a tool that will be a game changer in the journalism industry. Grueskin endorses the academic concern about the

¹ <https://www.gsma.com/solutions-and-impact/connectivity-for-good/mobile-economy/latam/>

² <https://data.gsmaintelligence.com/research/research/research-2022/the-mobile-economy-europe-2022>

popularization of the device. "The College Essay Is Dead" warns a recent article in *The Atlantic* magazine, where the punctuation is emphatic about the transformation that AI will cause in academia. ChatGPT's potential to write texts that are mistaken for human writing is a warning for the validation of authenticity and plagiarism in the academic field. It should be noted that Grueskin concludes by upholding the ideal of journalism as an indispensable social good, especially as the guardian of democracy, but suggests formulations and adaptations to the changes that are taking place, of an immediate nature, such as training communication professionals in the correct use and interpretation of AI and IoT technologies.

Nicholas Diakopoulos (2022) advocates that journalists take productive advantage of AI tools but believes that it is better to think of them as internal assistants to the newsroom, making suggestions to reporters and editors rather than generating text that will be published directly, and does not believe in writing articles ready for publication. He also warns that AI, like any other technology, is not a button to be pressed to fix what ails the media, but he is optimistic about what can be done with these AI tools when used responsibly by journalists. Sam Guzik (2022) criticizes the potential of AI for fact-checking and warns of the possible results. According to him, fact-checking is often not so straightforward. A quote can be accurate but misleading. As a rule, each piece of news is built on a subjective picture of what is included—or excluded—and technology is no stranger to such subjection. Guzik warns against the idea of passivity around AI and IoT, recognizing that the journalistic profession cannot hope for the salvation of journalism through these technologies alone.

It's worth highlighting an episode that illustrates Guzik's point about the quality of journalistic information, given the task of reporting accurately and correctly. In 2017, the American newspaper *The Los Angeles Times* (*LA Times*) published a tweet reporting that an earthquake measuring 6.8 on the Richter scale had occurred in the city of Santa Barbara. However, the news was fake. The tweet, produced by the LA Times algorithm, used the information sent incorrectly by the US Geological Survey database. This case highlights the problems in production routines when the AI autonomy becomes integral.

We will describe below what was understood from the narrative review of the readings by Pavlik and Salaverría, mainly. The authors' data collection was selected using the bibliographic method, which filtered the most recent publications by researchers dealing with technological potential in the field of communications, especially journalism.

The automation of journalistic content production is a bet that John Pavlik (2019) also sees. According to Pavlik, it is likely that an increasing amount of news will be generated automatically from data sources (e.g., sensors) connected via IoT. Reaffirming the idea in this direction, the author believes that smart cities and the like will be rich sources of real-time data, which, through algorithms, can generate news ranging from transportation to weather conditions and the environment. He also understands that exploiting these resources and organizing data effectively represents an important strategic opportunity for journalism and its languages represented by AI, leveraging the market for augmented reality (AR) and virtual reality (VR). In "Drones, Augmented Reality and Virtual Reality Journalism: Mapping Their Role in Immersive News Content", Pavlik (2020) investigates four areas in which drones are impacting immersive news content. Pavlik argues that the use of drones to produce what he classifies as "experiential news" is growing in tandem with advances in technology, offering immersive experiences such as virtual reality or augmented reality.

John Pavlik (2020) explains the four implications of drones for augmented reality, mixed reality, and virtual reality journalism —the first major implication being the use of a first-person narration. As an example of applicability, he cites a report by *The New York Times* that made use of 360-degree video captured from inside three different refugee camps. The second major implication pointed out by Pavlik is the combination of audio and video as geotagging, allowing journalists to make an immersive video playback based on maps that can accurately and visually overlay the location of aerial video on ground locations, enabling the viewer to see and understand the mapping location. This shows the importance of providing before and after video images —for example, in stories about climate change, in reports on natural disasters (e.g., a forest fire), a refugee camp or migration patterns, in scenes where visualizing change over time is a critical part of the narrative, providing users with an additional layer of understanding and immersion in the story. The third implication of drones for immersive news would be the ability to capture volumetric and 360-degree video and 3D audio. Among the potential benefits is the creation of haptic journalism (Pavlik & Feiner, 2018). Pavlik and Feiner (2018, p. 1) state: "Haptic interfaces present an opportunity to create a new form of storytelling in journalism. These interfaces communicate through haptics — the bodily sensations of touch, pressure, vibration, temperature, pain and proprioception." Haptic journalism can help news consumers understand a variety of stories from science to the environment, by allowing them to "feel the data", thus fostering greater empathy. The fourth implication concerns the generation of new types of content based on data acquired from a wide range of sensors, including 3D photogrammetry. As journalism continually adds new tools to tell stories, Pavlik believes that the key is to do so effectively while maintaining the news values that make journalism essential to society. Among the potential features made possible is the prospect of multiple users simultaneously experiencing immersive drone videos or other types of data —for example, visualizations generated from atmospheric data such as real-time air pollution measurements, or from a recorded news experience. According to Pavlik, the key to this is the development of 5G network services, which will enable IoT in urban areas and beyond as well as immersive drone reports in real-time or near real-time (i.e., low latency).

Journalism can use such drone-captured data to provide immersive news, offering a whole new perspective on cities and other locations around the world. However, Pavlik warns that while these implications bring a variety of potential benefits to news content, including more engaging and accurate reporting, there are also possible adverse implications. These include the possible accidental or intentional misuse of drones to create immersive news content that is compelling, seemingly real but a new class of deep fakes from an aerial perspective (Pavlik, 2019). Furthermore, it is imperative that journalists and media outlets employing drones in the production of immersive news follow the highest ethical standards to maximize public trust. Developing clear industry guidelines for the deontological use of drones in the production of immersive journalism is the next major step.

Pavlik's critical perspective aligns with that of Evgeny Morozov, a Belarusian author known for his book "Big Tech: the rise of data and the death of politics." Pavlik, like Morozov, is concerned about the Internet of Things (IoT), particularly how it might increase surveillance and reduce privacy for users. He worries about the growing digital divide between northern and southern countries. Morozov's concept of "dadocentric capitalism," which he connects to the postmodern condition described by Harvey in

1989, echoes these concerns, suggesting that data is becoming central in our capitalist system, potentially at the expense of individual rights and equity. In this sense, both authors agree on the importance of valuing the protection of user privacy in the face of large corporations.

Another key authors, Negredo et al. (2019), seek to understand the dizzying expansion of digital journalism in Spain over the last decade, despite the 2008 crisis that hit the country's economy hard.

According to the 2019 study "Journalism expands despite the crisis: digital native news media in Spain," born-digital media made up 46.4% of all active digital publications in Spain. This indicates that the sector is growing, diversifying, and developing, particularly during a time characterized by creative and innovative approaches to storytelling. Negredo et al., argue that digital native media have advanced to a strategic position in the reconfiguration of the media ecosystem, in a paradoxical context of resourcefulness during a series of adversities throughout Western Europe.

Newman (2019) researched digital media leaders' plans and projections for the future of their organizations. Among the trends they emphasized was the importance of producing trustworthy content to build credibility with audiences. Related to this was "a shift toward user payment as a core business model" (Newman, 2019, p. 44). It follows that as successful digital launches become established companies that represent a considerable share of the market, according to Schumpeter's (2008) theory, they need not only to adapt to change but also to continue disrupting what it means to make news media in the online world, such as new products and services.

The study led by Salaverría (2019) with the participation of several communication professors at Spanish universities, who taught journalism and technology courses in the academic year 2020-2021, has allowed us to observe the consolidation of this specialty through the compulsory and optional courses included in the current curricula in Spanish higher education. The study reveals that the selection of courses related to journalism and technology within Spanish university curricula has expanded significantly, with a 33% increase in the number of these courses since the 2015-2016 academic year.. The data collected from the study indicates that, in the academic year 2020-2021, the number of courses related to technology in journalism exceeded one hundred (119), and that practically all Spanish communication faculties (38 out of 40) have incorporated some courses in this field.

The findings underscore the growing importance and academic development of digital journalism as a field of study. This is supported by Salaverría's 2019 work, "Digital Journalism: 25 years of study," in which he discusses the evolution of digital journalism from a modest beginning to becoming the most vibrant and active area of journalism research. Salaverría views the development of digital journalism positively, noting that it has become a rich and varied field with numerous sub-areas and established research methods.. He cites the emergence of specialized conferences and journals to support his argument. He also looks ahead to the next quarter of the century, where he believes that major technological, social, and professional innovations will continue to transform journalism possibly at a faster pace than in recent years, leaving challenges for academic research.

Nicholas Thompson (2022) argues that AI will certainly change the media business. In his view, in the past, AI served in a generic way to portray short sports stories and small aids in basic text editing. His current standpoint is that new companies will emerge that use AI to aggregate and summarize journalism. Thompson believes that journalists will be even more essential to society as AI enters the mainstream, where the journalistic function will be paramount in setting standards, tracking possible abuses, and bringing ethics and specimen to the technology.

According to Marcelo Barcelos (2020), the use of AI in the production and dissemination of news in Brazil will gain in popularity over the next ten years due to the technological backwardness of the main newsrooms such as Zero Hora and O Globo, which he studied. In his doctoral thesis, Barcelos applies Godet's Strategic Foresight methodology, which is a research approach aimed at exploring probable, possible, and desirable future scenarios. He uses this methodology to envision a form of journalism that meets the needs of the Internet of Things. He mentions the pioneering use of artificial intelligence in the country during the Rio Olympics in 2016, when algorithms updated the results of the games on Twitter. He also points out that the criteria for newsworthiness are not watertight. In other words, they are always changing over historical periods and are altered according to different contexts, believing in the alteration of these criteria based on the device, in line with Santaella's thinking (2019). One change that is already underway, according to Barcelos, is the modification of media design, interface design, and information design, reinforcing the directionality of journalism in favor of screens.

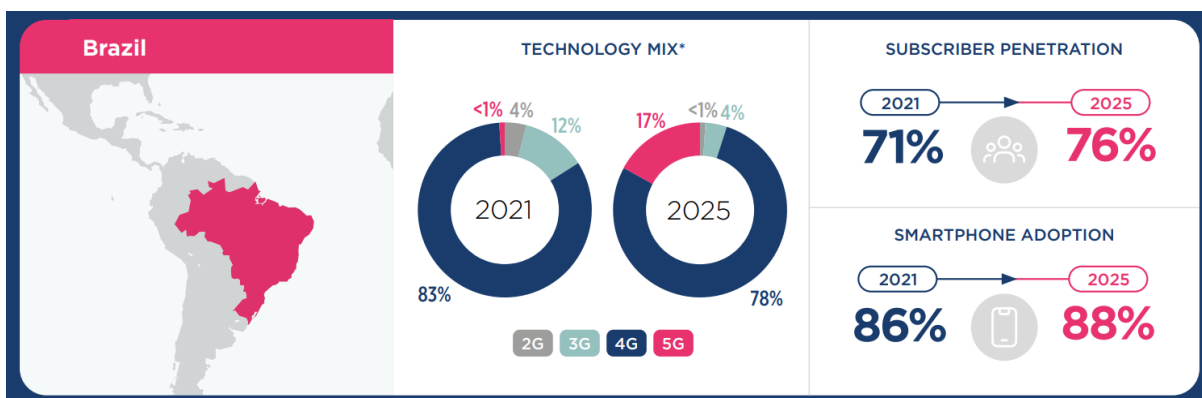


Fig. 3. Subscribers and technology trends for the Brazilian market

Source: The Mobile Economy Latin America 2022, GSMA.

According to the mentioned document in “The Mobile Economy Latin America 2022”, the Latin American region is lagging behind European, Asian, and North American centers. The 4G connection is dominant, while 5G is starting to expand. In the first half of 2022, 4G accounted for 410 million connections (59%), while 5G represented just 1%, with growth expected to reach 11% by 2025.

The report emphasizes how the Covid-19 pandemic has affected the region, particularly noting a significant increase in startup funding in 2021, which reached US\$19.5 billion—over triple the amount from 2019. This surge underscores the potential for advancements in digital technology, with notable contributions from the education and e-commerce sectors. Additionally, the document suggests that the expansion of 5G could offer the essential connectivity for introducing the metaverse to Latin America.

Even though the 5G era is beginning to take shape in the Latin American region, the current scenario in Brazil shows that 4G accounts for 83% of connections, compared to 0.3% for 5G. By 2025, projections point to a 78% share for 4G and 17% for 5G. These figures are lower than in Spain, where 5G already accounts for 5% of connections and will account for 43% by 2025.

This data has a direct impact on the innovation ecosystem of the country's main newsrooms. While Brazil is consolidating 4G technology, European centers are already working on real-time monitoring and processing through IoT (Salaverriá & Santos, 2020). Reading the report also made it possible to relate the mobile industry to the United Nations (UN) Sustainable Development Goals (SDGs), given the sector's pioneering spirit in being the first to commit to the 17 goals.

The document highlights the specific effects on Sustainable Development Goals (SDGs) 4 (Quality Education), 5 (Gender Equality), and 9 (Industry, Innovation, and Infrastructure) in Latin America. In contrast, "The Mobile Economy Europe 2022" report focuses on different SDGs: 3 (Good Health and Well-Being), 13 (Climate Action), and 16 (Peace, Justice, and Strong Institutions).

We also carried out research into the documentary *The Truth about 5G*³, directed by Sean Nicholls (2020) and, available on Prime Video. The documentary explores the context of misinformation surrounding 5G, the global technological race between the United States and China for leadership in this mobile generation, and the potential political influence associated with anti-5G movements.

In the documentary, Rodney Croft, psychology professor at Wollongong University (Australia) argues that the fears of activists have no scientific basis. Studies show that the rates of waves emitted by antennas are proportionally greater than the distance between the base and the receiver, so a greater number of antennas requires less radio frequency emission, with 5G being at an extremely small and similar level of irradiation to 4G, refuting the misinformation that 5G's radio frequency emission would be impacting human health. Axel Bruns, a journalist, contends that the pandemic and its resulting economic crisis have been beneficial for anti-5G groups and other conspiracy theorists in garnering attention for their causes. They have exploited the pandemic by linking it to various agendas they support, reinforcing their narratives with a sense of certainty fueled by the pandemic context.

Co-occurrence of the Covid-19 pandemic with the recent launch of 5G networks has sparked a conspiracy theory that the coronavirus was caused by the fifth mobile generation. In his most recent study "Health and science-related disinformation on COVID-19: A content analysis of hoaxes identified by fact-checkers in Spain", Salaverriá (2022) notes the emergence of a massive "infodemic" that contributed to public disinformation at a time when access to quality information was crucial. Their investigation analyzed the health-related scientific hoaxes that had been disseminated during the pandemic. The study was carried out by analyzing the content of hoaxes that were debunked by Spain's three main fact-checking organizations in the three months following the WHO's announcement of the pandemic. The results indicated that science and health content, varnished with journalism, played a leading role in shaping the dissemination of these hoaxes during the pandemic.

³ <https://tv.apple.com/us/movie/the-truth-about-5g/umc.cmc.6x5a8eh59zb9fp65pw1or9q01>

The consequence of this promotion to the public resulted in attacks on the street technicians responsible for installing the antennas. Intimidation and physical attacks were recorded in European and North American cities, hundreds of telephone towers were set on fire under the pretext of 5G spreading the coronavirus and working for the "New World Order".

Experts are categorical that political interests of state actors coexist in the 5G technological war, in a kind of continuing Cold War, with the Russian state facing accusations of fomenting anti-democratic demonstrations in Australia, a country that aligns itself with US technological policy. Axel Bruns says that the main intention of this large-scale disinformation was to create divisions, disruptions, and protests, encouraging a significant portion of the population to disobey any lockdown orders and social distancing, which led to economic and population losses, ultimately weakening the countries to which they were directed.

After discussing the reflections imposed by the documentary, it becomes clear that the West fears the vulnerability of a world dominated by the "Chinese 5G". Russia's move to choose the Chinese company Huawei as the provider of 5G equipment has instigated a movement to exclude the company from Western markets. The United States, the United Kingdom, Australia, New Zealand, Canada, and France have already banned Huawei's products on the grounds of fear of China's national security law, which obliges national companies to cooperate with its intelligence agencies, without specifying criteria. One of the premises of 5G is to create a more connected world. However, the potentially greatest technological revolution of the century could leave the world even more divided, in a kind of "technological iron curtain", where some countries will use technologies supplied by China's Huawei, while others will be supplied by companies with the "backing" of the United States, such as Nordic companies Ericsson and Nokia.

5.1. Incorporation of AI in classrooms

Based on the analysis of the articles focusing on the need to update the academic curriculum, it was possible to draw some important points about the relationship between new technologies and journalism, especially the use of AI. It is also worth noting that the number of articles discussing change and the need to adopt new guidelines has grown exponentially in recent years. Some of the results of the analysis are as follows:

- there is a high degree of consensus on the need to incorporate artificial intelligence in communication faculties;
- it will be difficult to incorporate AI into curricula;
- it is likely that younger teachers will be the ones to take on these contents in their courses;
- some experts believe that the possibilities and consequences of incorporating AI into university teaching at this time need to be well measured. A more basic updating of curricula will be necessary; and
- two tendencies are identified: (1) to integrate them in a general and transversal way; and (2) to integrate them in specific subjects of AI applied to communication.

5.2. Student training in AI use

With some of the points raised by experts and based on participant observation at the CRICC⁴, the debate is advancing in Catalan universities toward the need to promote emergency courses that encourage and teach students how to use AI responsibly. The following are some of the discussions (and the findings of the experts and engineers we spoke to) concerning this matter:

- communications students should be trained to use AI technologies;
- the predominant reasons why students should be trained to use AI is that they will likely be tools required by communications companies in the near future;
- as they recognize that AI technologies have already reached the professional and popular consumer level, and not just for engineering experts, so students should not turn their backs on them; and
- it is recognized that learning AI technologies will not be exclusive but will have to be added to other digital tools, such as the use of automatic translators, Wikipedia, or word processors.

5.3. Specific course on AI and communication

There is no clear consensus on whether an AI and communication course should be introduced. There are three predominant opinions:

- teachers and researchers who believe that an AI and communication course should be introduced;
- those who oppose such idea or believe that it is still too early to implement it; and
- those who believe that AI should be incorporated in a transversal or complementary way in other communication courses.

Table 4. An outline of how AI could be introduced into the education of communication faculties, based on readings on the need to adapt the academic curriculum. Prepared by Carlos Lopezosa, adapted.

Proposed AI core training scheme in communication

Competences	Objectives	Themes
		Types of AI, differences between artificial intelligence, machine learning, and deep learning

⁴ <https://fima.ub.edu/grups/cricc/en/>

Fundamentals	To know the origin, development, and actuality of AI applied to communication	Origin and evolution of AI
		Algorithm basics
		Impact of AI on the media ecology
		Types of AI and how they can be used to support journalistic work
Technical competences	To acquire skills for content production, the most common programs and tools, and the type of work involved.	Description and use of AI tools
		Design of prom (requests), learning of specific techniques for written, graphic, and audiovisual creation with the AI and the subsequent "post-production" where the subject must check and refine the results generated with the AI
		Identification of reliable information through AI: use of search tools, cleaning, processing, verification, acquisition analysis, etc.
		Data visualization tools applied to AI
Ethical competences	To acquire competencies on the ethical implications, ethical implications and values of this discipline	Analysis of media case studies using these resources
		Introduction to the ethical problems of these new ways of constructing reality
		Responsible use through critical thinking for decision -making in the choice of AI to be used to achieve better quality of the journalistic product
		Interpret and criticize the possible biases of AI and its application

		Aspects of critical analysis, copyright, and legal aspects in the context of AI use
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5.4. MoJo's growth

In conversations with journalists, the most noteworthy change was the implementation of MoJo. According to reports, in the period from 2005 to 2007, journalists from international newsrooms began using cell phones — Nokia, Blackberry, iPhone — to make stories. At the time, mobile internet technology was WCDMA (Wideband Code Division Multiple Access) or 3G, with significant limitations compared to 5G, widely used to cover major events or live broadcasts. MoJo was born to encourage journalists to publish news via cell phones. According to Quinn (2011), "MoJo is about editing on cell phones, as well as filming. It's also putting captions, headlines and credits. Real mojo, is doing everything with a mobile phone." Therefore, the implementation of 5G has leveraged the production of this new format, which is gaining increasingly more market share and, in a way, reducing the number of reporting teams by rejecting the use of large devices for transmission between towers. A new workflow has emerged for media storytelling, in which reporters are trained and equipped to be fully mobile and autonomous.

During a visit to the newsroom, the practical application of 5G and the Internet of Things (IoT) was observed, showcasing how this fast and interconnected ecosystem can stimulate thoughtful discussions. This is despite Paul Virilio's concept of dromology from 1986, which equates speed with wealth.

On the other hand, the beneficiaries of MoJo include large media companies, due to cost cutting, and multimedia journalists, who have the skills to film, record audio, edit and write such material as well as cover online.

In general terms, it was also possible to understand some prospects for news models, languages, and formats with IoT. In 2019, at the Mobile World Congress (MWC) in Barcelona, the launch of HoloLens, MX (augmented reality and holography) glasses, alerted the media industry to the incursion of journalism capable of exploring human languages,

Immersive and 360° journalism, also known as haptic journalism, as described by Pavlik & Feiner in 2018. Pavlik & Feiner (2018). In projecting the potential and impact of IoT on journalism, Lúcia Santaella (2019) claims that society is on its way to what would be a second digital revolution, requiring other theories of journalism that can trigger criticality and solve communication problems in the context of cognitive and semiotic computing. Although it depends on a more powerful network, as is the case with 5G networks, when we consider the dynamism and precision that sensorized environments will have to provide data in real time, whether through alerts or the triggering/sharing of this data in informational and intelligent networks, the continuous and regular capture of information from a given area will be able to feed comparative research, historical series, and access infinite memories about the region under surveillance. And this should be extremely useful for journalism in new transmission formats such as MoJo (mobile

journalism), where smartphones are used to produce news, which can be forwarded to a newsroom or shared directly with the public via online social media.

An important detail is the growth of published articles and discussions on the need to update the academic curriculum for media courses, pushing for more and more courses that deal with high-tech (immersive) journalism, learning programming, and experimenting with new news formats.

Nevertheless, the analysis has allowed us to encourage a debate on the need to regulate the use of generative AI and its deontological implications for the professional and academic fields. Reading the “White Paper on artificial intelligence: a European approach to excellence and trust” (European Commission, 2020), it was possible to see these concerns in the social and political fields. In this respect, Brazil is following the EU's lead with PL n0 2338 (Republica Federativa do Brasil, 2023), which seeks to establish a legal framework for artificial intelligence in the country, establishing principles, rules, guidelines, and foundations to regulate the development and application of artificial intelligence.

5.5. Journalism 5.0: IoT in the age of 5G

As the Internet of Things (IoT) intertwines with the 5G revolution, journalism is facing an era of unprecedented opportunities and transformative challenges. This chapter explores how exponential technologies can be assimilated by the journalistic field, catalyzing significant changes in the production, distribution, and consumption of news.

5.5.1. Ubiquitous data collection and sensory journalism

With the proliferation of IoT devices in urban environments, journalism can collect real-time data ubiquitously. For example, sensors embedded in city traffic routes can be a vast source of information, acting as "reporters" and allowing journalists to create richer, more contextualized narratives (Ufarte Ruiz, Rubio & Verdú, 2021).

5.5.3. Immersive reporting and augmented reality

5G enables immersive experiences, allowing journalism to transcend traditional boundaries. Augmented reality (AR) and virtual reality (VR) can be powerful storytelling tools, allowing readers to immerse themselves in complex events, places, and situations, broadening understanding, engagement, and the possibility of raising public awareness. However, it should be noted that the implementation of immersive journalism is a challenge for media companies, with its adoption remaining in some centers of the Global North due to the high cost of operation (Seibert, Planer & Godulla, 2022).

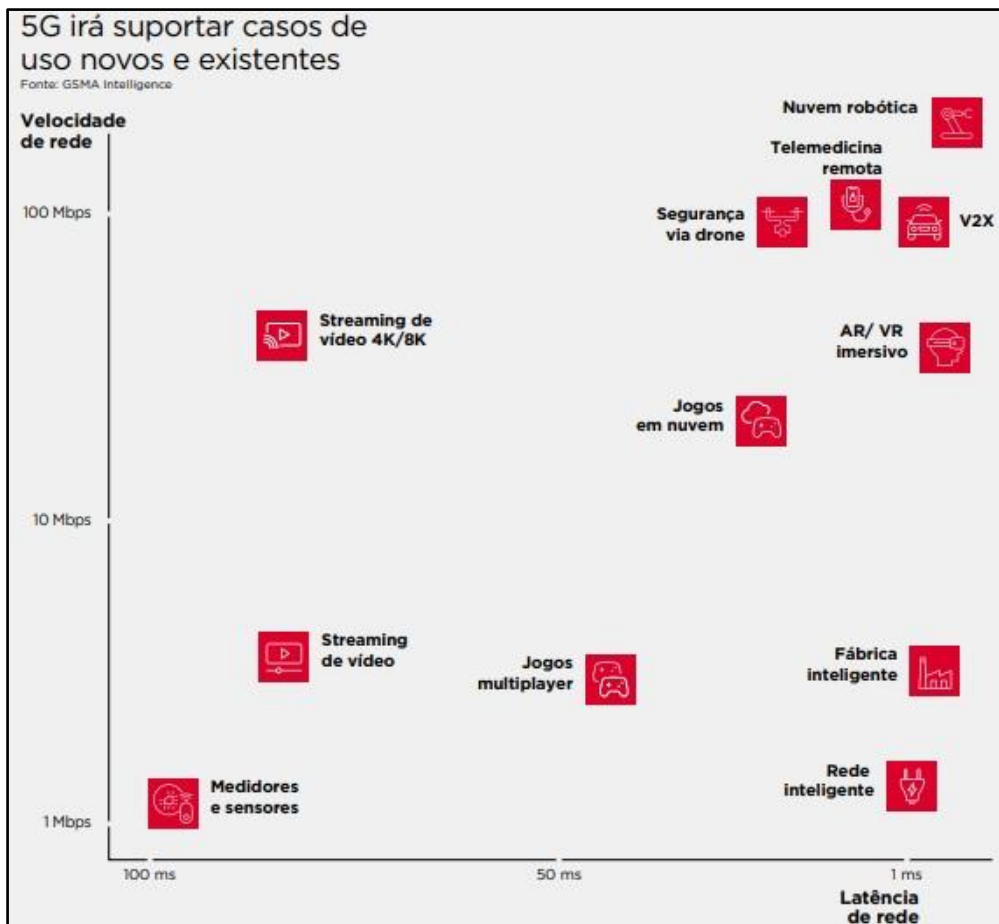


Fig.4. Possibilities unlocked by 5G. Drones and AR/VR stand out, with capacity for incorporation by journalism.

Source: 5G in Latin America: Unleashing the potential. 2023, GSMA.

5.5.4. Personalization of information and AI-assisted journalism

The combination of IoT and 5G will allow for a more refined personalization of news. Algorithms will be able to analyze information consumption patterns, providing users with content tailored to their preferences. AI-assisted journalism not only optimizes production efficiency but also improves the relevance of news to the target audience (Ramallal & Belda, 2022).

5.5.5. New distribution models and audience participation

The enhanced connectivity of 5G facilitates the adoption of new news distribution models. IoT-based interactive platforms enable more active audience participation, transforming the journalistic experience into a dynamic conversation rather than a one-way street. Content co-creation and real-time interaction between journalists and audiences are becoming key elements of this new paradigm (Codina, Lopezosa & Rovira, 2022).

5.5.6. Ethical challenges and editorial responsibility

Despite the numerous opportunities, the merging of IoT and 5G in journalism also raises ethical concerns. Issues related to privacy, security, and data handling require a careful

approach. This chapter concludes by reflecting on the need for robust ethical guidelines, the need for the sector regulation, journalistic remuneration by platforms, which tend to benefit in the 5G growth scenario, as well as responsible practices to guide the evolution of journalism in the 5.0 era (Ufarte Ruiz, Rubio & Verdú, 2021).

5.6. Prospects for adaptation by journalism and its relationship with the public

This section examines the prospects for the adaptation of journalism in the era of IoT and 5G, highlighting how these changes impact the relationship between the media and the public.

5.6.1. Multidimensional narratives

With the convergence of IoT and 5G, journalism can create richer, multidimensional narratives. This transformation not only enriches the user experience but also deepens engagement. Media outlets can stand out by offering content that goes beyond text, incorporating visual, auditory, and interactive elements to captivate an increasingly diverse audience competing for the attention economy (Simon, 1971).



Fig. 5. Subscribers and 5G technology trends for the Brazilian market. The technology is expected to grow exponentially, accounting for more than 1% of Brazil's GDP by the end of the decade. During the Mobile World Congress 2023 in Barcelona, the GSMA projected that 5G will overtake 4G by 2029, becoming the dominant mobile technology network, with adoption in more than 85% of the main markets by 2030. Source: 5G in Latin America: Unleashing the potential. 2023, GSMA.

5.6.2. Active participation and instant feedback

The interconnectivity provided by IoT and 5G opens the door to more active audience participation. Social media platforms, online forums, and interactive applications allow readers not only to consume news but also to actively participate in the discussion. Instant feedback gives journalists valuable insight into the needs and interests of the

public, contributing to coverage that is more in line with audience expectations (Aramburú, López & Hidalgo, 2022).

5.6.3. Transparency and credibility in a connected world

Transparency is becoming a fundamental pillar in the 5.0 era as news consumers demand greater clarity about sources and reporting methods. Media outlets face the challenge of maintaining and strengthening public trust in a digital environment where information circulates rapidly. Adopting transparent and ethical practices becomes an imperative strategy for news outlets.

5.6.4. Future challenges and opportunities in the journalism-public relationship

While the prospects for journalistic adaptation in the 5.0 era are promising, significant challenges emerge. Issues of disinformation, polarization, and unequal access to technology require a careful approach (García-Orosa, Vázquez-Herrero & López-García, 2022). This chapter concludes with a reflection on how journalism can capitalize on emerging opportunities while facing the challenges of cultivating a more robust and symbiotic relationship with its audience in the age of exponential connectivity.

5.6.5. News with IoT: formats and languages

This chapter explores the growth of news formats and languages in the IoT era, highlighting how connectivity can redefine journalistic storytelling, affecting its three main phases: information gathering, its processing, and, finally, its distribution rooted in the multiplication of interconnected mobile devices.

5.6.6. The rise of multisensory storytelling

IoT integration opens the door to richer, more engaging storytelling. News can now be told not only through text but also through images, sounds, and interactions. Multisensory storytelling not only informs but transports the audience to the heart of the story, providing a more immersive experience. John Pavlik classifies this new journalistic ethos as "haptic journalism" (Pavlik & Feiner, 2018). Pavlik and Feiner (2018, p. 1) state: "Haptic interfaces present an opportunity to create a new form of storytelling in journalism. These interfaces communicate through haptics - the bodily sensations of touch, pressure, vibration, temperature, pain and proprioception." Haptic journalism can help news consumers understand a variety of stories, from science to the environment, by allowing them to "feel the data", fostering greater empathy.

5.6.7. Urban sensors as silent reporters

Urban sensors function as silent reporters, capturing real-time data on various aspects of urban life (Salaverría & Santos, 2020). On traffic routes, for example, sensors can monitor the flow of vehicles, congestion patterns, and even local weather conditions. This information becomes the basis for journalistic narratives that not only report events but also contextualize them within the environment in which they occur.

5.6.8. Participatory journalism and digital testimony

IoT empowers citizens to become instant reporters. Mobile devices and sensors allow the public to actively participate in news gathering, contributing digital testimonies and first-

hand images (Segarra-Saavedra, Cristofol & Martinez-Sala, 2019). On the one hand, this form of participatory journalism redefines the notion of news sources, promoting a more inclusive and diverse narrative, while on the other hand, it can trigger deontological problems that flirt with the trivialization of the profession.

5.6.9. Challenges and editorial adaptation

Despite the numerous possibilities, adopting these new ways of presenting news brings editorial challenges (Salazar, 2018). The need to guarantee the veracity of information, universal accessibility, and editorial integrity remain crucial. Media outlets are facing the responsibility of balancing innovation with the preservation of ethical standards and public trust.

This chapter concludes with the realization that the convergence between IoT and journalism is not just a technical evolution but a revolution in the way stories are told and consumed. News 5.0 promises an information experience that is more dynamic, engaging and, above all, connected to the ever-changing world around us.

In conversations with agents from the corporate world (engineers from the Swedish multinational Ericsson and collaborators from the Mobile World Congress), which took place between March and May 2023, we noted the current discrepancy between the financing of network infrastructures (here we are limiting ourselves to 5G) to the detriment of the monetization of platforms. At the MWC in Barcelona, the telecoms operators' discourse was along the lines of convergence for big techs: it is necessary to divide up investments in infrastructure, so that the reach is greater and, above all, financial sustainability does not take a single side, promoting a "fair share" of applications. In this scenario, other questions have emerged from the results obtained: to what extent are platforms facilitating or hindering journalism's access to new audiences? The tech giants are appropriating journalistic content, which earns them hits and therefore money. News has value and not just from the point of view of public service. News attracts internet users, who access it and pay for it.

Despite the algorithm effects on journalism on the platforms, we can see that its challenges lie in the field of content distribution and today it is the main gatekeeper that the media industry has had to adapt to. Its implications can be seen in:

- 1) personalization of content as mentioned above (Ramallal & Belda, 2022);
- 2) remuneration, as we are uncertain of how algorithms work, so the reach and therefore remuneration of news outlets is affected, as well as driving surveillance capitalism, a new economic model based on the collection, analysis, and sale of personal data (Zuboff, 2019);
- 3) algorithmic racism (Silva, 2019), which can reflect and amplify existing prejudices in society (use of biases); and
- 4) competition with non-professionals as discussed—journalists do not only compete with journalists (Codina, Lopezosa & Rovira, 2022). The long-term deontological problems are still unknown, but the loss of critical thinking has already been the subject of other studies.

6. Discussion and Conclusions

The implication of new technologies in the journalistic ethos can be inferred in terms of approaches and trends. Primarily, we mention 4 applications in journalism, following the visits to the newsrooms and interviews with experts from the corporate and academic world.

6.1. High-quality live streaming

Boosted by the growth of 5G networks, in Brazil's case, offering greater speed and low latency, providing audiences with a more satisfying viewing experience.

Real-time interactivity: live broadcasts can take advantage of the low latency of 5G networks to involve viewers in real-time, allowing immediate questions, comments, and interactions, making the experience more engaging.

Access to real-time data: with IoT, journalists can incorporate sensors and connected devices to provide contextual information in real-time during live broadcasts, enriching content and audience understanding.

Flexibility in news coverage: high-quality live broadcasts can be carried out from any location (MoJo), facilitating instant coverage of evolving events, accidents, natural disasters, and more.

Cost savings: more bandwidth and time-efficient live broadcasts save production costs by requiring less equipment and resources.

6.2. News coverage in remote locations

The use of drones, for example, controlled via IoT and with the help and stability of 5G networks, opens up a huge menu for new news formats while maintaining journalism's original premise of storytelling.

Fast and safe access: drones can be deployed quickly in remote areas, allowing journalists to reach hard-to-reach or dangerous locations without the need for complex logistics.

High-quality aerial images: drones can capture high-resolution aerial images and videos, providing a panoramic and detailed view of the location, which enriches journalistic storytelling.

Coverage of natural disasters and/or environmental monitoring: drones can be used to monitor the environment and report on issues such as illegal deforestation, water pollution, and climate change.

Reducing risks for journalists: the use of drones can prevent journalists from being exposed to dangerous situations such as war zones, minimizing risks to personal safety.

Data collection via IoT: IoT sensors can be deployed in remote areas to collect additional information such as weather data or information from traffic sensors, improving the depth and accuracy of reporting.

6.3. Producing personalized journalism

With 5G and IoT networks, personalized news can be delivered quickly and efficiently, ensuring that readers receive up-to-date information in real-time.

Improved monetization: media platforms can take advantage of personalized journalism to target ads more effectively, which can result in higher advertising revenues.

Nonetheless, we draw attention to possible harm caused by this "tailored" relevance such as the **strengthening of information bubbles** through excessive personalization, leading readers to become trapped in information bubbles, limiting their exposure to divergent perspectives, and hindering the full understanding of complex issues.

Privacy and security: data collection required to personalize news can raise privacy and security concerns, especially if strict data protection measures are not in place.

Information manipulation: personalization can also be exploited to spread disinformation since algorithms can be manipulated to disseminate biased or false information according to user preferences.

Reduced diversity of topics: readers may miss the opportunity to discover topics and information outside their usual interests, which can limit their overall understanding of the world.

6.4. Immersive journalism

Adherence to immersive journalism, which uses augmented reality (AR) and virtual reality (VR), is not yet a reality in a large part of the media due to the high cost of production and the need for compatible devices on the market, which also results in a demand that is not significant in absolute numbers. However, as shown in the graph in Figure 4, experts are betting on a vertiginous growth in the next decade of immersive journalism due to factors such as:

More immersive experience: AR and VR allow readers or viewers to immerse themselves in stories, making information more captivating and memorable.

Visual and emotional appeal: AR and VR experiences are highly visual, which helps to convey information in a more effective and attractive way as well as creating a deeper connection with the audience, and can arouse empathy and emotions in relation to the topics covered.

Accessibility: these technologies can make news more accessible to people with different learning styles, allowing them to choose how they want to explore the story.

Increased dwell time: readers and viewers can spend more time consuming immersive content, increasing engagement and value for advertisers.

As trends, AI and IoT technologies, driven by 5G networks, will affect the three main phases of journalistic work: information gathering, processing and, most importantly, the distribution of news content (Salaverría & Santos, 2020). Certainly, ethical dilemmas such as data appropriation will arise. Therefore, this digital dazzle must be accompanied by reflections on the power of technology in social processes, market diffusion of knowledge, and production, consumption, and circulation of information.

Conclusions

The advent of 5G and the Internet of Things (IoT), coupled with the growing sophistication of Artificial Intelligence (AI), heralds a transformative era for journalism. This study, conducted at the University de Barcelona, has meticulously explored the intersection of these emergent technologies with journalistic practices, revealing a landscape ripe with both opportunities and challenges.

The integration of AI, 5G, and IoT into journalism is not merely a technological upgrade but a fundamental shift in how news is gathered, processed, and disseminated. These technologies empower journalists to create more engaging, interactive, and immersive content, enhancing the efficacy and reach of their reporting. AI-driven algorithms, 5G's high-speed connectivity, and IoT's expansive data collection capabilities collectively offer a new paradigm for journalism—one where efficiency, speed, and personalization are paramount.

However, this technological evolution also brings to significant ethical considerations. The transparency of AI algorithms, the privacy concerns associated with IoT devices, and the equitable deployment of 5G must be diligently addressed. Journalists and media organizations must navigate these concerns, ensuring that the adoption of new technologies does not compromise journalistic integrity or public trust.

Furthermore, the study highlights the necessity for a skilled workforce capable of harnessing these technologies. As journalism evolves, so too must the education and training of journalists, ensuring they are equipped with the requisite skills to thrive in a digitized media landscape.

Finally, the convergence of AI, 5G, and IoT technologies presents a dual-edged sword for journalism. While offering unprecedented opportunities for innovation and engagement, these technologies also demand a renewed commitment to ethical journalism and a recalibration of the journalist's role in society. As we advance into this new era, it is imperative that the journalistic community—academics, practitioners, and policymakers alike—collaboratively forge a path that upholds the core values of journalism while embracing the potential of technological advancements.

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