

# Technological dependence and outsourcing for innovation in journalism in Spanish media outlets (2014-2021)

## *Dependencia y externalización tecnológica en las innovaciones periodísticas de los medios españoles (2014-2021)*



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### Abstract:

Journalism and technology have always gone hand in hand, but the growth of technological progress and the resulting fascination have led to a lack of critical perspective. This study combines quantitative and qualitative methodologies to shed light on this intersection, with innovation at its core. First, the most prominent news organizations in the Spanish ecosystem in recent years (2014-2021) were identified. Next, all the innovations they implemented during that period were tracked. Lastly, the weight of technology in their innovations was analyzed using three variables: creator, change over time, and the nature of the organizations. The results reveal that approximately two-thirds of the innovations implemented are linked to technology, thereby corroborating its importance for progress in journalism. However, the results also confirm the existence of many initiatives independent of technological progress, particularly in the organizational sphere. In terms of the creators, third-party technologies predominate, with a spike in 2020 in response to the health crisis. These findings allow us to delve into the correlation between technological innovation, the social context and the reliance on big tech.

### Keywords:

Technology; innovation; journalism; platformization; media ecology.

### Resumen:

*Periodismo y tecnología siempre han ido de la mano, pero el creciente avance técnico y su consiguiente fascinación ha degenerado en una falta de perspectiva crítica. Este estudio combina metodologías cuantitativas y cualitativas para arrojar luz sobre esta intersección, con la innovación como eje central. En primer lugar, se identificaron las organizaciones periodísticas más destacadas en el ecosistema español en los últimos años (2014-2021). A continuación, se rastrearon todas las innovaciones que habían implementado en ese periodo. Finalmente, se analizó el peso de la tecnología en sus innovaciones a partir de tres variables: la autoría, la evolución temporal y la naturaleza de las organizaciones. Los resultados revelan que aproximadamente dos terceras partes de las innovaciones adoptadas tienen relación con la tecnología, lo que corrobora su importancia para el avance del periodismo. Sin embargo, se confirma la existencia de un gran número de iniciativas independientes del progreso técnico, sobre todo en el ámbito organizacional. En cuanto a la autoría, predominan las tecnologías ajenas, que presentan un pico en el año 2020 como respuesta a la crisis sanitaria. Estos hallazgos permiten ahondar en la interrelación entre la innovación tecnológica y el contexto social y en la dependencia de los gigantes tecnológicos.*

### Palabras clave:

*Tecnología; innovación; periodismo; plataformaización; media ecology.*

## 1. Introduction

Technology is part of journalism's essence (López-García and Vizoso, 2021). From the mass distribution of printed paper (Primo and Zago, 2015) to the automated and personalized generation of news (Jones and Jones, 2019; Lindgren, 2021), professionals have harnessed technological progress to offer a better product and expand its scope (Schapals and Porlezza,

2020). Additionally, digital media outlets have expanded the impact of technology on all aspects of journalism (Manovich, 2002: 64). Technology is viewed as “essential” for innovation in any activity, including journalism (Moreira Flores, 2017: 160). However, in recent decades, its nature and evolution have become the subject of constant debate (Smith, 1983: 47; García Avilés, 2021: 2).

Technological innovation pushes the boundaries of journalism (Lewis, 2012) and invites journalists to reconsider their professional identity (Deuze, 2005). According to certain authors, the importance and interdependence of technology in the profession can be exaggerated. For years, critique of technological determinism and “technomyopia,” as referred to by Paul Saffo (cited in Fidler, 1997: 11), has noted that the persuasive appeal of new technologies fosters the creation of utopias and hinders reflection on more fruitful lines of research (Almirón and Jarque, 2008: 103). This matter has also been addressed through research on innovation in journalism, within the context of *media ecology*. It would be necessary to look beyond specific practices and evaluate the impact of technology on spheres such as social change (García Avilés, 2021: 4) because it significantly alters journalists’ work and the quality of the resulting product (Franciscato, 2010).

In any case, once a technology becomes widespread, understanding its configuration and development is extremely useful (Postman, 1992: 7). A technology’s history shapes the design of the industrial structures linked to it (Dosi, 1982: 147). According to the so-called *platformization* of cultural industries, media outlets become excessively reliant on companies that are solely technology-based, and this ultimately has socioeconomic impacts on the industry, organizations and audiences (Simon, 2022; Steensen and Westlund, 2020; Nieborg and Poell, 2019). This phenomenon poses an increasingly greater challenge, and media outlets use different approaches in response to it, from adopting third-party technologies to investing in in-house technological developments (Simon, 2022).

The study of technological progress is of broad interest to journalism but requires a focus that prevents technological determinism and the denial of technology’s influence. From this perspective, and through the theoretical framework of *media ecology* and the *platformization* of news, this article aims to analyze the presence of technology in journalism innovation. In addition to analyzing the interdependence, the goal is to also clarify who creates the technological advances used in these innovations, as well as the years and types of initiatives on which the technology has the greatest impact. To do so, 25 of the most prominent innovative journalism projects in Spain were selected and the variables linked to technology in the innovations implemented between 2014 and 2021 were analyzed.

### 1.1. *Technology-based innovation*

Change in the media is driven and accompanied, sometimes in contradictory or unexpected directions, by the production, access and use of technology, interdependent with other forces such as politics or the market (McQuail, 1990). Technology contributes to innovation (Moreira Flores, 2017), although through mechanisms that are more complex than by simply adjusting to technical changes (Storsul and Krumsvik, 2013).

Traditional newsrooms were organized in such a way that news editors were kept separate from technicians (Boczkowski 2004; Usher 2014). In the last decade, however, technical and journalistic profiles have become hybridized due to the emergence of native-digital media outlets, the introduction of media labs geared toward innovation (Hogh-Janovsky and Meier, 2021;

Zaragoza Fuster and García Avilés, 2022), and the implementation of agile and collaborative workflows (Valero-Pastor et al., 2019).

In this sense, the proliferation of numerous startups linked to communication has blurred the lines between purely technology companies and news organizations (Carlson and Usher, 2016: 10). According to Carlson and Usher (2016), some of these organizations sought openly to eliminate the separation between journalistic and technological identities. By “breaking down” these barriers, organizations can improve their products and the consumption of news, particularly through the user experience.

Post-industrial journalism startups (Anderson et al., 2015) resemble new technology-based firms (NTBFs). These organizations, which are widely studied from economic and business perspectives (Arantes et al., 2019: 63), are defined as those that obtain a competitive advantage in the ongoing search and application of advanced technical and scientific knowledge (Garrido et al). Due to their nature, these organizations are primarily responsible for spreading innovation in the industry and therefore in society (Aldeano and Magdaleno, 2007), with technology is one of the dominant traits (Arantes et al., 2019: 49).

However, most of these research efforts suffer from a certain degree of technological determinism and limited critical reflection on the technological nature of the innovations implemented. Worth noting is the contribution by Granstrand (1998: 487), who highlights the two sides of technology –soft and hard– framed in a “dynamic body of knowledge” and linked to the transformational processes within organizations. In this sense, technology could also be viewed as a knowledge resource because it forms part of a company’s intellectual capital and shares the general characteristics of knowledge, conferring it the possibility of scale, scope, speed and space for change.

### *1.2. Adoption of technology in ongoing transformation*

Conventional models that represent the diffusion of innovation highlight the importance of adopters of new technologies (Vargo, 2020). According to the classic theory developed by Rogers (1962), the diffusion of innovation is not linear but rather depends on various phases and the attitude of everyone involved (producers and recipients). However, for innovation to spread throughout an organization, it must be implemented holistically and in all areas, not just through management (García-Avilés, 2020).

There are primarily two approaches that explain the adoption of a specific technology: “demand-pull” and “technology-push” theories (Peters et al., 2012). According to Dosi (1982: 148-149), “demand-pull” hypotheses point to the market and consumption habits as the catalysts for technological development. In other words, companies perform a “needs analysis” on the audience and decide to allocate technological efforts accordingly. “Technology-push” theories, on the other hand, argue that changes in society are determined by the technological advances developed independently by companies. The two approaches coexist at odds with one another and are independently unable to account for the factors that drive technological innovations. This theoretical approach coincides with that of Smith (1983: 291), in which technological advances hover between existing needs in the beginning but can then create new opportunities.

Although recent studies shed light on the characteristics of certain technological changes, they continue to be insufficient given the diversity of variation patterns, prospects and analysis dimensions. According to Gynnild (2014: 727), the advances linked

to the development of algorithms, the use of big data and the adoption of social science methods rely less on technological creation than on the values, objectives and development of the interactive skills of news professionals.

The *media ecology* theory, originally outlined by McLuhan in 1964 (Richard and Turner, 2010), states that all change affects the entire system to a greater or lesser degree because it is neither additive nor subtractive (Postman, 1992: 18). Neil Postman argues that technology has an impact on society as well as on what and how people think. This theory garners special interest to explain the correlation and evolution of the elements of communication (Scolari, 2012: 218) through the concept of remediation, which is “the representation of one medium inside another” (Scolari, 2013: 51), leading to the analysis of media outlets as settings where communication flows fluidly.

Technology never behaves in a neutral manner (Díaz Noci, 2001: 1), but rather it has a constant connection with its social context (McQuail, 2010: 39). According to Fidler (1997: 23), the media’s mutation, or “mediamorphosis,” poses the need to study all the elements of an interdependent system as well as to analyze the similarities and relationships between past, current and emerging media outlets. Along these lines, all technological evolutions entail a gain and a loss in a generally complex and asymmetrical process (Piscitelli, 2005: 21). In the same way that demand-pull theories focused on “needs” to create a specific technology, new media outlets appropriate techniques, forms and social meaning from others. A media outlet does not operate in an isolated manner but rather through an ongoing relationship built on respect and rivalry with its competitors (Landow, 2006: 65).

As a result, technologies not only project and amplify industry trends but also allow employees to establish their professional identities. However, technology can also be a source of conflict, tension and frustration in news organizations, with negative consequences because it is oftentimes “imposed from above” and can disrupt informal hierarchies (Deuze, 2008: 204). This leads to the aforementioned professional divides, although it also opens the door for the creation of technology-based firms that offer greater “technological dynamism” and break the inertia of organizations (Fontes and Coombs, 2001: 79).

### 1.3. *The platformization of news*

Cultural production does not occur independently of the social and technological context. In the West, news organizations –and companies from other industries, such as the video game segment –are “contingent on” a group of platforms that include Apple, Google and Meta (Nieborg and Poell, 2019). According to these authors, this complex process has been analyzed from the perspective of the economy, politics and software: *platformization*.

*Platformization* can be defined as “the penetration of economic, governmental, and infrastructural extensions of digital platforms into the web and app ecosystems, fundamentally affecting the operations of media industries and production practices” (Nieborg et al). This definition underscores the socioeconomic implications that go beyond the technological advances of these platforms and have a bearing on the media industry due to their dependence on “U.S.-technology giants” (Simon, 2022). According to this author, platforms are contributing to the transformation of processes at news organizations: from providing services to assisting with research and technological development.

This dependency began between 2007 and 2008, and continued to grow in the subsequent years due to mobile consumption, which these companies have even more control over (Steensen and Westlund, 2020: 40). Additionally, the introduction of

artificial intelligence (AI) in newsrooms could increase the reliance of news organizations on the technology companies that provide these types of services (Simon, 2022).

This creates several different paths within the relationship between media companies and platform companies (Gorwa, 2019: 856; López-García and Vizoso, 2021). In the first, companies can develop in-house technology. This particularly applies to startups that have been founded as an alternative to traditional media outlets and have implemented innovations that are extremely challenging for most legacy media outlets to achieve (Valero-Pastor and González-Alba, 2018). Investments made by media outlets for in-house developments are viewed as a response to the risk of losing skills, which would further widen the gap between news organizations and big tech, and cement an already asymmetrical relationship (Simon, 2022: 17).

In the second, as Simon (2022) explains, platform companies sometimes operate as “partners” for media outlets in the research and development of technology; in other words, the technology has a shared origin and both parties benefit. In the third, media outlets are completely dependent on these companies because news organizations either hire a third party to develop a specific technology or they benefit from existing platforms. According to Ekström and Westlund (2019: 259), these platforms offer “a digital infrastructure with diverse kinds of information and communication, as well as opportunities to produce, publish and engage with content.”

Through the theoretical framework of *media ecology* and the *platformization* of news, this article aims to analyze the presence of technology in journalism innovations at Spanish media outlets. This reflection will help pave the way to classify and conceptualize the use of technology in the media and study the social repercussion of technological advances from a non-deterministic perspective. Based on these theories, the following research questions are considered:

RQ1. To what degree do the journalism innovations implemented in Spain between 2014 and 2021 depend on technology?

RQ2. What years, areas of innovation and types of news organizations have been impacted the most by technology?

RQ3. Who creates the technology used in these innovations?

## 2. Methodology

This study combines quantitative and qualitative methodologies to calibrate the relationship between technology and innovation in journalism. The work is limited to the Spanish media ecosystem between 2014 and 2021, and covers journalism innovations of various origins, sizes and purposes. To answer the research questions, the innovations implemented in the industry were tracked and their relationship with technology was evaluated. Finally, the results were individually quantified to determine the preponderance of multiple variables: the media outlets in which they appeared and when, and what area they affect. This methodology was applied in two consecutive phases: a) selecting 25 of the most prominent innovative journalism projects in Spain, and b) analyzing the variables linked to technology in the innovations between 2014 and 2021.

## 2.1. Selecting the organizations

To select the sample of 25 journalism projects, a panel of experts (n=22) consisting of individuals from academia, the industry and other fields, such as media consulting and journalism associations, was created. The 50 experts initially proposed were selected through purposive sampling based on subject knowledge criteria, professional profile, parity and geographic diversity (Koerber and McMichael, 2008). The 22 experts who agreed to participate were interviewed between January and March 2021, and their responses were subsequently anonymized<sup>1</sup>.

**Table 1. Panel of experts**

| Job title               | Area            | Location | Gender | Age |
|-------------------------|-----------------|----------|--------|-----|
| Director of Design      | Media           | Madrid   | Male   | 38  |
| Editor in Chief         | Media           | Madrid   | Female | 40  |
| Professor of Journalism | University      | Pamplona | Male   | 50  |
| Professor of Journalism | University      | Seville  | Male   | 45  |
| Professor of Journalism | University      | Madrid   | Male   | 45  |
| Professor of Journalism | University      | Murcia   | Male   | 45  |
| Professor of Journalism | University      | Madrid   | Female | 35  |
| Director of Innovation  | Media           | Madrid   | Male   | 40  |
| Content Manager         | Media           | Madrid   | Male   | 60  |
| Audience Consultant     | Consulting firm | Madrid   | Male   | 38  |
| Audience Consultant     | Consulting firm | Madrid   | Male   | 55  |
| CEO                     | Consulting firm | Madrid   | Male   | 58  |

<sup>1</sup> This study has been evaluated by the Office of Research Ethics at Miguel Hernández University, where it was carried out and granted a Code of Responsible Research.

|                       |             |           |        |    |
|-----------------------|-------------|-----------|--------|----|
| CEO                   | Startup     | Madrid    | Male   | 42 |
| Analyst               | Startup     | Madrid    | Female | 42 |
| Head of Communication | Association | London    | Male   | 40 |
| Head of Communication | Association | Madrid    | Male   | 35 |
| President             | Association | Valencia  | Female | 35 |
| Product Manager       | Media       | Madrid    | Female | 44 |
| Assistant Director    | Media       | Madrid    | Male   | 44 |
| Founder               | Startup     | Barcelona | Female | 49 |
| CEO                   | Media       | Madrid    | Female | 54 |
| Innovation Manager    | Media       | Barcelona | Male   | 53 |

Source: prepared by the authors

The participants were asked to mention innovative Spanish news organizations and explain their answers (P1). They were also asked to propose noteworthy journalism innovations (P2). These mentions were quantified and entered into a database containing 78 innovative news organizations. To choose the final sample for the study, their weight was calibrated based on the number of mentions by experts and the number of social media followers. These data were collected for all the media outlets on April 20, 2021.

**Table 2. Coding the types of expert and social relevance of the media outlets analyzed**

| Media outlet       | Expert relevance (66.6%)      |                             | Social relevance (33.3%) |                     |                      | Final score |
|--------------------|-------------------------------|-----------------------------|--------------------------|---------------------|----------------------|-------------|
|                    | P1 (organizations)<br>(33.3%) | P2 (innovations)<br>(33.3%) | Twitter<br>(11.1%)       | Facebook<br>(11.1%) | Instagram<br>(11.1%) |             |
| <i>El País</i>     | 16                            | 10                          | 8,000,000                | 5,338,864           | 1,100,000            | 80.39       |
| <i>Eldiario.es</i> | 17                            | 14                          | 1,200,000                | 577,447             | 156,200              | 69.96       |



|                         |    |    |           |           |           |       |
|-------------------------|----|----|-----------|-----------|-----------|-------|
| <i>El Confidencial</i>  | 13 | 13 | 914,200   | 1,073,454 | 143,500   | 60.34 |
| <i>RTVE</i>             | 10 | 12 | 1,200,000 | 779,439   | 267,800   | 52.19 |
| <i>Maldita</i>          | 11 | 8  | 118,900   | 63,000    | 54,100    | 41.06 |
| <i>Newtral</i>          | 9  | 6  | 189,100   | 34,000    | 40,700    | 32.38 |
| <i>El Mundo</i>         | 5  | 3  | 3,900,000 | 2,656,585 | 516,400   | 29.29 |
| <i>El Español</i>       | 10 | 3  | 430,100   | 735,000   | 92,000    | 29.13 |
| <i>Marca</i>            | 2  | 0  | 5,500,000 | 4,910,221 | 2,600,000 | 28.83 |
| <i>Civio</i>            | 5  | 7  | 45,200    | 10,000    | 2,364     | 26.56 |
| <i>Datadista</i>        | 3  | 7  | 26,300    | 8,287     | 868       | 22.61 |
| <i>La Vanguardia</i>    | 4  | 1  | 1,200,000 | 4,407,727 | 542,000   | 22.53 |
| <i>Revista 5W</i>       | 4  | 3  | 55,200    | 17,330    | 25,100    | 15.17 |
| <i>Kloshletter</i>      | 4  | 2  | 4,774     | 1,326     | 1,788     | 12.62 |
| <i>Diari ARA</i>        | 3  | 2  | 534,800   | 291,000   | 158,700   | 12.42 |
| <i>Antena 3</i>         | 1  | 0  | 1,400,000 | 1,943,790 | 403,000   | 9.04  |
| <i>La Sexta</i>         | 1  | 1  | 1,000,000 | 480,149   | 125,100   | 7.07  |
| <i>Jot Down</i>         | 0  | 2  | 292,000   | 193,517   | 42,200    | 5.68  |
| <i>El Orden Mundial</i> | 0  | 2  | 270,800   | 109,332   | 36,900    | 5.47  |
| <i>Matthew Bennet</i>   | 0  | 2  | 119,100   | 0         | 275       | 4.93  |
| <i>TV3</i>              | 1  | 0  | 606,100   | 598,828   | 270,000   | 4.78  |

Source: prepared by the authors

## 2.2. Identifying and analyzing innovations

To identify the innovations of the 25 organizations selected, a qualitative analysis was performed of the content obtained from document sources (academic databases, Spanish and international portals specializing in journalism innovation, corporate blogs of projects) and the experts were interviewed. The innovations identified in this process (n=363) were listed in a spreadsheet that was then filtered using the consensus group technique to detect redundancies or inconsistencies.

During the last phase of the research, the decision was made to omit four media outlets from the sample: the consulting firms Narrativa and Prodigioso Volcán, Ibai Llanos and Podium Podcast. Although they can all be found within the communication ecosystem and have a significant influence on the industry's evolution, it was deemed more appropriate to exclude their innovations from this study because they veer away from the creation of strictly journalism products. The final list contained 21 organizations and 243 innovations.

The innovations then underwent a qualitative analysis to determine their link to technology. Using the methodology created to study innovation in journalism (Carvajal *et al.*, 2015) and applied to the Innovation in Journalism Ranking (De Lara *et al.*, 2015; García-Avilés *et al.*, 2018), they were grouped into three categories:

1. Technological innovations. Those in which technological progress plays a fundamental role in the concept of the innovative idea, such as developing applications, programming with AI and using hardware.
2. Innovations made possible thanks to technology or based on technology. This is attributed to ideas in which technology is not essential but rather a prerequisite for development. Examples include creating niche podcasts and newsletters or hosting digital events.
3. Non-technological innovations. In this case, neither the idea nor the execution relies on technology, such as when creating newsroom teams or adopting new editorial focuses.

The qualitative analysis also identifies the creator of the technology used in the innovations. According to the proposal by Simon (2022) on the media's *platformization*, there are three categories:

1. Outsourced. Those developed exclusively by third parties. They include everything from designs that have been outsourced to a third party (and therefore have ownership rights), to the use of products created by other entities (with or without financial remuneration).
2. In-house. The organization uses its resources to drive the initiative from beginning to end.
3. Mixed. Other actors operate as partners in developing new technological ideas.

This classification was created by the research team using the double-blind method. The innovations were first evaluated individually by two authors using separate spreadsheets to avoid bias in the analysis, and then by the rest. The innovations that garnered consensus from the researchers were approved, whereas those that raised doubts were discussed using the consensus group technique in which standardized criteria were defined for similar cases. For example, it was decided that paywalls would be viewed as innovations "made possible by technology" because the innovative aspect is the shift toward a subscription model, except in the case of paywalls in which technology plays a central role, such as algorithmic ones.

These two category blocks were combined with three independent variables:

1. Date. The years when the innovations were implemented (between 2014 and 2021) were logged. Dates could not be assigned to 25 innovations (9.7% out of the 259 in total) due to a lack of information.
2. Areas of innovation. Based on existing research (De Lara *et al.*, 2015; García Avilés *et al.*, 2018), distinctions were made between a) production, b) distribution, c) organization, d) and marketing.
3. Organizations. In addition to registering and analyzing each media outlet separately, the different types were defined according to a) the parent company (press, radio, television or native digital), b) the editorial focus (mainstream or specialized), and c) the size (large, medium/small -in line with the SME concept- or one-person).

### 3. Results

The findings show that technology is linked to nearly two-thirds of the innovations registered in the last eight years. This panoramic perspective also reveals that it is more common for media outlets to outsource their technological development and that they rarely partner with technology companies.

#### 3.1. Change over time

**Table 3. Technology-based by year**

| Year | Technological |        | Technology-based |        | Non-technological |        | Total |        |
|------|---------------|--------|------------------|--------|-------------------|--------|-------|--------|
|      | N             | %      | N                | %      | N                 | %      | N     | %      |
| 2014 | 2             | 22.22% | 2                | 22.22% | 5                 | 55.56% | 9     | 4.05%  |
| 2015 | 12            | 38.71% | 12               | 38.71% | 7                 | 22.58% | 31    | 13.96% |
| 2016 | 10            | 45.45% | 4                | 18.18% | 8                 | 36.36% | 22    | 9.91%  |
| 2017 | 8             | 34.78% | 3                | 13.04% | 12                | 52.17% | 23    | 10.36% |
| 2018 | 13            | 33.33% | 10               | 25.64% | 16                | 41.03% | 39    | 17.57% |
| 2019 | 5             | 19.23% | 12               | 46.15% | 9                 | 34.62% | 26    | 11.71% |
| 2020 | 16            | 30.19% | 18               | 33.96% | 19                | 35.85% | 53    | 23.87% |

|              |    |        |    |        |    |        |     |         |
|--------------|----|--------|----|--------|----|--------|-----|---------|
| <b>2021</b>  | 6  | 31.58% | 9  | 47.37% | 4  | 21.05% | 19  | 8.56%   |
| <b>Total</b> | 72 | 32.43% | 70 | 31.53% | 80 | 36.04% | 222 | 100.00% |

Source: prepared by the authors

Although the change over time of purely technological innovations does not reveal a clear trend, it shows certain growth over the years.

The number of non-technological innovations is lower in the last year of the sample, most likely due to the pandemic. In turn, this variable peaked in 2014 and 2017, surpassing half of the innovations registered at a time when the creation of multidisciplinary teams gained importance, as in the case of *El País*, *El Confidencial*, *El Mundo* and *El Español*. 2016 was also a fruitful year in this regard, particularly due to the innovations linked to organizational aspects, such as promoting alliances between media outlets to improve the distribution and impact of products. Examples include partnerships between *El Confidencial* and PorCausa; *El Confidencial* and WebLogsSL; the sale of joint subscriptions between *Eldiario.es*, Mongolia and Carne Cruda; alliances between *Eldiario.es*, *El Faro* (Mexico) and *Ballena Blanca*; and participation in international consortia, as in the case of *El Mundo* in the “football leaks” investigation.

Table 4. Creators of innovation by year

| Year         | Outsourced |        | In-house |        | Mixed |        | Total |         |
|--------------|------------|--------|----------|--------|-------|--------|-------|---------|
|              | N          | %      | N        | %      | N     | %      | N     | %       |
| <b>2014</b>  | 1          | 25.00% | 3        | 75.00% | 0     | 0      | 4     | 2.82%   |
| <b>2015</b>  | 14         | 58.33% | 8        | 33.33% | 2     | 8.33%  | 24    | 16.90%  |
| <b>2016</b>  | 6          | 42.86% | 3        | 21.43% | 5     | 35.71% | 14    | 9.86%   |
| <b>2017</b>  | 3          | 27.27% | 7        | 63.64% | 1     | 9.09%  | 11    | 7.75%   |
| <b>2018</b>  | 11         | 47.83% | 10       | 43.48% | 2     | 8.70%  | 23    | 16.20%  |
| <b>2019</b>  | 5          | 29.41% | 8        | 47.06% | 4     | 23.53% | 17    | 11.97%  |
| <b>2020</b>  | 16         | 47.06% | 6        | 17.65% | 12    | 35.29% | 34    | 23.94%  |
| <b>2021</b>  | 7          | 46.67% | 6        | 40.00% | 2     | 13.33% | 15    | 10.56%  |
| <b>Total</b> | 63         | 44.37% | 51       | 35.92% | 28    | 19.72% | 142   | 100.00% |

Source: prepared by the authors

The analysis of the source of innovations over time reveals that in 2015 (by percentage) and 2020 (by absolute value), news organizations were more technologically reliant on third-party firms. This makes it possible to establish a connection with the platformization phenomenon, which is explained further on. An aspect that stands out about 2015, for example, is Telegram's penetration in news organizations as a new vehicle for internal and external communication, in the form of a newsletter, as in the case of *Eldiario.es* and *laSexta*.

In 2020, in response to the pandemic, incremental innovations based on existing technologies were introduced and gained importance due to the social context and the need to prioritize virtuality. These include videoconferencing platforms used by media outlets at various parent companies, as well as QR codes, which became particularly popular in television networks. Additional examples are themed newsletters based on third-party technology and new channels on Twitch and TikTok, as in the case of the verifiers *Maldita* and *Newtral*, respectively.

Technology developed internally by news organizations reached maximum figures in 2014 and 2017, particularly with the introduction of AI tools. The cases involving *El País* and *El Confidencial* stand out.

However, the trend varies for the results of the “mixed” category, in which other actors serve as partners for the developments. In fact, the category does not include any innovations of this type in 2014. The maximum figures appear in 2016 and 2020. Items that stand out are data visualization (with the popularity of tools like Flourish and Datawrapper) and advances in marketing strategies with the introduction of paywalls and digital subscriptions (*La Vanguardia* and *El País*) that required hybrid partnerships.

### 3.2. Areas of innovation

The analysis of the presence of technology in various areas of innovation reflects major differences. In terms of marketing (the area with the fewest innovations registered), most of the innovations (nearly double the purely technological ones) are technology-based. Advances in paywalls, subscriptions and memberships, like the ones at *El País*, *Eldiario.es* and *El Mundo*, are several paradigmatic examples of this trend. Non-technological innovations hardly represent one-third of the total, along the same lines as the overall average.

**Table 5. Technology-based by area of innovation**

| Area         | Technological |        | Technology-based |        | Non-technological |        | Total |        |
|--------------|---------------|--------|------------------|--------|-------------------|--------|-------|--------|
|              | N             | %      | N                | %      | N                 | %      | N     | %      |
| Marketing    | 11            | 22.92% | 20               | 41.67% | 17                | 35.42% | 48    | 19.75% |
| Distribution | 31            | 39.74% | 44               | 56.41% | 3                 | 3.85%  | 78    | 32.10% |
| Organization | 7             | 12.07% | 5                | 8.62%  | 46                | 79.31% | 58    | 23.87% |

|                   |    |        |    |        |    |        |     |         |
|-------------------|----|--------|----|--------|----|--------|-----|---------|
| <b>Production</b> | 28 | 47.46% | 9  | 15.25% | 22 | 37.29% | 59  | 24.28%  |
| <b>Total</b>      | 77 | 31.69% | 78 | 32.10% | 88 | 36.21% | 243 | 100.00% |

Source: prepared by the authors

In the case of innovations related to content distribution, more than half are made possible thanks to technology. The use of social media and other distribution platforms, such as podcasts and newsletters, are some of the most common examples. Non-technological innovations are virtually inexistent in this category, except for alliances with big tech firms like Amazon.

However, in the area of organization, nearly all of the innovations are developed without technology. Building teams, introducing work dynamics and participating in training programs are some of the most common examples. Of the purely technological innovations, the creation of content management systems (CMS), such as the one at *Diari Ara*, and the use of AI to improve workflows, like the one linked to the documentation at La Sexta, are usually at the top of the list. For those that are technology-based, with a weight similar to the previous category, partnerships with third parties stand out, such as the example between *Newtral* and Facebook.

On the other hand, in the area of production, technological development prevails, representing nearly half of the total. An aspect that stands out is the creation of in-house tools, such as those used to automate content processing through AI, like the ones developed by *Newtral*. Also worth noting is the acquisition of technological material, usually by television networks, to harness phenomena such as augmented reality.

Table 6. Creators of initiatives by area of innovation

| Area                | Outsourced |        | In-house |        | Mixed |        | Total |         |
|---------------------|------------|--------|----------|--------|-------|--------|-------|---------|
|                     | N          | %      | N        | %      | N     | %      | N     | %       |
| <b>Marketing</b>    | 12         | 38.71% | 8        | 25.81% | 11    | 35.48% | 31    | 20.00%  |
| <b>Distribution</b> | 38         | 50.67% | 24       | 32.00% | 13    | 17.33% | 75    | 48.39%  |
| <b>Organization</b> | 7          | 58.33% | 4        | 33.33% | 1     | 8.33%  | 12    | 7.74%   |
| <b>Production</b>   | 12         | 32.43% | 19       | 51.35% | 6     | 16.22% | 37    | 23.87%  |
| <b>Total</b>        | 69         | 44.52% | 55       | 35.48% | 31    | 20.00% | 155   | 100.00% |

Source: prepared by the authors

When these variables are cross-referenced with the creators of technology-based innovations, significant variations appear throughout the areas. The low weight of in-house development in marketing stands out and is primarily limited to detecting adblockers at *El Confidencial* and *La Vanguardia*, and promoting subscriber participation at *Diari ARA* and *El Español*. In turn, joint technology development between media outlets and third parties for improving paywalls at newspapers with traditional print versions, like *El País*, *El Mundo* and, once again, *La Vanguardia*, is noteworthy.

In the area of distribution, the presence of third-party technology stands out. Reliance on social media or text, audio and video distribution platforms is the main explanation, although the aforementioned use of QR by television networks must also be highlighted. Third-party technology plays an even bigger role in the area of organization due to the rise of remote work following the pandemic. This trend is inverted in the area of production, which has the lowest use of third-party technology and its weight stands out. The casuistry varies significantly and is usually in the form of specific products for creating differentiated content for data visualization.

### 3.3. News organizations

The analysis of the presence of technology in innovation at each organization reveals several paradigmatic cases. Eminently technological advances surpass more than half of the total at Antena 3, La Sexta and TV3, but they represent less than one-fourth of the total at *El Español*, *Eldiario.es*, *Maldita* and RTVE. In-house technology is not present in organizations such as *El Orden Mundial* and *Jot Down*.

**Table 7. Technology-based by media outlet**

| <i>Media outlet</i>     | Technological |        | Technology-based |        | Non-technological |        | Total |        |
|-------------------------|---------------|--------|------------------|--------|-------------------|--------|-------|--------|
|                         | N             | %      | N                | %      | N                 | %      | N     | %      |
| <i>Antena 3</i>         | 7             | 77.78% | 2                | 22.22% | 0                 |        | 9     | 3.70%  |
| <i>Civio</i>            | 4             | 40.00% | 3                | 30.00% | 3                 | 30.00% | 10    | 4.12%  |
| <i>Datadista</i>        | 3             | 37.50% | 4                | 50.00% | 1                 | 12.50% | 8     | 3.29%  |
| <i>Diari ARA</i>        | 2             | 40.00% | 1                | 20.00% | 2                 | 40.00% | 5     | 2.06%  |
| <i>El Confidencial</i>  | 9             | 32.14% | 6                | 21.43% | 13                | 46.43% | 28    | 11.52% |
| <i>El Español</i>       | 5             | 25.00% | 9                | 45.00% | 6                 | 30.00% | 20    | 8.23%  |
| <i>El Mundo</i>         | 7             | 36.84% | 7                | 36.84% | 5                 | 26.32% | 19    | 7.82%  |
| <i>El Orden Mundial</i> | 0             | 0      | 1                | 33.33% | 2                 | 66.67% | 3     | 1.23%  |

|                       |    |        |    |         |    |        |     |         |
|-----------------------|----|--------|----|---------|----|--------|-----|---------|
| <i>El País</i>        | 11 | 34.38% | 6  | 18.75%  | 15 | 46.88% | 32  | 13.17%  |
| <i>eldiario.es</i>    | 4  | 21.05% | 6  | 31.58%  | 9  | 47.37% | 19  | 7.82%   |
| <i>Jot Down</i>       | 0  | 0      | 1  | 50.00%  | 1  | 50.00% | 2   | 0.82%   |
| <i>Kloshletter</i>    | 0  | 0      | 2  | 50.00%  | 2  | 50.00% | 4   | 1.65%   |
| <i>La Sexta</i>       | 0  | 0      | 1  | 11.11%  | 2  | 22.22% | 9   | 3.70%   |
| <i>La Vanguardia</i>  | 6  | 46.15% | 5  | 38.46%  | 2  | 15.38% | 13  | 5.35%   |
| <i>Maldita</i>        | 3  | 14.29% | 7  | 33.33%  | 11 | 52.38% | 21  | 8.64%   |
| <i>Marca</i>          | 3  | 37.50% | 3  | 37.50%  | 2  | 25.00% | 8   | 3.29%   |
| <i>Matthew Bennet</i> | 0  | 0      | 3  | 100.00% |    |        | 3   | 1.23%   |
| <i>Newtral</i>        | 0  | 0      | 6  | 54.55%  | 4  | 36.36% | 11  | 4.53%   |
| <i>Revista 5W</i>     | 0  | 0      | 1  | 33.33%  | 2  | 66.67% | 3   | 1.23%   |
| <i>RTVE</i>           | 1  | 12.50% | 3  | 37.50%  | 4  | 50.00% | 8   | 3.29%   |
| <i>TV3</i>            | 0  | 0      | 1  | 12.50%  | 2  | 25.00% | 8   | 3.29%   |
| <b>Total</b>          | 77 | 31.69% | 78 | 32.10%  | 88 | 36.21% | 243 | 100.00% |

Source: prepared by the authors

Technology-based innovations barely represent one-fourth of the total at Antena 3, *El Confidencial*, *El País*, *La Sexta* and *TV3*. In turn, half of the innovations at *Datadista*, *Jot Down*, *Kloshletter* and *Newtral*, as well as all of Mathew Bennet's innovations, are made possible by technology.

Non-technological advances, primarily for editorial matters and work dynamics, comprise half or more at *El Orden Mundial*, *Maldita*, *Revista 5W*, *Jot Down*, *Kloshletter* and *RTVE*. On the other hand, they barely represent one-fourth of the total at *Datadista*, *La Sexta*, *La Vanguardia*, *Marca* and *TV3*, and have not been identified at Antena 3 or Mathew Bennet.

These data allow us to make a preliminary analysis based on the features of the organizations studied. Upon taking into consideration the parent company of each organization, technological innovation can be seen in the television networks,



except for RTVE, whose innovations are less technological than the rest. In turn, it has a much smaller impact on the innovative initiatives of native digital media outlets and newspapers with traditional print versions

A comparison of the editorial models for the organizations studied reveals a slightly homogeneous trend in mainstream media outlets that is clearer among specialized publications. Innovations for projects centered on data journalism and fact-checking have a more technological nature, but with nuances: *Civio*, for example, is focused on technological development, but *Datadista* and *Newtral* are technology-based. Those centered on a subject matter niche, oftentimes with long-form content (*El Orden Mundial*, *Jot Down* and *Revista 5W*), share a common pattern: most of the innovations are not technological or are merely technology-based. *Marca* veers from this trend due to its special features and larger size. This last variable (the number of workers for each project) brings to light that one-person projects do not include purely technological innovations, but rather that most are only made possible by technology.

**Table 8. Creators of innovation by media outlet**

| <i>Media outlet</i>     | Outsourced |         | In-house |         | Mixed |        | Total |        |
|-------------------------|------------|---------|----------|---------|-------|--------|-------|--------|
|                         | N          | %       | N        | %       | N     | %      | N     | %      |
| <i>Antena 3</i>         | 7          | 77.78%  | 2        | 22.22%  | 0     | 0      | 9     | 6.34%  |
| <i>Civio</i>            | 1          | 25.00%  | 2        | 50.00%  | 1     | 25.00% | 4     | 2.82%  |
| <i>Datadista</i>        | 3          | 42.86%  | 2        | 28.57%  | 2     | 28.57% | 7     | 4.93%  |
| <i>Diari ARA</i>        | 0          | 0       | 2        | 100.00% | 0     | 0      | 2     | 1.41%  |
| <i>El Confidencial</i>  | 2          | 13.33%  | 10       | 66.67%  | 3     | 20.00% | 15    | 10.56% |
| <i>El Español</i>       | 7          | 50.00%  | 4        | 28.57%  | 3     | 21.43% | 14    | 9.86%  |
| <i>El Mundo</i>         | 5          | 50.00%  | 3        | 30.00%  | 2     | 20.00% | 10    | 7.04%  |
| <i>El Orden Mundial</i> | 0          | 0       | 1        | 100.00% | 0     | 0      | 1     | 0.70%  |
| <i>El País</i>          | 6          | 35.29%  | 3        | 17.65%  | 8     | 47.06% | 17    | 11.97% |
| <i>eldiario.es</i>      | 4          | 40.00%  | 3        | 30.00%  | 3     | 30.00% | 10    | 7.04%  |
| <i>Jot Down</i>         | 1          | 100.00% | 0        | 0       | 0     | 0      | 1     | 0.70%  |
| <i>Kloshletter</i>      | 2          | 100.00% | 0        | 0       | 0     | 0      | 2     | 1.41%  |
| <i>La Sexta</i>         | 4          | 57.14%  | 3        | 42.86%  | 0     | 0      | 7     | 4.93%  |

|                       |    |         |    |        |    |        |     |         |
|-----------------------|----|---------|----|--------|----|--------|-----|---------|
| <i>La Vanguardia</i>  | 5  | 50.00%  | 3  | 30.00% | 2  | 20.00% | 10  | 7.04%   |
| <i>Maldita</i>        | 5  | 50.00%  | 4  | 40.00% | 1  | 10.00% | 10  | 7.04%   |
| <i>Marca</i>          | 1  | 25.00%  | 3  | 75.00% | 0  | 0      | 4   | 2.82%   |
| <i>Matthew Bennet</i> | 1  | 100.00% | 0  | 0      | 0  | 0      | 1   | 0.70%   |
| <i>Newtral</i>        | 4  | 57.14%  | 3  | 42.86% | 0  | 0      | 7   | 4.93%   |
| <i>Revista 5W</i>     | 1  | 100.00% | 0  | 0      | 0  | 0      | 1   | 0.70%   |
| <i>RTVE</i>           | 3  | 75.00%  | 0  | 0      | 1  | 25.00% | 4   | 2.82%   |
| <i>TV3</i>            | 1  | 16.67%  | 3  | 50.00% | 2  | 33.33% | 6   | 4.23%   |
| <b>Total</b>          | 63 | 44.37%  | 51 | 35.92% | 28 | 19.72% | 142 | 100.00% |

Source: prepared by the authors

Major differences also exist between the news organizations studied in terms of the creators behind the technology in the innovations. All of the technological innovations at *Jot Down*, *Kloshletter*, *Matthew Bennet* and *Revista 5W* are outsourced. This type of third-party development also represents at least three-fourths at *Antena 3* and *RTVE*. In turn, it barely reaches one-fourth at *Civivo*, *El Confidencial* and *Marca*, and is not present at *Diari ARA* and *El Orden Mundial*.

In-house development can be found in all the technological innovations at *Diari ARA* and is present in at least two-thirds at *El Confidencial* and *Marca*. On the other hand, it represents one-third or less at *Antena 3*, *Datadista*, *El Español*, *El País* and *La Vanguardia*, and does not exist in six cases. The combination of in-house development and outsourcing does not exist in twelve cases, although it can be found in at least one-fourth at *Civivo*, *Datadista*, *Eldiario.es* and *RTVE*. The most important case here is that of *El País*, where nearly half of the creators are marked as “both.” In this instance, aside from the innovations linked to subscribers, data visualization and AI, partnerships with Google for developing AMPs (accelerated mobile pages) and with Facebook for distributing news in Messenger via bots also stand out.

These individualized findings are combined with the analysis by type of organization. When the parent company is taken into consideration, it is noted that television networks rely primarily on third-party technology to innovate. This is usually done by acquiring materials manufactured by technology companies, except for *TV3*, where in-house technology is more prevalent. Newspapers with traditional print versions also tend to use third-party developments, although with certain exceptions, such as the aforementioned *El País*. In turn, native digital media outlets tend to rely more on in-house developments, except for *El Español*. The patterns are less clear for the combination of in-house and outsourced developments, although they tend to be more common at native digital media outlets.

The differences are less clear when the editorial model of the media outlets studied is taken into consideration. In turn, the size of an organization plays a major role. Organizations with a smaller workforce tend to rely more on third-party technology. Only large media outlets, primarily newspapers with traditional print versions, partner with others for the technological development of their innovations. The main exception is *Civivo*, which despite its small team (10 people), participates in the development of three of its four technological innovations.

#### 4. Discussion and conclusions

The results obtained in this research offer a comprehensive view of the intersection between technology and innovation in journalism: two out of every three advances are technology-based, accentuated over time, and most are developed outside of the media industry. These findings also make it possible to delve into realities such as the weight of technology in the distribution of content and in media outlets such as television. These data pave the way for a deeper reflection on the correlation between technological innovation, the social context and the reliance on big tech. They also reveal the need to further study the nature of this relationship and introduce categories that allow their in-depth analysis.

Innovation in journalism depends a great deal on technology (RQ1). This coincides with the idea that technology is consubstantial with journalism (López-García and Vizoso, 2021) and innovation (Moreira Flores, 2017). If technology is decisive in two-thirds of journalism innovations, then the problem of “technomyopia” (Fidler, 1997: 11) may lie in the lack of a long-term vision or critical reflection. Perhaps a reality of great magnitude is not being exaggerated, but rather that better lenses are needed to analyze it in-depth and with perspective.

Fidler (1997) describes a process in which the benefits of a technology are inflated in the beginning, and when expectations are not subsequently met, its impact is underestimated. This could be associated with the classic theory developed by Rogers (1962), in which a technology’s adoption is not linear, but rather depends on multiple phases and the attitude of recipients. The results of this research show that existing technologies—such as videoconferencing tools and QR codes—are being used, but their adoption has increased due to circumstantial reasons. However, regardless of when technological advances become popular, they should go through the same stages of launch, diffusion and cross into the mainstream. Therefore, when technology is developed and adopted, it is advisable to differentiate between actual changes in news creation and ephemeral modifications that have a low impact on society (Küng, 2017).

The comparison with change over time, areas of innovation and types of media outlets offers additional nuances (RQ2). Non-technological innovations tend to fall as the years go by, reaching a minimum level in 2021. The strong presence of users in channels like TikTok and Twitch has driven the demand-pull strategies of media outlets, thereby confirming that technological advances address existing needs but then create new demand (Smith, 1983: 291).

2020, a year defined by health measures in response to the COVID-19 pandemic, is the period with the most innovations (also technological) but the fewest in-house developments. The link between technology and the social context (McQuail, 2010: 39) became evident, along with its lack of neutrality (Díaz Noci, 2001: 1) and the ongoing correlation between the main elements of communication (Scolari, 2012: 218). It became clear that technological evolution is triggered by supply, scientific progress and demand, particularly in exceptional situations, like the COVID-19 pandemic. However, the results make it possible to conclude

that in recent years, technology-push theories have gained ground (Dosi, 1982: 148-149) because improvements to digital tools have allowed media outlets to create more technology-based innovations (Peters *et al.*, 2012).

The comparison between the areas of innovation is also revealing. The fact that technology is present in most of the advances registered for content distribution, and that more than half are third-party developments, is proof of *platformization* in journalism. It is important to note that innovations in an organization rarely depend on technology, but when they do, they almost always originate from third-party firms. The widespread use of apps like Google Meet, Zoom and Microsoft Teams during the remote work era, for example, influences how numerous news organizations work. Although technological development is prevalent in production, this is the only area in which innovations at media outlets are primarily driven in-house. In the area of marketing, partnerships with third parties for technological development stand out. In terms of business, the hybridization between news organizations and tech firms is clear (Carlson and Usher, 2016). These findings also coincide with recent research on podcast production and marketing strategies (Pérez-Alaejos *et al.*, 2022; Carvajal *et al.*, 2022).

Finally, comparing the results between media outlets provides key information for understanding the industry's evolution. According to this research, in the five most innovative cases (*El País*, *Eldiario.es*, *El Confidencial*, RTVE and *Maldita*), approximately half of the innovations are non-technological. These results reveal the limitations of technological determinism (Almirón and Jarque, 2008) and confirm the error of tying any novelty on the market to technology (Franciscato, 2010). It is likely that in companies with a stronger innovative tradition, most of their actions fall within a corporate strategy that is more defined and less reliant on the latest technological advances (Küng, 2015). This applies to newspapers with traditional print versions, as suspected, but also to most native digital media outlets, particularly those specialized by subject matter and with a predilection for long-form journalism.

On the other hand, technology has considerable weight in media outlets specializing in data and fact-checking. These types of entities could probably be classified as startups or NTBFs, in which technology is one of the distinctive features (Arantes *et al.*, 2019: 49). Television networks are also worth noting because technology tends to have more weight in their innovations. Their need to work with complex technical equipment and the size of their newsrooms are most likely determining factors.

This analysis is completed through a comparison of the creators behind the technology used in the innovations identified (RQ3). The data obtained show that third-party developments peaked in 2015 and 2020, most likely due to technological dependence during the pandemic in light of limitations on in-person work and mobility, as well as the short reaction time. During this period, media outlets increased their reliance on free digital tools like WhatsApp, Telegram, Slack, Google Drive, Wettransfer and Dropbox, with a higher application rate in the production phase (Bernal-Triviño, 2021).

In-house developments grew between 2017 and 2018, with the earliest advances in AI as the main focus. Most partnerships between media outlets and technology firms, oftentimes to improve marketing systems in response to the rise of paywalls, took place in 2016. These results corroborate the *platformization* of journalism because they confirm the growing dependence of media outlets on third-party agents for the implementation of technological innovations (Simon, 2022; Steensen and Westlund, 2020; Nieborg and Poell, 2019). This practice, which allows media outlets to connect more directly with technological advances and audience consumption habits, could potentially be dangerous for their long-term aspirations because it has been verified

on multiple occasions that the revenue streams and reach of organizations have been engulfed by big tech firms (Marcos Recio et. al, 2014; Whittaker, 2019; CNMC, 2021).

Although the causes and effects of this phenomenon cannot be deduced in this paper, it has been noted that organizations require third-party tools, particularly for content distribution, in which companies like Apple, Google and Meta operate (Nieborg and Poell, 2019), and for selling their services, in which case partnerships with business intelligence firms are frequently selected. An example of this trend is the growing relationship between Spanish media outlets and Piano Media, a Slovakian company and market leader in Europe specializing in news content monetization solutions (Ormaetxea, 2015) and that currently develops artificial intelligence technologies to optimize media outlets' revenue streams.

The analysis of the relationship between the creators of these technological innovations and media outlets' resources (human and material) also provides key nuances. Although it may seem counterintuitive, this link is less obvious than other variables, such as media outlets' philosophies. For example, an analysis of the top three mainstream native digital media outlets (*El Confidencial*, *El Español* and *Eldiario.es*) shows that the first develops twice as many in-house technologies as the rest. This connection becomes even clearer when considering one-person initiatives or those with very small teams, in which in-house development is virtually inexistent, with exceptions like *Civio*. However, it is most evident in partnerships between media outlets and technology companies. Large media companies are the only ones that can afford these joint developments. This confirms the socioeconomic context's impact on technological innovation and the interconnection between media outlets and their surroundings (Landow, 2006).

These findings only make sense when they are contextualized and harnessed to make progress in classifying and conceptualizing the use of technology in the media. It is more necessary than ever to perform a conceptual reflection on technology and innovation to prevent from falling into the trap of determinism (García-Avilés, 2021) and to leverage technological development as an opportunity to research its transformative power (Kyriakidou and Garcia-Blanco, 2021: 723). Although the containment proposed by Barnhurst (2012: 210) may seem impossible due to its usefulness and inability to adapt, it is advisable to consider the importance of understanding the social factor of technological innovation (Bruns, 2014; Khajeheian and Tadayoni, 2016; Storsul and Krumsvik, 2013). In reality, it is "journalism that gives technology purpose, shape, perspective, meaning and significance, not the other way around" (Zelizer, 2019).

This research is not exempt from limitations, primarily because it falls within a project that is in the midst of growth, consolidation and distribution. The innovation measurements are obtained from secondary sources and interviews that probably fail to reflect the full reality. The interview results and literature review could be triangulated using other methodologies such as a panel of experts and observations of media outlets that have applied the innovations being studied. The sample size could also be expanded in future research to extract more general conclusions about the factors that determine the adoption of technology in journalism.

Additionally, some of the non-technological innovations registered in the study could be, even superficially, conditioned by technology due to the leitmotif behind their idea and development. This would be the case of innovations such as the creation of specific data journalism teams, initiatives for training the entire workforce on aspects such as SEO (search engine optimization), and the introduction of new profiles specializing in user analysis.

In this sense, one of the biggest challenges of this work was due to the limited theory on technology in journalism. Although a certain degree exists in fields such as the economy and startups, the majority focuses on describing cases, but with minimal theoretical development. Therefore, it is necessary to delve further into this topic from a critical perspective. Future lines of research could also include in-depth research on the link between editors and technicians at news organizations (Kosterich, 2019) or a wider analysis of the friction between subcultures in newsrooms.

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## 6. Specific contributions from each author

|   | Name and Surname   |
|---|--|
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