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Journalists' Algorithmic Literacy: Attitudes towards Social Media and Generative AI

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Abstract: This study explores the relationship between Portuguese journalists' satisfaction with the adoption of digital tools and their algorithmic literacy across cognitive, affective, and behavioral dimensions. Based on an online survey (N = 219)

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and three focus groups, our findings indicate that a greater proportion of journalists who are overall satisfied with digital tools for their work recognizes the benefits of social media and generative AI, while still acknowledging associated risks. They also declare higher self-perceived competence, yet proficiency in generative AI remains notably low. Additionally, socio-professional differences emerge, with younger journalists and those working in online outlets or local/regional media expressing greater overall satisfaction with digital tools. The findings highlight that individual motivation and organizational context jointly shape algorithmic literacy, underscoring the need for targeted algorithmic literacy initiatives in journalism.

Keywords: journalism, social media, artificial intelligence, AI literacy, algorithmic literacy

La littératie algorithmique des journalistes: Attitudes à l'égard des médias sociaux et IA générative

Résumé: Cette étude explore la relation entre la satisfaction des journalistes portugais à l'égard de l'adoption d'outils numériques et leur culture algorithmique à travers des dimensions cognitives, affectives et comportementales. Sur la base d'une enquête en ligne ($N = 219$) et de trois groupes de discussion, nos résultats indiquent qu'une plus grande proportion de journalistes globalement satisfaits des outils numériques pour leur travail reconnaissent les avantages des médias sociaux et de l'IA générative, tout en reconnaissant les risques associés. Ils se déclarent également plus compétents, même si leur maîtrise de l'IA générative reste notamment faible. En outre, des différences socioprofessionnelles apparaissent, les jeunes journalistes et ceux qui travaillent dans des médias en ligne ou des médias locaux/régionaux exprimant une plus grande satisfaction générale à l'égard des outils numériques. Les résultats soulignent que la motivation individuelle et le contexte organisationnel façonnent conjointement la culture algorithmique, ce qui met en évidence la nécessité de mettre en place des initiatives ciblées en matière de culture algorithmique dans le domaine du journalisme.

Mots-clés: journalisme, médias sociaux, intelligence artificielle, IA littératie, littératie algorithmique

Introduction

Studying journalists' relationship with algorithmic systems is essential, as automation and Artificial Intelligence (AI) are recognized as transformative forces within journalistic practices (Diakopoulos, 2019; Zamith, 2020).

The heightened media and public attention on Generative AI (Gen-AI) has spurred increased interest in understanding its broader societal implications, with particular attention to journalism, including its work processes and governance (Shi & Sun, 2024; de-Lima-Santos & Ceron, 2021; Porlezza, 2024). Among various scientific

approaches, research has emerged on journalists' perceptions of AI, focusing not only on its uses but also on ethical and deontological considerations (Beckett & Yaseen, 2023; Diakopoulos et al., 2024).

This research is theoretically rooted in the discussion about the causes and effects of interrelated technological and societal changes, particularly visible since the adoption of social media platforms (Djerf-Pierre et al., 2016; Humayun & Ferrucci, 2022), professional digital tools and AI-driven systems (Perez-Seijo et al., 2023).

Journalists often resort to guesswork or imagination to discuss the workings of these technologies (Jones et al., 2022). Algorithmic imaginaries are collective and individual perceptions and understandings of how algorithms function and impact various aspects of life, which shape how users interact with tools and perceive algorithm-driven content (Bucher, 2012; Gandini et al., 2023). In this context, one of the emerging issues is the potential gap between increasingly widespread algorithmic systems as sociotechnical entities and journalists' understanding of them.

Recognizing this gap and its possible implications underscores the importance of studying journalists' algorithmic literacy. We operationalize the theoretical construction of algorithmic literacy considering its dimensions (Swart, 2021; Dogruel, 2021), related to cognitive, affective and behavioral experience of professional journalists with algorithmic systems, such as social media networks and AI-powered tools (Deuze & Beckett, 2022).

The main research question guiding this study is: What are the differences regarding cognitive, affective, and behavioural dimensions of algorithmic literacy between journalists satisfied with the professional adoption of digital tools and those who are neutral or dissatisfied?

Drawing on Foà et al. (2024) and Couraceiro et al. (2025), this study investigates the algorithmic literacy of Portuguese journalists through an online survey of a diverse sample of 219 respondents, supplemented by 3 focus group discussions' analysis. The aim is to specifically explore the affective dimension of algorithmic literacy (Swart, 2021), positing that journalists' emotional attitudes toward AI and digital tools may influence both their knowledge and practices.

Methodologically the analysis focuses on two sub-samples, representing distinct groups: 1) journalists who report satisfaction with the adoption of digital tools in their professional practice and 2) journalists who express neutrality or dissatisfaction regarding that.

The distinction between these two groups is grounded in the assumption that satisfaction with digital tools' adoption signals an underlying attitude, a predisposition that reflects emotional factors influencing the relationship with algorithmic systems (Gran et al., 2021; Lomborg & Kapsch, 2020; Swart, 2021).

Specifically, we examine Portuguese journalists' satisfaction with digital tools' adoption to understand their 1) knowledge of algorithmic systems, 2) perceptions of the opportunities and risks associated with both social media platforms and Gen-AI tools, 3) self-assessed competences in using these digital tools that embed algorithmic systems.

Quantitative and qualitative results triangulation allows for the discussion of differences in journalists' self-assessed competences and satisfaction with the usage of digital tools, contributing to a deeper understanding of journalistic perceptions and attitudes regarding both social media platforms and Gen-AI tools.

Conclusions emphasize how satisfaction level with digital tools' adoption can influence journalists' predisposition and attitude towards the adoption of emerging technologies. Research enriches theoretical and empirical knowledge about the understudied context of Portuguese journalism and its professional practices. The findings have implications for literacy programs, professional training, newsroom policies aimed at enhancing journalists' skills, ethical awareness and governance about AI and Gen-AI.

1. Literature Review

1.1. *Algorithmic Systems*

Algorithms, the foundational units of both generative and non-generative AI, consist of sets of instructions processed by computers according to predefined steps (Dogruel, 2021). These algorithms are programmed by individuals and operate with varying purposes and complexities, depending on the contexts and objectives of their implementation (Silva et al., 2022). In communication studies, algorithmic systems are understood as complex and multifunctional sociotechnical mechanisms with an adaptive and pervasive presence in citizens' daily lives (Downey, 2012; Dogruel, 2021; Kudina & van de Poel, 2024).

Algorithms are often depicted as more objective or reliable than human actors however their functioning strongly relies on human choices, provided programming information and data. Zuboff (2019) points out that most algorithms applied to digital platforms are designed to serve economic interests and social control, reinforcing the power of the companies that develop them and, at the same time, shaping collective behavior.

Algorithmic systems are the constitutive elements upon which digital infrastructures are built, among which we also list the global networks and social media platforms.

Algorithmic systems have broad societal influence, yet their inner workings often remain concealed. Due to this opacity, they are frequently described as black boxes (Pasquale, 2015), which highlights concerns about bias and lack of transparency (Chulvi, 2023). Algorithmic systems have been adopted in newsrooms for decades,

however the conceptualization of algorithmic journalism, also known as automated or robo-journalism (Shapals, 2020) sheds light not only on the automatic forms of news production, but also on the broader transformations of digital journalism and workflows, including data collection, analysis, news creation, content distribution and access.

The intelligibility of algorithmic systems refers to their characteristic of being understood in a meaningful way, ensuring essential values for society and democracy. Fairness, Accountability, Transparency and Ethics, the so-called FATE (Shin, 2021), are pillars of frameworks that address the need for essential values, and also relate to the evolution of technologies such as AI and its generative models (Gen-AI) (Koulu, 2020; Silva et al., 2022; Dorr & Hollnbuchner, 2017). Thus, the pervasiveness and opacity of these systems present challenges to multiple social actors, from regulators to business players, from researchers to digital platforms' users.

Our research focuses on journalism considering the wide penetration of algorithmic systems in newsrooms and the peculiar position exerted by journalists who are potential users for professional purposes and watchdogs for professional reasons.

1.2. Algorithmic Systems Adoption in Journalism Practice

Algorithmic systems adoption, interaction with and development become part of newsroom routines (Svenson, 2022). Perceptions are two-fold and often polarized between a negative conception of consequences and harms for the profession and its ethics, or more enthusiast and aligned with technological solutionism.

FATE principles are strongly related to important values of journalism, a profession based on demonstrating accuracy, impartiality, and objectivity to gain public trust and maintain its legitimacy in society. Therefore, algorithms and the adoption of algorithmic systems represent both a source of opportunity and a risk for journalism.

The adoption of the algorithmic systems in newsrooms and journalism practices has been studied following diverse research streams. Since the rise of online social networks, the relationship between journalists and social media has become complex and multifaceted, evolving over time and according to specific personal and professional characteristics, but also forms of usage. Variations are based for example on factors such as age, gender, type of work, and workplace. Over time, the perceived usefulness for professional purposes changed, and some early adopters abandoned these platforms and the valuation of social media affordances declined (Djerf-Piere et al., 2016).

Social media usage by journalists is classified by Humayun and Ferrucci (2022) into three broad categories: news construction, news dissemination, and branding. It can be used as a source of information, with strong ethical and deontological issues

related to credibility and trust. Social media use motivations can range from personal to organizational, and they are also public arenas and fertile fields for collaboration, inclusion, and participation with potentialities and challenges brought by phenomena such as collaborative or citizen-journalism, as well as disinformation dissemination.

The role of social media and search engines in news distribution alters the relationship between authors, receivers, and business owners, with a new focus on engagement, metrics, interactions, constant updates, and new models of digital curatorship, personalization, and prioritization, which also have serious implications for editorial models and logic (Brake, 2017).

Other scholars discuss whether and how algorithmic systems reflect and respect journalistic values and norms, such as the public interest, verification, transparency and accountability.

The rise of automated journalism raises significant legal questions regarding authorship, liability, and data protection. Algorithmic news refers to journalism practices implemented by intersecting AI-driven tools and human professional work (Culver & Minocher, 2021). The implementation of algorithmic systems, particularly AI-driven tools, in journalism is analyzed considering initiatives across different media systems and national contexts to highlight the multiple consequences that these technologies have on media outlets and professional practices (Yanses & Beckett, 2023; Perez-Seijo et al., 2023).

Concerns increase accounting for ethical implications of bias in Gen-AI in journalism and both scholars and regulators discuss possible measures to minimize harms (Culver & Minocher, 2021; Porlezza, 2024). For the responsible adoption of AI in newsrooms, Beckett and Yaseen (2023) suggest adopting a six-step strategy that includes a specific focal point on improving AI literacy. For journalists as algorithmic media designers, it is crucial to understand the implications of algorithmic systems in their field critically, regarding news production, workflows, and ethical concerns directly related to usage of data, digital tool adoption such as social media platforms, and AI-driven systems (Deuze & Beckett, 2022; Broussard et al., 2019; Diakopoulos, 2019). Pranteddu and colleagues (2024) offer insights from analytical comparisons on the sociotechnical imaginaries of artificial intelligence in news work.

Discussing the intelligibility issues of algorithmic systems and AI in public media service news production Jones and colleagues (2022) investigate journalists' ability to understand and engage with these technologies, and how their adoption may preserve journalistic norms and values. Scholars highlight that often journalists resort to guesswork or imagination to discuss the workings of these technologies, highlighting the importance of enhancing literacy among journalists to ensure effective and responsible usage of technologies.

1.3. *Algorithmic Literacy*

Scholars point to algorithmic literacy as a multidimensional construct, rooted in media literacy (ML) (Livingstone, 2004; Frau-Meigs, 2024) but evolving to address

the complexities of contemporary digital environments. Building on media and information literacy conceptualizations (European Union, 2009; UNESCO, 2021) ML refer to a set of cognitive, emotional and social skills needed to be able to use text and technologies, including analytical and critical thinking skills, creative production of media messages, reflection and ethical thinking, as well as active social participation using media (Foá et al., 2023).

Algorithmic literacy can be situated within previous and broader models of literacy and learning that conceptualize human relationship with mediated environments as a multidimensional process encompassing cognitive, affective, and psychomotor domains (Bloom, 1956; Krathwohl, 2002).

Algorithmic literacy's relevance extends to emergent and more complex technologies such as generative AI. Since newer AI-powered tools are themselves embedded in algorithmic systems, algorithmic literacy offers an essential conceptual lens for examining the adoption and use of new technologies.

The research strand on algorithmic literacy has developed measures to frame and operationalize the concept, typically encompassing three core levels: algorithmic knowledge, attitudes, and skills (Dogruel, 2021; DeVito, 2021; Gran et al., 2020; Oeldorf-Hirsch & Neubaum, 2021). These levels address both the awareness of the presence and societal impact of algorithm-based systems and the possession of knowledge and critical perspectives to engage with them in informed and autonomous ways.

Swart's (2021) work captures these three levels as dimensions of algorithmic experiences (cognitive, affective, and behavioral), connected to three forms of interactions with algorithms (understanding, sensing, and engaging).

In parallel, recent scholarship in communication sciences has advanced the notions of AI literacy and Gen-AI literacy (Ng et al., 2021; Annapureddy et al., 2024; Cox, 2024;). These concepts, as shown by Couraceiro et al. (2025), share with algorithmic literacy the inclusion of equivalent cognitive, affective, and behavioral dimensions, but differ in scope. AI and Gen-AI literacies are largely framed by current innovation cycles, whereas algorithmic literacy addresses the foundational structures common to a wide range of algorithmic systems, from search engines, social media, Gen-AI tools, and many digital apps.

This study adopts algorithmic literacy as a broader and more stable conceptual umbrella term, allowing for a more comprehensive understanding of how journalists perceive algorithmic mediation in news production and dissemination, without being constrained by the technological hype associated with specific innovations.

Because interacting with algorithmic systems does not guarantee literacy for all users at the same level (Powers, 2017), studies grounded in the theoretical framework of algorithmic literacy have emphasized the need to assess it by accounting for

variations among individuals, tools, and contexts, while also considering its purpose of reinforcing users' agency and critical empowerment (Araujo & Sá, 2024).

Moreover, evidence suggests that knowledge about algorithms does not have a strong correlation with positive attitudes towards them (Araujo et al., 2020) and that increased knowledge alone has little consequence on changing attitudes (Silva et al., 2022). These findings reinforce the need for a holistic conception of algorithmic literacy that integrates affective and behavioral dimensions alongside cognitive.

Thus, digital users' algorithmic literacy and algorithmic experiences cross and overlap, including the comprehension of technical and social processes through which algorithms are generated, distributed, and consumed, as well as the competences that allows some degrees of control over these processes (Shin, 2021; Dogruel, et al., 2021).

Scholars intending to measure degrees of awareness and knowledge about algorithmic systems have proposed some parameters (Dogruel et al., 2022; Silva et al., 2020; Zarouali et al., 2021; Devito, 2021). Research also explores how everyday interactions with algorithms shape people's sense-making processes (Swart, 2021). According to the literature, our research distinguishes, within the cognitive dimension, awareness – recognizing the presence or absence of algorithms – from knowledge – understanding the underlying mechanisms of algorithms (Dogruel, 2021).

Given users' relationships with algorithmic systems are also conditioned by their perceptions, the affective dimension is a core component of algorithmic literacy. This dimension is partially informed by and related to folk theories and algorithmic imaginaries (DeVito, 2021), which influence how individuals interpret and emotionally respond to algorithmic processes.

The affective dimension assumes that sensations, emotions and moods are both shaped and triggered by algorithmic interactions, implying reflection on algorithmic systems' mechanisms that contribute to users' understanding (Swart, 2021). Thus, individuals' attitudes toward algorithms emerge as a central manifestation of the affective dimension. Such attitudes, reflecting predispositions or positions toward the use of technology, are closely tied to emotional factors in the relationship with algorithmic systems (Gran et al., 2020, 2021; Lomborg & Kapsch, 2020; Swart, 2021), influencing their opinions, engagement and satisfaction levels with usage (Gran et al., 2020).

The behavioral dimension includes skills and competency development, enabling people to effectively engage with algorithmic systems (Oeldorf-Hirsch & Neubaum, 2021; Araujo & Sá, 2024). This means considering people's actions and interactions, if and how they seek to influence or control algorithmic systems, leveraging advantage to them or adopting strategies of challenging or resisting algorithmic influences.

2. Methodology

This study focuses on the affective dimension of algorithmic literacy, aiming to assess its influence on the cognitive and behavioral dimensions, both quantitatively and qualitatively. Additionally, this study explores differences in journalists' responses across two contexts: online social media platforms and Gen-AI tools.

A mixed-methods approach (Miles et al., 2019) was adopted, comprising quantitative and qualitative analyses. The quantitative component relied on an online questionnaire survey completed by 219 journalism professionals in Portugal. The qualitative component involved three focus group discussions with 18 journalists who had expressed interest in participating through the final item of the survey questionnaire. This methodological strategy allowed for data triangulation, providing a more comprehensive and multifaceted understanding of the research object (Wolff et al., 1993).

Data collection was conducted over an eight-month period, between August 2023 and March 2024, using an online questionnaire created in Qualtrics. The survey link was disseminated primarily via email through the institutional mailing lists of the Portuguese Union of Journalists (SinJor) and the Journalists' Professional License Committee (CCPJ). Additional reach was obtained through public posts on the researchers' social media accounts. Prior to the main fieldwork, an online pre-test was administered to a small group of journalists in Portugal to evaluate and refine the instrument (see Foà et al., 2024), following established guidelines for questionnaire validation (Bryman & Bell, 2016).

Both data collection instruments were developed based on the theoretical framework proposed by Swart (2021), which identifies three fundamental dimensions of algorithmic literacy: cognitive, affective, and behavioral.

2.1. *Quantitative Analysis: Survey*

From the participants who initiated the questionnaire, 219 completed all sections and were retained as valid responses for analysis. While not statistically representative of the estimated population of over 5000 active journalists in Portugal, the sample composition aligns with the profile of journalists depicted in recent studies on the profession in Portugal (Crespo et al., 2017; Rolo et al., 2023). Similar to these studies, the sample is characterized by a predominance of mid-career journalists, a higher proportion of senior professionals compared to younger ones, and a significant representation of individuals with higher education. The sample also reflects diversity in terms of the types of media outlets where journalists work and their geographical coverage.

This sampling approach, which combines purposive and convenience strategies, is appropriate for exploratory research aiming to capture a broad range of experiences and attitudes within a professional community, rather than producing statistically

generalizable results. Detailed sample characteristics can be found in Appendix, as supplementary material.

To process the 219 validated survey responses, statistical procedures were conducted using SPSS software, including frequency distributions to organize and summarize the data.

As part of the online questionnaire, one question assessed the cognitive dimension of algorithmic literacy by listing various "digital tools used in journalistic work," including Google (search engine), Twitter (social media platform), Chartbeat (news performance analytics), Mailchimp (email marketing), WordPress (content management system), Canva (image editor), Adobe Premiere (video editor), Audacity (audio editor), Word (text editor), and Excel (spreadsheet software). Respondents were asked to identify which of these digital tools have algorithmic functionalities.

For this study, the affective dimension of algorithmic literacy was operationalized through responses to a survey question that asked participants to rate their overall satisfaction with "using these digital tools in their journalistic work," based on a five-point Likert scale (1 - Very dissatisfied; 2 - Dissatisfied; 3 - Neither satisfied nor dissatisfied; 4 - Satisfied; 5 - Very satisfied).

The operationalization of the affective dimension of algorithmic literacy through user satisfaction is grounded in theoretical proposals that conceptualize satisfaction as an evaluative and emotional response. In Bloom's (1956) original taxonomy, the affective dimension can be understood not as purely emotional but as closely intertwined with cognitive processes of judgment and evaluation. Bloom describes evaluation as the act of making judgments about the value or adequacy of ideas, methods, or experiences based on explicit or implicit criteria. This evaluative process, while fundamentally cognitive, establishes a conceptual bridge to the affective domain, where values, preferences, and satisfaction emerge as informed responses to prior cognitive operations. In this sense, satisfaction reflects an evaluative appraisal, a cognitively mediated affective response that arises from assessing the effectiveness or appropriateness of a given experience or tool relative to one's goals and standards.

Lomborg and Kapsch's (2020) notion of "feeling algorithms" further supports our approach, as they propose that "affective encounters with algorithms, especially those generating strong emotions, entail evaluations – positive or negative, and these, in turn, inform the meaning-making process, the decoding of algorithms" (p. 8). In the context of journalists' algorithmic literacy, satisfaction with digital tools can thus be interpreted as an attitudinal indicator that captures the extent to which technological experiences meet or exceed expectations and align with professional goals, and the extent to which individuals emotionally relate to, trust, or derive value from these systems.

Given that only 16 of the 219 journalists selected the lowest two satisfaction levels, for analytical purposes, responses were categorized into two groups:

1. Journalists who reported being satisfied (n=94) or very satisfied (n=25) with using digital tools in their work.
2. Journalists who reported being dissatisfied (n=10) or very dissatisfied (n=6) with using digital tools, as well as those who were neutral (n=84).

From this reclassification into two groups, (1) those satisfied with using digital tools for work and (2) those neutral or dissatisfied, this study seeks to analyze differences across cognitive, affective, and behavioral dimensions.

- Cognitive dimension: differences in responses regarding the definition of an algorithm (multiple-choice question) were assessed, complemented by answers to 10 true/false statements available in Appendix.
- Affective dimension: attitudes were measured using an agreement scale on specific aspects related to risks and opportunities associated with the use of social media platforms and Gen-AI tools. These results also provided reflections that intersect with the cognitive dimension.
- Behavioral dimension: differences were examined in journalists' self-perceived competencies in using social media platforms and Gen-AI tools for journalistic work.

Although overall satisfaction with digital tools in the workplace is influenced by emotional factors such as frustration or enthusiasm toward technology, we acknowledge that the satisfaction metric used in this study does not explicitly explore these emotional aspects. To address this limitation, the quantitative analysis was complemented by qualitative data collected through three interactive online focus groups.

2.2. *Qualitative Analysis: Focus Groups*

To gain deeper insights beyond the quantitative findings, three online focus groups were conducted with 18 participants who had completed the survey and agreed to participate. This qualitative approach allowed for a more detailed exploration of journalists' experiences, opinions, and concerns regarding the use of algorithms and artificial intelligence in journalism.

The online format facilitated the participation of a demographically and geographically diverse group. The focus groups were designed to understand the language and concepts used by journalists themselves, to encourage more articulated narratives about their experiences and to observe the process of collective sense-making.

Each session included three members of the research team, with distinct roles: one facilitated the interaction and exercises, another moderated the open discussion, and the third took notes.

The three key dimensions of algorithmic literacy – cognitive, affective, and behavioral – were explored throughout the discussions. Thematic blocks with questions and exercises were developed for both the individual and group activities. Zoom was used for the online discussions, supplemented by Mentimeter, an interactive tool that enabled real-time collection of responses, shared definitions, visualizations, and rankings while maintaining participant anonymity. These interactions were combined with open discussion moments.

The discussions focused on theoretical and ethical principles. Debates touch issues related to practical application of algorithmic systems in daily work, journalists' experience of different digital tools adoption in the newsrooms, the presence and role of Gen-AI in the Portuguese media ecosystem, considering also international recommendations such as those outlined in the Paris Charter on AI for Journalism, issued by Reporter Without Borders (RSF) and other partners representatives of the media and journalism community. A table in Appendix summarizes the main themes and analytical focuses.

For the presentation of results, each focus group was randomly assigned a distinct letter (A, B, C), and participants were identified using different numbers to ensure anonymity. Demographic information - including gender, age group, type of media outlet, and geographical reach - was retained to facilitate the distinction and comparison of their perspectives. A table in Appendix summarizes the characteristics of the focus groups participants, listing every participant from 1 to 18.

By integrating qualitative insights with the quantitative findings, this methodological approach ensures a more robust analysis of how journalists' attitudes toward digital tools are shaped by emotional factors, contributing to a nuanced understanding of algorithmic literacy in journalism.

3. Results

This section is based on a question in the survey asking about the journalists' overall satisfaction with digital tools in their work, including Google, Twitter, Chartbeat, Mailchimp, WordPress, and Word, among others. The analysis focuses on two distinct groups: (1) journalists who indicate satisfaction with the adoption of digital tools in their professional practice and (2) those who express neutrality or dissatisfaction regarding their use.

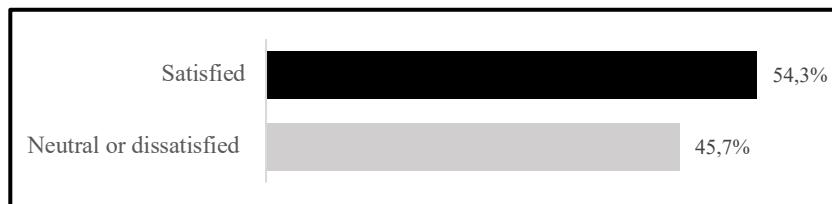


Figure 1. *Overall satisfaction of journalists with the use of digital tools in their work*

Source: own elaboration. N=219.

Note 1. Digital tools: Google, Twitter, Chartbeat, Mailchimp, WordPress, Canva, Adobe Premiere, Audacity, Word, and Excel

Note 2. Satisfied includes the categories "satisfied" (n=94) and "very satisfied" (n=25). Neutral or dissatisfied includes the categories "very dissatisfied" (n=6), "dissatisfied" (n=10), and "neither satisfied nor dissatisfied" (n=84).

Based on the 219 responses obtained, we can see, in Figure 1, that the majority of journalists surveyed (54,3%) report being satisfied with the use of digital tools in their work. However, a considerable proportion (45,7%) remain neutral or dissatisfied with their use.

The focus groups reveal that these two groups are not necessarily dichotomous. Even those satisfied with the use of digital tools exhibit what can be described as cautious satisfaction in their approach, indicating a nuanced perspective rather than a fully positive acritical view.

"[I use] all those kinds of tools that are available, but always with a very critical spirit" (A5, female, 45-49 years, national, online)

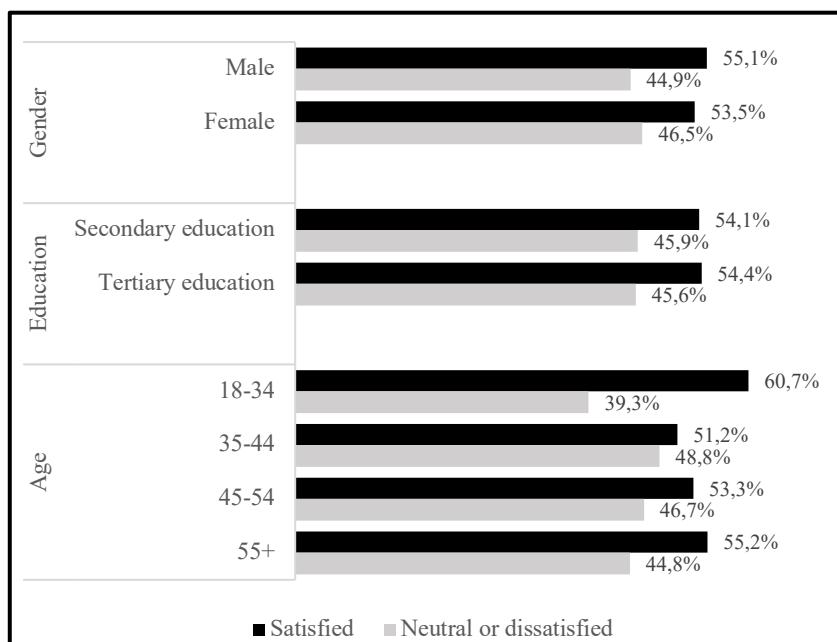


Figure 2. Overall satisfaction of journalists with the use of digital tools in their work by gender, education and age

Source: own elaboration. N=219.

The sociodemographic data of the surveyed journalists (Figure 2) indicate no significant differences in satisfaction levels based on gender or educational background. However, clear differences emerge based on age, with younger journalists (18-34 years old) expressing higher levels of satisfaction with the use of digital tools.

Focus group analysis further reveals that younger journalists are more inclined toward experimentation and adept at using the latest digital tools. For instance, two of the three participants aged between 30 and 34 years old work daily with data analysis and visualization, possess programming skills, and utilize advanced technological tools.

Additionally, most participants between 45-49 years old (the most representative age sub-group in the focus groups with six participants) also report proficiency in various digital tools, following technological advancements with enthusiasm, often driven by personal interest.

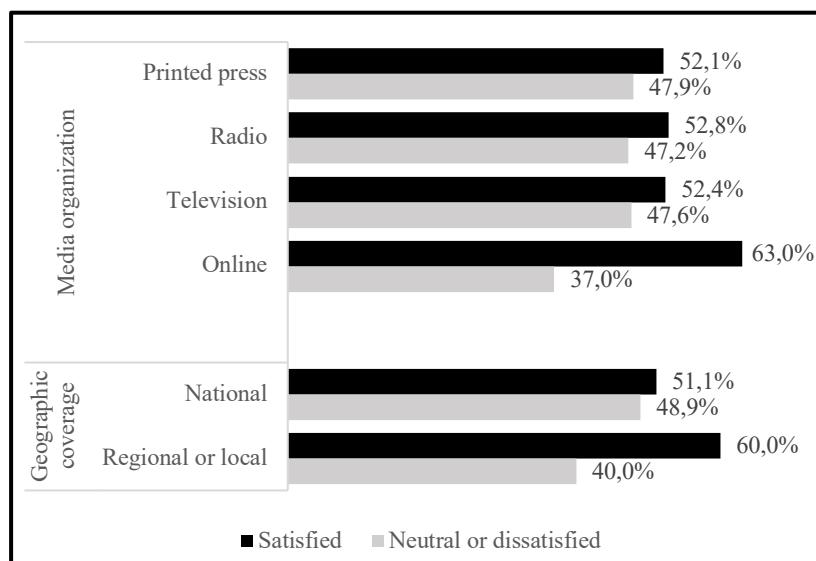


Figure 3. *Overall satisfaction of journalists with the use of digital tools in their work by media organization typology and geographic coverage*

Source: own elaboration. N=219.

Regarding differences based on the type of media outlet and its geographic scope (Figure 3), journalists working in online media and those employed in regional or local outlets indicate higher levels of satisfaction with the use of digital tools.

Focus group participants working in hyperlocal, local, and regional media report using a wider range of tools and performing more diverse tasks compared to journalists working in outlets with national reach.

“Audacity is part of my daily routine for optimizing the quality of audio files. Why is that? Because this audio I then use in Word to help with the transcription. Because a lot of time is wasted on transcription. The better the quality, the better the results and the more time I save and the less time it takes me to do this task. Another thing I use with some regularity is an Adobe program with generative capacity. (...) Imagine, for example, that I need to fill in a certain area of the image. It used to be possible, but I'd have to do it by hand and it would take half an hour or fifteen minutes. Nowadays, it's almost instantaneous. This applies to many, many situations.” (C3, male, 45-49 years, hyper-local, printed press)

3.1. Cognitive dimension

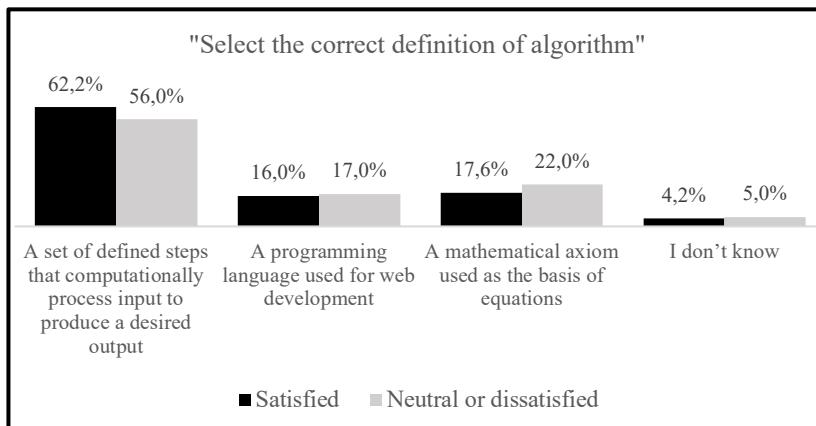


Figure 4. Journalists' answers to the question "select the correct definition of algorithm" by overall satisfaction with the use of digital tools in their work

Source: own elaboration. N=219.

According to Figure 4 most journalists, regardless of their levels of satisfaction with using digital tools, correctly choose the definition of algorithm as "a set of defined steps that computationally process an input to produce a desired output".

The little differentiation in knowledge on the subject of algorithmic systems, based on journalists' overall satisfaction with digital tools, is reinforced by the complementary analysis of ten true/false questions (see appendix). These questions address specific technical aspects of knowledge about algorithms and the results indicate that, in general terms, the answers did not vary between satisfied and neutral/unsatisfied journalists. On average, both groups got approximately 8 of the 10 questions right, which shows a consistency in the level of this technical knowledge, regardless of the degree of satisfaction with digital technologies.

Focus group analysis reveals that participants with more intensive and advanced use of these digital tools demonstrate greater technical knowledge, particularly those with data analysis expertise.

3.2. Affective Dimension

The need to study the affective dimension in relation to different platforms (Oeldorf-Hirsch & Neubaum, 2023) led us to delve deeper into journalists' perceptions of the opportunities and risks of using social media platforms and Gen-AI tools.

The following eight questions fit within this affective dimension, using a scale of agreement which, together with the distinct nature of the topics covered, allows us to assess journalists' attitudes towards specific statements that reflect opportunities and

risks regarding different algorithmic systems. This approach aims to capture nuances in affective perceptions and analyze how they vary according to the nature of the social media platforms and Gen-AI tools in question, specifically platforms such as Facebook, Twitter-X, LinkedIn, TikTok and tools such as ChatGPT Bard, Bing, Midjourney, DALL-E, etc.

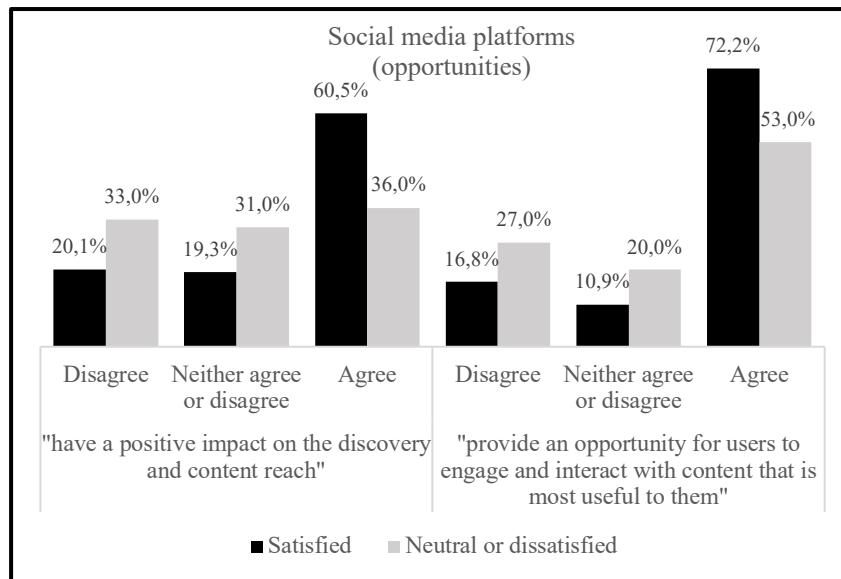


Figure 5. *Journalists' perceptions about opportunities in the use of social media platforms by overall satisfaction with the use of digital tools in their work*

Source: own elaboration. N=219.

Figure 5 illustrates journalists' perceptions of opportunities on social media platforms. Among journalists satisfied with digital tools, 60,5% agree that social media platforms "have a positive impact on discovery and content reach" compared to only 36% among neutral or dissatisfied journalists, who show a more varied response distribution. Similarly, 72,2% of satisfied journalists believe that algorithms "provide an opportunity for users to engage with more useful content," a significantly higher percentage than the 53% observed among neutral or dissatisfied journalists.

Focus group participants acknowledge the benefits of social media for news distribution but highlight their uncertainty about how its algorithms work, noting that ongoing changes have made organic reach more challenging.

"I can perhaps talk about my experience over the last nine years (...) We started with Facebook, we had a base of five thousand likes and, until about this year, we managed to reach almost forty-one thousand. You can easily see that. It was all done with organic traffic. In other words, we never paid for any

sponsored posts. This year our content and our publications are being put down, they're being scrutinized by an algorithm that sometimes misunderstands content. We have to ask for a review." (C3, male, 45-49 years, hyper-local, printed press)

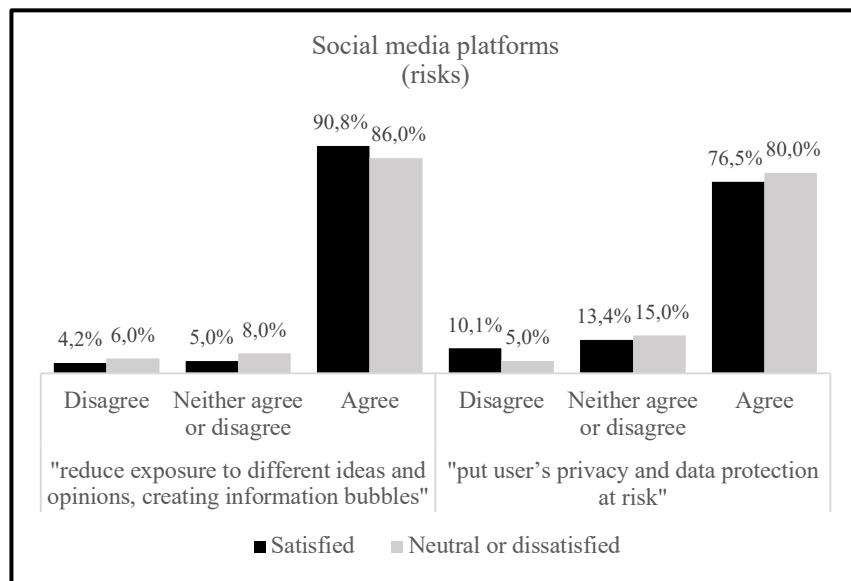


Figure 6. *Journalists' perceptions about risks in the use of social media platforms by overall satisfaction with the use of digital tools in their work*

Source: own elaboration. N=219.

In Figure 6, it is evident that both groups of journalists acknowledge the risks associated with social media algorithms, particularly their impact on limiting exposure to diverse opinions and creating information bubbles. Among journalists satisfied with digital tools, 90,8% express concern about this issue, compared to 86% of neutral or dissatisfied journalists. Similarly, regarding privacy and data protection risks, 76,5% of satisfied journalists recognize these concerns, while a slightly higher percentage (80%) is observed among neutral or dissatisfied journalists.

The focus groups provided deeper insight into how professionals navigate social media, balancing its utility for work with concerns about privacy, algorithmic influence and platform control over contents.

"I don't like to publish a lot of things. I really use it for work. I try to keep everything as private as possible so that they don't really impose anything on me that they think I like. And the same goes for the advertisements I see and all my settings, my definitions." (B2, female, 45-49 years, national, online)

“This [downgrade of visibility] is Meta’s algorithm trying to prevent our publications from reaching a wider audience or forcing us to pay.” (male, 50–54 years, regional, printed press)

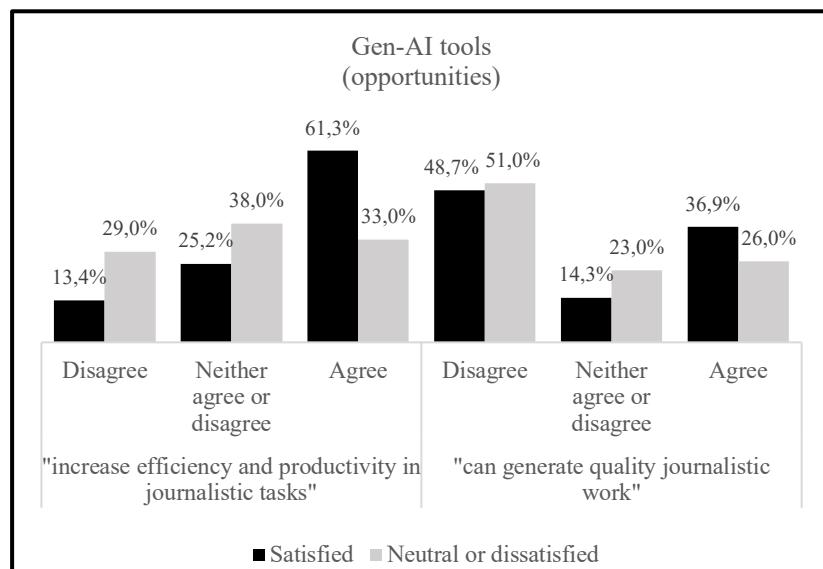


Figure 7. Journalists' perceptions about opportunities in the use of Gen-AI tools by overall satisfaction with the use of digital tools in their work

Source: own elaboration. N=219.

Figure 7 highlights journalists' perceptions of the opportunities presented by Gen-AI tools in journalism. Regarding efficiency and productivity, a majority of satisfied journalists (61,3%) agree that those tools enhance journalistic tasks, compared to only 33% of neutral or dissatisfied journalists. However, when it comes to the quality of journalistic work, opinions diverge. Nearly half of satisfied journalists (48,7%) express concerns about quality, while 36,9% believe Gen-AI tools can produce quality journalism, a sentiment similarly expressed by neutral or dissatisfied journalists.

Focus group participants who have been using Gen-AI tools express satisfaction with their ability to streamline tasks such as writing content, viewing them as valuable for optimizing time and resources.

“Right now, I’m interested in what these tools can do for me. As I have few resources, I have to use these tools in some way to help me speed up my work. But also to guarantee the results I’m asked to deliver. With the few people I have working, my management expects me to reach a certain level. (...) Imagine having a tool that’s going to write to me, that’s going to text a series

of topics, I've already gained 10 minutes there. That's good for my 8-hour day." (C3, male, 45-49 years, hyper-local, printed press)

Despite recognizing efficiency gains, most journalists in the focus groups stressed the need for oversight and critical judgment when using Gen-AI. Explicit concerns about its impact on journalistic quality were rare and voiced primarily by a small minority with greater expertise in these tools.

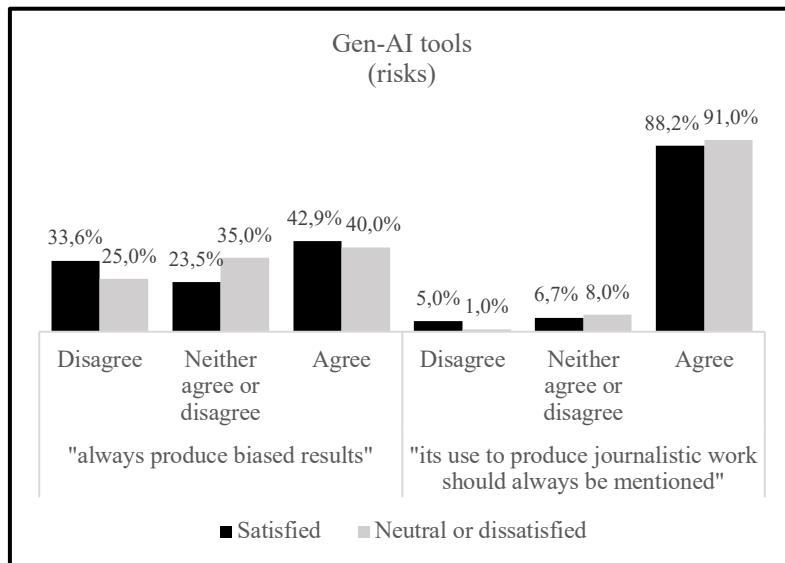


Figure 8. Journalists' perceptions about risks in the use of Gen-AI tools by overall satisfaction with the use of digital tools in their work

Source: own elaboration. N=219.

Figure 8 explores journalists' perceptions of the risks associated with Gen-AI tools. Both satisfied and neutral/dissatisfied journalists share similar, though not unanimous, views on algorithmic bias. Among satisfied journalists, 42,9% agree that AI algorithms always produce biased results, while 33,6% disagree. In the neutral/dissatisfied group, 40% agree and 25% disagree. On the other hand, a clear consensus emerges regarding transparency, with approximately 90% of both groups agreeing that the use of Gen-AI in journalistic work should always be disclosed.

Focus group discussions reveal an emotional and cautious stance among journalists regarding the risks of bias in Gen-AI, particularly with concerns about the intentions behind its programming.

"I want to keep a positive attitude towards this. And I think there will always be a human behind the machine. But I'm a little afraid that there might be a lot of malicious humans programming the machine. And, in fact, I think the scope

that this could have is worrying. So I'm a bit worried about that." (C1, female, 55-59 years, national, radio)

Most journalists express ethical concerns about Gen-AI and emphasize the need for transparency, agreeing on the importance of disclosing its use.

"It must be clearly identified that it is made with artificial intelligence." (A5, female, 45-49 years, national, online)

"The work being done today is very confusing to me. We never really know when it's a journalistic piece or when it's something generated by artificial intelligence." (male, 40-44 years, national, television)

When discussing transparency in the use of Gen-AI for journalistic work, participants frequently raised concerns about copyright and intellectual property, emphasizing its impact beyond creative professionals.

"For me, the issue of copyright is the most confusing and urgent. And I think that many people who aren't artists, illustrators or photographers, undervalue this issue. And I think it's one of the most fundamental (...) Work is being stolen" (B3, female, 30-34 years, national, online)

3.3. Behavioral dimension

The analysis of journalists' competence in using social media platforms for their work, on the one hand, and Gen-AI tools on the other, segmented by general satisfaction with digital tools, reveals some patterns of the intersection of the affective dimension with the behavioral dimension.

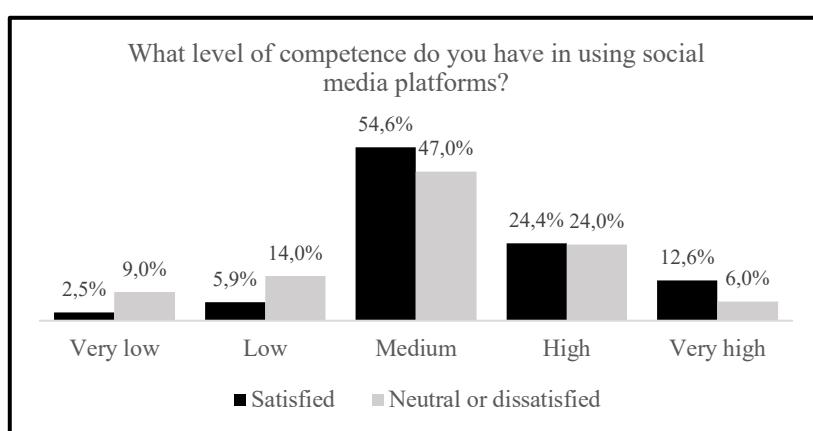


Figure 9. Competence of journalists in using social media platforms for work by overall satisfaction with the use of digital tools in their work

Source: own elaboration. N=219.

Figure 9 illustrates journalists' self-assessment of their competence in using social media for work. Among journalists satisfied with digital tools, most rate their competence as average (54,6%), with a significant portion considering it high or very high. In contrast, a smaller proportion of neutral or dissatisfied journalists rate their competence as very high (47%), with a larger group assessing it as low or very low.

As part of focus group discussing one participant highlighted the evolving skills required to effectively navigate those platforms, specifically mentioning the importance of adapting to changes in algorithms.

“With regard to dissemination, I think it's a good fourth place. I think that's where we need (...) to understand how they work and how algorithms can work in our favor as journalists, right? Because we want to promote our work. And, as we heard for a while, to publish on Facebook it works better if you have an image, or if you have a video. And then the rules change too, because the algorithms change, until there's no longer any interest in promoting news on social media. How do we then manage to use the algorithms in our favor on each of the platforms where we can be?” (A4, female, 40-44 years, national, online)

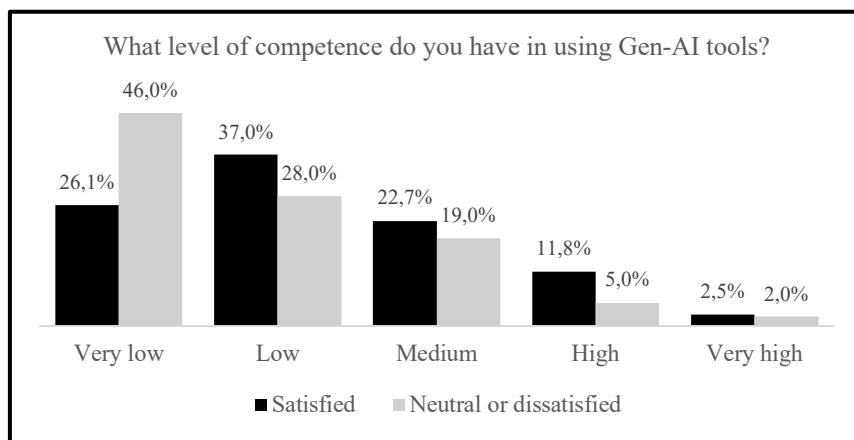


Figure 10. Competence of journalists in using Gen-AI tools for work by overall satisfaction with the use of digital tools in their work

Source: own elaboration. N=219.

Figure 10 shows the self-assessment of competence in using Gen-AI tools among journalists. Overall, Gen-AI competence is mostly seen as low or very low in both groups of journalists. However, this trend is particularly pronounced among those who are neutral or dissatisfied with digital tools, with a notably higher share indicating a very low level of competence (46% compared to 26,1%).

In the context of focus groups, there is limited use of Gen-AI tools, with participants reporting the same range of applications. Most utilize it for simpler tasks, such as headline suggestions or text summarization. One participant reflects on the potential of AI to act as a colleague, though only for less “serious” tasks, but reflecting important affective components of the relationship with algorithmic systems.

“Because as I work alone, sometimes I miss having a colleague in the newsroom who can talk to me. And sometimes I ask... You know that question you sometimes ask your colleague next to you? Sometimes it's a conversation that's not important at all. Sometimes you forget a word, the word slips out and sometimes I ask the artificial intelligence to remind me of a word I've missed. What's that actor's name again? More mundane things like that. It's nothing too serious like text editing.” (B2, female, 45-49 years, national, online)

4. Discussion and Conclusions

This case study highlights the critical role of algorithmic literacy in a news media environment where algorithmic systems increasingly mediate news production, distribution, and consumption. Understanding journalists' engagement with these technologies is essential not only for ensuring the integrity of journalistic practices but also for safeguarding their broader democratic role.

Given that journalists' satisfaction with digital tools may reflect distinct levels of acceptance of newer technologies such as Gen-AI, our research explores the following question: What differences exist between journalists who are satisfied with digital tools and those who are neutral or dissatisfied in terms of cognitive, affective, and behavioral dimensions of algorithmic literacy?

The findings confirm the distinction between cognitive and affective dimensions in technology adoption, as previously identified in the literature (Araújo et al., 2020; Silva et al., 2022). The affective dimension, measured by satisfaction with digital tools, did not show a direct correspondence with the cognitive dimension, measured through the definition of algorithm and ten other questions assessing their understanding of algorithmic functioning.

This separation between the affective and cognitive dimensions indicates that enthusiasm or skepticism toward digital tools does not necessarily correspond to higher technical knowledge. However, qualitative data from focus groups suggest that journalists who express greater interest in these technologies tend to actively seek information and exhibit more complex attitudes: a positive acceptance of technology coexists with more concrete and technical concerns about the risks associated with its implementation in journalism. In this sense the dynamics observed in the focus groups reveal that individual motivation, expressed through curiosity, self-learning habits and

perceived professional utility, can act as a mediating factor for both knowledge and attitudes, highlighting its role in shaping algorithmic literacy beyond formal technical expertise.

Regarding the affective dimension, both satisfied and neutral/dissatisfied journalists acknowledge the risks associated with algorithmic systems (such as biases, filter bubbles, and transparency concerns). Yet, satisfied journalists are more likely to recognize their potential benefits in terms of productivity and efficiency. Focus group discussions revealed that perceptions of risk differ by technological domain: while concerns about social media focused on broader societal implications, discussions about Gen-AI were primarily framed around ethical and deontological issues, as well as personal hesitations regarding adoption.

The “algorithmic imaginaries” (Butcher, 2012) and “folk theories” (DeVito, 2021) emerge more clearly in journalists’ discourse when discussing social media platforms. The longer exposure to these digital environments may contribute to a sense of familiarity, leading journalists to formulate more sophisticated, albeit speculative, assumptions about their understanding of how algorithms function. These perceptions are often framed in antagonistic terms toward big tech companies, as journalists recognize and internalize the logic of “surveillance capitalism” (Zuboff, 2019), understanding that the algorithms of social media platforms are designed primarily for economic and social control purposes. However, despite acknowledging these structural dynamics, journalists lack detailed knowledge of the specific algorithmic mechanisms that shape the visibility of journalistic content.

While those critical perspectives allow journalists to question the intentions of the human programmers behind algorithmic systems it also leads them to rely on fragile assumptions to interpret algorithmic behavior. This aligns with the idea that journalists use “guesswork and imagination” (Jones et al., 2022) to make sense of opaque and inaccessible algorithmic systems.

The behavioral dimension reveals that journalists who are more satisfied with digital tools rate their own competence in using social media and Gen-AI higher. This supports the argument that exposure to algorithmic systems does not guarantee homogeneous levels of algorithmic literacy (Powers, 2017). However, overall competence in Gen-AI remains significantly lower than in social media, a gap that was reinforced in focus group discussions. The adoption of algorithmic technologies in journalism thus has direct implications for professional routines (Svenson, 2022). Some journalists maintain an active presence on social media mainly due to professional obligations, while others – particularly those motivated by personal interest – reveal experimenting with Gen-AI tools despite persistent ethical and professional hesitations. This underscores again that individual motivation influence behavioral engagement and literacy development.

Our findings also point to relevant socio-demographic and professional differences in journalists’ perceptions and satisfaction with digital tools. One of the most pronounced contrasts is generational: younger journalists (18–34 years old)

demonstrate higher satisfaction with digital tools. This result may be linked to broader trends in which professionals working in online-only outlets also exhibit more positive attitudes toward technology. The organizational cultures of digital newsrooms, where technological tools have been integral since inception, help explain this difference (Crespo et al., 2020). Similarly, journalists in local or regional media show higher satisfaction with digital tools, which may be attributed to resource limitations that make technology central to optimizing journalistic tasks (Ríos-Rodríguez et al., 2022).

These patterns underscore the influence of newsroom conditions and professional backgrounds, suggesting that journalists' algorithmic literacy is shaped through the interaction of individual motivation and organizational factors.

Limitations and Future Research. Our study's limitations derive primarily from its focus on a single country, which, while relevant as an exemplary case of media literacy promotion (Chapman, 2016; ERGA, 2021), may not be fully representative of journalistic realities in other national contexts. Important contextual and cultural differences exist in how journalists interact with algorithmic technologies (Pranteddu et al., 2024). Additionally, although focus groups were employed to triangulate quantitative findings, the time constraints and interactive format may have limited the depth of discussions, particularly regarding the affective dimension.

Future research should therefore broaden the scope of analysis by adopting comparative, ethnographic, and longitudinal approaches capable of capturing the evolving interactions between journalists and algorithmic systems. Cross-national and cross-organizational comparisons would help illuminate how contextual, cultural, and institutional factors mediate journalists' attitudes toward and uses of algorithmic technologies. Ethnographic methods could be particularly valuable in capturing the evolving nature of algorithmic literacy in journalistic practice, particularly among the socio-professional groups that in our study exhibited distinct satisfaction levels with digital tools, namely younger journalists, those working in online outlets, and those employed in regional media. Longitudinal studies would allow researchers to trace changes in journalists' algorithmic literacy, particularly as Gen-AI tools and evolving algorithmic systems continue to transform newsroom practices.

In sum, this study shows that algorithmic literacy among journalists is multidimensional and context-dependent. The results reveal that while journalists share similar concerns about algorithmic power and opacity, their engagement levels and orientations toward technology differ according to individual motivation, professional setting, and generational background. These findings support a more integrated view of algorithmic literacy as a dynamic interplay of knowledge, attitudes, and practices, influenced by both structural conditions and individual agency.

Ultimately, our study underscores the importance of fostering algorithmic literacy among journalists, not only as a means of technical skill development but as a critical

competency necessary for navigating the ethical, social, and professional challenges posed by algorithmic systems in journalism.

Appendix

Table A. Characteristics of survey respondents

		n	%
Total		219	100%
Gender	Male	118	53,9%
	Female	101	46,1%
Age	18 to 34 years old	28	12,8%
	35 to 54	133	60,7%
	55 and above	58	26,5%
Education level	Secondary education	37	16,9%
	Tertiary education	182	83,0%
Type of media and format	Printed press	121	55,3%
	Radio	36	16,4%
	Television	21	9,6%
	Online	41	18,7%
Media coverage area	National	139	63,5%
	Regional	46	21,0%
	Local	27	12,3%
	Hyperlocal	7	3,2%

Source: own elaboration

Table B. 10 true/false statements regarding cognitive dimension

Statement	Correct response s%
The results of an algorithm can be biased due to incorrect data (input)	99,1%

Algorithms, in the form of social bots, can be used to automatically distribute opinions and information on social networking sites	97.3%
What people do on the Internet, influences the databases used in an algorithm and may change its function in the future	96.8%
I can influence algorithms with my internet usage behavior	96.3%
The use of algorithms that classify people based on certain criteria can lead to systematic discrimination of some people	90.9%
The use of algorithms which deliver personalized content can mean that the content you find is mostly consistent with your pre-existing opinions	82.2%
The results of algorithms always differ strongly from the decisions humans would make	79.9%
Algorithms can only run predefined processes	65.3%
It can easily be identified, if algorithms discriminate against certain persons	64.8%
The database used by an algorithm is not decisive in determining its quality	49.3%

Source: own elaboration

Note: incorrect statements are marked with strikethrough

Table C. Main themes and research focus of the Focus Groups

Algorithmic experience's dimensions	Theme	Research focus
Cognitive	Presence and influence of algorithmic systems	Recognition of the influence of algorithmic systems in daily life. Identification of tools used in journalistic routines.
Cognitive / Affective	Algorithmic systems in journalistic work	Identification of main advantages and disadvantages of application. Ranking responses according to patterns of perceived importance.
Affective	Deontological considerations on algorithmic bias	Reflection on ethical principles from the Paris AI Charter through discussions of Gen-AI use cases in Portuguese media.
Behavioral	Algorithmic recommendation systems	Sharing experiences and discussion about content recommendation settings on social media, including if and how journalists adjusted them.

Behavioral	AI-driven tools adopted in newsrooms	Discussion about AI-driven tools in newsrooms, including if and how they are being used.
	AI training in newsrooms	Identification of training initiatives, including past experiences.

Source: own elaboration

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