



METHODOLOGICAL PROPOSAL FOR THE TELEVISED ANALYSIS OF SCIENTIFIC INFORMATION Case Study of the University of Zaragoza

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KEYWORDS

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ABSTRACT

This research proposes a new methodology to analyse the process of transferring scientific information from its generation in institutes and research groups to its dissemination in society. This case study focuses on the analysis of scientific information coming from the community of Aragon. As part of the fieldwork, press releases from the Science Communication Unit of the University of Zaragoza were analysed and compared with their coverage in the audiovisual media. The results show a limited presence of scientific news in the main news programmes, with greater interest from public regional channels. It is concluded that the lack of audiovisual resources and limited airtime hinder television dissemination, while visibility in regional media is influenced by criteria such as informational proximity and institutional announcements.

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1. Introduction

The importance of science in society is reflected in its impact on people's well-being and quality of life. This is well known today, as science provides a solid basis for informed decision-making and helps to avoid decisions based on unfounded beliefs or prejudices and is "a dynamic process of knowledge construction" (Zaelzer, 2020, p. 1). In short, there can be no evolution without science. As Calvo Roy, president of the Spanish Association of Science Communication (AEC2) (UCC+I UCO, 2018), points out: "Citizens must have a voice, a vote and knowledge. In an increasingly technological world, science will not solve all problems, but problems will not be solved without science".

The transfer of scientific knowledge to society is a crucial aspect of ensuring that these scientific and technological advances have a positive impact on people's lives. One of the most widely used tools for transferring scientific knowledge to society is science journalism. Authors such as Bucchi and Trench (2014) have highlighted its fundamental role in disseminating and communicating science to the general public. By writing and disseminating scientific news and articles, science journalists make scientific knowledge accessible and contextualise it so that it is understandable to the non-specialist public. This tool not only informs society about scientific advances, but also helps to foster public interest and participation in science-related issues.

As Lewenstein (2003) points out, "science communication is a social process, and the media are essential to that communication. Without the media, science would remain in laboratories and on the pages of scientific journals" (p. 49). Thus, the media are essential for the social diffusion of science. Moreover, according to Quintanilla (1990), "the development of the scientific and technological system in a democratic society depends both on the scientific community and on the citizen, who decides with his vote which direction he wants the budget to take" (p. 68). Therefore, the scientific media literacy (Marta-Lazo and Gabelas-Barroso, 2023) of citizens is crucial in order to have a critical society that is prepared to make decisions on scientific and technological issues that affect it. On another note, the medium with the highest penetration in Spain continues to be television. According to the General Media Survey (AIMC, 3rd wave, 2021), 81.8% of the Spanish population watches television regularly. Furthermore, television (72%) (FECYT, 2021) is the medium most used to obtain information on science and technology. It is important to note that these data are framed within the period of the fieldwork for this study, since the subsequent period was characterised by an exceptional circumstance due to the pandemic, and their inclusion would introduce strange variables resulting from an exceptional situation. For this reason, it was considered appropriate to anchor them in this period and not to update them.

Furthermore, it is important to focus on the university as a structure of scientific institutions "where science is mainly developed" (Díaz Herrera, 2022, p. 3). For this reason, the social transfer of scientific knowledge from universities is an issue that we consider central to the communication of science and technology. The transfer of knowledge generated in classrooms, laboratories, professorships, research projects and all the initiatives that come out of the university itself on a daily basis is part of what society expects from the university (Clemente Mediavilla and Semova, 2023). It should be noted that university research is the "guiding axis of the university" and becomes "the axis of the social transfer of knowledge" (Domínguez et al., 2012, p. 41). The main objective of this knowledge transfer is to strengthen the relationship between universities, business, government and civil society (Toro Galvis, 2022). Likewise, in the 21st century there is a greater need for academia to contact society in different ways, "using different strategies and always seeking to achieve the development or transformation [sic] of the local community" (López and Alfaro Mardones, 2022, p. 1586).

For all these reasons, we consider it relevant to analyse the social transfer of scientific knowledge in the process of information transfer from the university to television news, using an original methodology designed ad hoc. As a final objective, the content will be analysed in order to find out the presence, the hierarchy of information in the agenda setting and the informative treatment (intelligibility) of scientific news.

2. Methodology

In this research, we conducted an analysis to examine the informative presence of scientific content produced at the University of Zaragoza within the agenda-setting information of the main media outlets in Aragon. To achieve this, we defined parameters enabling the evaluation of relevant concepts or variables of the object of analysis (Casetti & Di Chio, 1999; Igartua Perosanz, 2006). Specifically, the

chosen classification units, i.e. the unit of data collection and the unit of analysis, were the scientific news items (SN). However, from each SN, we collected several units of measurement, namely 41 parameters.

2.1. The Sample

The study sample includes the most watched television news programmes in Aragon. All news programmes broadcast during two specific periods were selected to determine the percentage of S&T topics. A total of 202 news programmes from the national channels TVE 1, Antena 3, Telecinco and the regional channels TVE Regional News and Aragon TV were analysed. The subject areas of 5,997 news items were studied in order to identify techno-scientific news. After an interview with Carmina Puyod, head of the Scientific Culture Unit at the University of Zaragoza, it was concluded that press releases are mainly broadcast from Monday to Thursday, making weekend news irrelevant to the research. They analysed programmes broadcast from Monday to Friday over two months, chosen to coincide with the months of greatest scientific production at the university: November 2019 and February 2020. The analysis periods started on 15 November 2019 and 3 February 2020, respectively, with the first period delayed due to the general election in Spain. During these periods, the news focus will be on the election campaign and results, and the timing will be suboptimal for research, as it deviates from a typical month.

2.2. Preparation of the Codebook

The message coding model in which we collected the data was based on quantitative and qualitative content analysis. To this end, we created a codebook, which, although it is true that it was inspired as a starting point by the research of Monclús (2011), was adapted and completed according to the specific parameters and indicators required in the singular analysis of scientific information, so that it is original, as well as the thematic analysis sheets of the messages.

2.2.1. Delimitation of the Unit of Analysis: Science News

We consider scientific news to be the information unit in the field of science and technology that reports on important facts related to fields such as science, technology, innovation, health, environment, informatics, archaeology, astronomy and space exploration. It also includes other research activities, i.e. any human activity aimed at the acquisition of new knowledge and its application to the solution of scientific problems or issues of relevance to humanity.

2.2.2. Variable: Subject Area

The subject area was a fundamental parameter because it allowed us to classify the news by topic. We identified ten main thematic areas. Within each of these major thematic macro-areas, we have distinguished 24 areas and four thematic sub-areas. In the following, we develop the topics that belong to each of these thematic areas.

1. Science and Technology (Ciencia y Tecnología. CT). These are the key themes of our research. Within this macro area, we have identified the following sub-areas:
 - Institutional Science and Technology (Ciencia y Tecnología Institucional. CTI): If there are institutional or political statements in the S&T news item. Not considered CTI are those news items that, although the call is institutional, choose not to give an institutional voice in the news item.
 - Aragon Science and Technology (Aragón Ciencia y Tecnología. ACT): When a science and technology news item occur in Aragon, it is forwarded to the national channels.
2. Culture (C). These news items are usually placed at the end of news programmes to conclude them and are usually of a more friendly nature. Cultural events, art in general, traditions (popular festivals, popular culture), gastronomy, religion and beliefs, cultural institutions, cultural centres, popular culture, artistic heritage, intellectual property, promotion and development of culture (cultural meetings), Nobel prizes. The subdivisions are as follows:
 - - Culture People (Cultura Gente. CG): Topics related to artists and celebrities.

- Culture, Entertainment and Arts (Cultura Entretenimiento, Espectáculos y Arte. CE): Awards, favourite children, various artistic manifestations such as illustration, literature, exhibitions, cinema, theatre, concerts, opera, architecture or works of art. Promotion of the channels themselves, television, film premieres, video games, fashion. Cultural guided tours.
- Curiosities and lifestyle (Curiosidades y Estilo de Vida. CC): Leisure time, popular festivals, curious information of low global social relevance affecting a small group of social groups, profiles of non-famous people.

Although in cultural themes, which are usually placed at the end of the news programme, political voices appear at municipal level, for example the deputy mayoress in the presentation of a play (this happens several times in Aragon TV), the main content, which is the play, takes precedence and is therefore classified as EC.

3. Coronavirus (CV). In this macro area we find all the information related to the pandemic caused by COVID-19. In February 2020 it began to appear on the agenda of the Spanish media.
4. Sports (Deportes. D). News that make up the current sports situation.
5. Economy (Economía. E). All news related to the economy that does not include the appearance of a politician, such as the economy, business and finance, pensions, work, sales, unemployment, the stock market, budgets, seasonal balances, the voices of businessmen, large companies and economic initiatives against depopulation.
6. Interview (Entrevista. EN). We distinguish an interview section according to the relevance of the topics within the news programme in this format. Within the interview macro-thematic area, we distinguish between two thematic areas, depending on whether the interview was conducted live from an outside location or on set:
 - Live or on-set interview (Entrevista en directo o grabada en plató. EP).
 - Live outdoor interview (Entrevista en directo en exterior. EE).
7. Meteorological Information (Información Meteorológica. M): This section features weather forecasts for the upcoming days and any articles where weather is the central theme, excluding coverage of catastrophes.
8. Politics (Política. P): This macro section encompasses all political issues, including statements by politicians, topics of national interest, and royal matters. Less significant topics related to royal houses are categorized under Culture People (Cultura Gente. CG), as previously explained. Furthermore, this section includes relevant topics concerning former leaders. Within this thematic area, we distinguish the following sub-sections based on their territorial scope:
 - Politics in the regional news of Aragon TV and TVE:
 - National Politics (Política Nacional. NP): All national political news.
 - Regional Politics (Política Regional. RP): All issues related to regional politics in Aragon and the Government Delegation in Aragon.
 - Local Politics (Política Local. LP): Political information related to the local level. In our case, those relating to the cities of Zaragoza, Huesca or Zaragoza. Statements made by the technicians of the Town Council are not considered LP, but the mayors of the towns and cities are.
 - Politics in the national news on A3, T5 and TVE:
 - Politics (Política. P): See Politics macro section above.
 - Politics Corruption (Política Corrupción. PC): News containing political statements or dealing with the political consequences of corruption cases.
 - Politics Independence (Política Independentismo. PIN): Information containing political statements on the Catalan independence controversy.
 - Gender-based Violence Politics (Política Violencia de Género. PV): The suffix V is added to political issues related to gender-based violence. For example, political action against gender-based violence or when a politician is directly involved in a case.
9. Society (Sociedad. S). This macro area classifies information about society. It is about citizens in general or those who are part of a specific social group. These are topics related to

education, health, depopulation, riots, conflicts, social services, gender violence, evictions, floods, public holidays, the environment, transport, holiday activities, charity campaigns, volunteering, etc. Society includes the following areas:

- Education Society (Sociedad Educación. SE): All issues relating to education, including bullying.
 - Health Society (Sociedad Sanidad. SS): Issues related to hospitals and diseases or health alerts that are released to society.
 - Society Gender Violence (Sociedad Violencia de Género. SV): Cases of murder, rape or male aggression.
 - Society Terrorism (Sociedad Terrorismo. ST): Issues related to terrorism and victims of ETA.
 - Society Conflicts (Sociedad Conflictos. SC): Anything related to social and labour conflicts. Some examples are the following: demonstrations, protests, riots, rallies, immigration, refugees, human dramas, religious conflicts or evictions.
 - Society Environment (Sociedad Medioambiente. SM): Information on the environment and climate change.
 - Society Independence (Sociedad Independentismo. SIN): All social issues related to the Catalan independence conflict.
 - Society Events (Sociedad Sucesos. SSU): This is specific, conflictual, unpredictable and usually negative information. Some examples are the following: accidents, complaints, disappearances, success, results or termination of a business deal; demolitions, criminal acts, unfortunate accidents or disasters. Within events, we distinguish the following sub-areas:
 - Society Weather Events (Sociedad Sucesos Tiempo. SSUT): Weather-related events such as snowfall, flooding or weather alerts.
 - Society Accidents Events (Sociedad Sucesos Accidentes. SSUA): Events such as road, train, boat, sea, mountain accidents, rescues, small fires, collapses, explosions, heart attacks, etc.
 - Society Crime Events (Sociedad Sucesos Delitos. SSUD): This subcategory includes events such as robberies, crimes, drug trafficking, fraud, seizures of weapons and drugs, assaults against non-men, immigration trafficking, atrocities or murders.
 - Social Catastrophes Events (Sociedad Sucesos Catástrofes. SSUC): In this sub-domain, we have classified information relating to natural or man-made disasters involving large numbers of victims and/or significant material damage. Examples include major fires, tsunamis, hurricanes, explosions, earthquakes and volcanoes.
10. Courts (Tribunales. T). All matters relating to trials, sentencing or punishment. Within this macro area we distinguish the following areas:
- Gender violence courts (Tribunales Violencia de Género. TV): It is considered TV only when a trial for gender-based violence begins or there is talk of the alleged perpetrator(s) being brought before a court or remanded in custody. Prior to this, it is considered SV.
 - Corruption courts (Tribunales Corrupción. TC): This heading covers corruption cases brought before the courts and their follow-up.
 - Independence Courts (Tribunales Independentismo. TIN): All information on the Catalan conflict that reached the courts is included in this area.

We have also used coding to analyse the territorial scope of the news as follows:

- International: An (I) is added to information that deals with issues outside our country.
- National: An (N) is added to regional news that deals with issues outside the region and at the national level.

Each NC analysed is coded with an identifier (ID) which is made up, as shown in Table 1, of the first six analysis indicators.

Table 1. Indicators in the NC analysis table

Indicator	Variables
1- Number of the scientific news item in each media (ID)	1, 2, 3...
2- Medium (ID)	TE = TVE National News RE = TVE Regional News AT = Autonomous News of Aragon TV A3 = Antena 3 National News Programme T5 = National News of Telecinco
3- Day of the week (ID)	L = Monday M = Tuesday X = Wednesday J = Thursday V = Friday
4- Date: day+month+year (ID)	151119 will be on 15 November 2019, 161119 will be on 16 November 2019 and so on.
5- Thematic Area (ID)	Thematic areas encompassing all analysed NCs CT: Science and technology news ICT: International Science and Technology News CTI: Institutional Science and Technology News ACT: Aragonese science and technology news on national broadcasters
6- *Scientific Macro Area (ID)	A = Agriculture and Veterinary B = Biomedical Sciences E = Experimental Sciences and Mathematics H = Human Sciences S = Social Sciences T = Technology MIS = Miscellaneous. Hybridisation of several macro areas.
7- *Scientific Area	LO = Logic MT = Mathematics AA = Astronomy and Astrophysics FI = Physics QA = Chemistry CV = Life Sciences EC = Earth and Space Sciences CA = Agricultural Sciences CM = Medical Sciences TC = Technological Sciences AN = Anthropology DE = Demographics CC = Economic Sciences GE = Geography HI = History CJ = Legal Science and Law LG = Linguistics PE = Pedagogy PC = Political Science PS = Psychology CL = Sciences of Arts and Letters SO = Sociology ET = Ethics FI = Philosophy

Indicator	Variables
	NN = Nanoscience and Nanotechnology
8- *Scientific sub-area	Included in the UNESCO classification (MEC, 2004).
<p>9- Value of the NC in the agenda setting. Each scientific news item is subjected to a rigorous analysis of its news value in the <i>agenda setting</i>. Thanks to this, we know why the scientific-technological fact is newsworthy thanks to the following two-level classification.</p>	<p>Thematic: P = Awards and Recognition. C = Citizen Science Projects or Programmes. P = Scientific Policy (positions, economic data, institutional information, signing of collaboration agreements...). Also programmes of Unizar and its UCC (e.g. scholarship programmes). D = Outreach activities (communication to society). T = Transfer Activities. Companies and institutions that demand services or activities from the University (OTRI contracts, activities of chairs external to the University...). H = Findings, registrations, patents, pioneering technologies or relevant data. I = Own topic with information of interest.</p> <p>Suffix Science Dissemination Format: 01 = Publication of journals, reports, articles... 02 = Conferences/lectures 03 = Congresses/summits 04 = Seminars 05 = Workshops 06 = Presentations 07 = Meetings and gatherings 08 = Exhibitions, fairs and workshops 09 = Press conferences, media call 10 = Days at which data can be presented 11 = Issuance of informative NP without call for papers 12 = DI: International Day 13 = Own production 14 = Inaugurations of scientific institutions (centres, research institutes...)</p> <p>It will be marked with (-) if it is a NC of the channel's own production and is outside the Agenda Setting.</p>
10- Total informative duration	XX:XX: XX (H:MM:SS)
11- Partial duration science news	XX:XX: XX (H:MM:SS)
12- Duration of scientific news headline	XX:XX: XX (H:MM:SS)
13- Duration of the scientific news	XX:XX: XX (H:MM:SS)
14- Total number of topics	The overall number of news items broadcast in the news programme.
15- Position	<p>The position of the NC within the report is indicated.</p> <p>1 For the first news item broadcast just after the summaries 2 For the next one...and so on....</p>
16- Summary	<p>Whether scientific information has been on the front page or not.</p> <p>1 Yes 0 No</p>

Indicator	Variables
17- Bait	<p>If the information has been announced during the news programme for later broadcast.</p> <p>1 Yes 0 No (-) If the news item does not have this format</p>
18- News presenters	<p>M = Female H = Male MH = Female + Male MM = Woman + Woman HH = Male + Male</p>
19- Science news presenters	<p>M = Female H = Male MH = Female + Male MM = Woman + Woman HH = Male + Male</p>
20- **Format	<p>Audiovisual record in which the news is presented. All the different formats that can be found in a news programme, as listed in Table 2, are taken into account. Each format has been assigned a number and the coding is as follows.</p> <p>1 = VTR: full video with voice-over by editor and/or on-site, statements (experts or lay persons), images. 2 =RECAP: full video with editor's voice-over without statements. 3 = CUTAWAYS: images with the presenter's voiceover on set. If the tails are crossed (attached to another video), the duration of the intros coincides with the duration of the news item. If, on the other hand, they have been shown on camera before, the duration of the intro refers to the seconds that the presenter is on camera before inserting the images. 4 = TOTAL: loose statement by expert or lay person. 5 = TOTAL + CUTAWAYS: images with presenter's voice-over on set preceded by an expert or layperson's statement. 6 = CUTAWAYS + TOTAL: images with the presenter's voice-over on set crossed with two or more statements from experts or lay persons. 7= ON-CAMERA NOTE: information given by the presenter without any audiovisual support. 8= DTO: LIVE connection to an outside. 9=DTO + @: the live broadcast is simultaneously complemented by images. 10=DTO + @ + T: live is simultaneously complemented by images and cross-referenced with a total. 11=DTO + @ + T: live is simultaneously complemented by images and crosses more than one total. 12= PDTO: PLATÓ LIVE connection with journalist on set. 13= PDTO + @: the live broadcast is simultaneously complemented by images. 14=PDTO + @ + T: live is complemented simultaneously with images and cross a total. 15=PDTO + @ + T: live is simultaneously complemented by images and crosses more than one total. 16=GRAPHISM: if the information is illustrated in its entirety with graphics, computer-generated visual elements that either accompany the image through embedding, are inserted in full screen or appear in augmented reality on a plate.</p>

Indicator	Variables
	17=VTR: full video without voice of the editor with statements (expert or lay persons) and images (usually these pieces are set to music). 18=PDEC: LIVE STUDIO INTERVIEW WITH CUTAWAYS. The presenter interviews live in the studio, and the interview is illustrated with cutaway footage (footage from the day and/or archival footage).
21- "Fridge".	News that is not of the day is produced and broadcast after the event: 0- No 1- Yes

Source: Own elaboration. * Indicators 6, 7 and 8 are lists of scientific macro-areas, areas and sub-areas. The scientific macro-areas have been obtained from the University of Zaragoza (SGI, s. f.). As for the areas and sub-areas, they are an adaptation of the classification made by Unesco (MEC, 2004). For the current research, we have taken into account disciplines that are at the forefront of science and technology, such as Nanoscience and Nanotechnology. ** The nomenclature and abbreviations of the different audiovisual formats (sub-genres) of the news macro-genre and the news genre are the following: Summary (sumario. Sum), Teaser (Cebo. Ceb), Wink and Teaser (Guiño y Cebo. @), Totals (T), Cutaways with total/es (Colas con total/es. @+T), Closed piece with totals (Pieza cerrada con totals. VTR), Recap (Caldo. VTRc), On-camera note (Nota en cámara. NeC), Live (Directo. DTO) and Graphics (Grafism. GRAF).

The rest of the indicators are defined outside Table 1 as, due to their complexity, they require more precise and detailed explanations and clarifications.

- 22 and 23: Voices of science and technology news. The voices of the news items are, on the one hand, the journalist responsible for preparing the news item and, on the other hand, the statements included in the news item. In order to know whether the journalist is a specialist, their names will be tracked in successive science and technology news items of the channel (the names of the journalists will be printed in a label/title on the news item, technically called "informa"). In case of doubt, the media outlet should be consulted.
- 22: Voices of statements in science and technology news. In terms of statements, the following voices were identified:
 - EH = Expert/Specialist Total
 - EM = Total Expert/Specialist
 - IM = Female institutional total (e.g. the Queen, political figure, other institutional bodies...).
 - IH = Total institutional man (e.g. King, political figure, other institutional bodies...).
 - PH = Spokesperson man (direction/management/leadership/coordination... of a company, association, social group, confederation, event, project, institute...).
 - PM = Female Spokesperson (direction/management/spokesperson/headship/coordination... of a company, association, social group, confederation, event, project, institute...).
 - CH = Total Scientist
 - CM = Total Scientific
 - LM = Total Lego Female
 - LH = Total Lego Man
 - OM= Other (cannot be determined from the context as it is not labelled)
 - OH= Other (cannot be determined from the context as it is not labelled)
- 23: Journalistic voices in science and technology news. The following voices are also identified in relation to journalists:
 - PNEM = Non-Science Journalist Women.
 - PNEH = Non-Human Science Journalist.
 - PEM = Journalist specialising in women's science.

- PEH = Journalist Specialising in Human Science.
- ISAH = In Situ Active: The editor records an entry at the news site in an active way, interacts with the environment in the scientific context.
- ISAM = In Situ Active: The editor records an entry at the news site in an active way, interacting with the environment in the scientific context.
- ISPM = In Situ Passive: The editor records an entry at the news location passively, she does not interact.
- ISPH = In Situ Passive: The editor records an entry at the news site in a passive way, he/she does not interact.
- ISADH = In Situ Active Live: The editor is actively on the spot, interacting with the environment in the scientific context.
- ISADM = In Situ Active Live: The editor actively interacts with the environment in the scientific context.
- ISPDM = In Situ Passive Live: The editor is passively on the spot, without interacting.
- ISPDH = In Situ Passive Live: The editor is passively on the spot, without interacting.
- ISDPM = In Situ Live Plató: The editor does a live on set.
- ISDPH = In Situ Live Plató: The editor does a live on set.

If there is insufficient information on the S&T news totals and there are doubts about the S&T profile, they are considered as Experts (EH) or Experts (EM).

- 24: Breakdown Type of images Time (% and ") : The percentage (%) is calculated in relation to the total number of seconds (") that the message lasts. A number has been assigned to each type of image used in the message. The coding is as follows:

1 = Archive image. Images belonging to the media's archive, normally not indicated with a locator (title indicating the place, e.g. "Teruel, this morning").

2 = Image from films or video games.

3 = Picture of the day. Images recorded intentionally for the production of the news item. They can be images recorded for the NC "fridge" or for broadcasting on the same day. The latter are usually distinguished by the insertion of a label called a locator that indicates when the images were taken.

3A = Images of the day from agencies. Those cases in which it is clearly distinguished that the images used are not collected directly by the channel but have been received through news agencies.

4 = Images provided. Images and photographs provided by the same source that created the news item, either through an agency or directly. For example, the case of the images used by the channels for the launch of the Solar Orbiter. It is most likely that the channels download the images from the news agencies, which are in turn supplied by the source: ESA/NASA.

4A = Totals provided by the source of the news item.

5 = Own graphics. These may be full-screen graphics or graphics embedded on the image. In the latter case, it will be counted as a graphic and not as an archive or daytime image, even if the graphic is superimposed on an archive image, daytime image, film, etc.

6 = Graphics provided. Graphics offered by the same source that created the news item, whether through a news agency or not.

7 = Own total. Totals recorded intentionally for the elaboration of the news item. The duration of the total does not vary if it is covered with images. In this case the images compute us.

8 = Total Archive. Archiving declarations.

9 = In Situ Active or Passive (ISAH/ISAM or ISPM/ISPH)

10 = In Situ Active or Passive (ISAH/ISAM or ISPM/ISPH) + @

11 = In Situ Active or Passive (ISAH/ISAM or ISPM/ISPH) + @ + T

12 = In Situ Active or Live Passive (ISADH/ISADM or ISPDM/ISPDH)

13 = In Situ Live Active or Live Passive (ISADH/ISADM or ISPDM/ISPDH) + @

14 = In Situ Active or Live Passive (ISADH/ISADM or ISPDM/ISPDH) + @ + T

15 = Live Image

- 25: Primary source: if there is a UCC Unizar press release or if it is an independent topic. The latter conclusion is reached when the information on the scientific news does not appear in any news agenda and it is not about congresses, conferences, etc. In other words, it is the medium that is looking for the news without receiving a press release or announcement.
 - 1 = Yes
 - 0 = No
- 26: Secondary source agencies: if the information that appears in the science story appears in the agendas of the agencies. For all:
 - 1 = Yes
 - 0 = No

To analyse the secondary sources, we looked at two of the main international agencies: Reuters and AFP. For the research in these international agencies, we carried out a search of scientific news. In this way, we found out whether it was included in the content that these agencies provided to the television channels. We also carried out the same research in the national news agencies Agencia EFE and Europa Press (EP). Agencia EFE does not have a scientific agenda as such, but by searching the news we can see whether EFE has covered the subject of science and technology, so that it is included, and it can be considered that the media have received the information. Europa Press, for its part, has an EP Science Agency. We have also carried out research in the following regional agencies: Aragon Press and Agenda Aragon TV. We had access to the agendas of this channel so that we could find out whether the science news was included in its own agenda. We also had access to the agenda of the regional EP of Aragon.

- 27: UZ research group: If applicable, give the acronym or name of the group involved in the NC.
- 28: Own topic: Own topic refers to all those topics that do not originate from the agencies, nor from the UCC of Unizar in the case of Aragon TV, or that are not the result of a press release.
- 29: Notes: Data relevant to the research.
- NSD: We indicate with "no data available" any variable that cannot be extracted.

2.2.4 Technique and Coding

We first carried out a pre-test to validate the coding of the thematic areas above. We carried out an initial content analysis for subsequent review and sharing. The results did not exceed 90% agreement, so we redesigned the codebook. In this first test phase, we collected data through quantitative and qualitative content analysis. In a second revision of the test analysis, in addition to improving the classification of the news in each thematic area, we made various changes to underpin the cataloguing as accurately as possible in each case.

Once the pre-test had been carried out and the appropriate variables had been modified, the working methodology was as follow:

- 1st. Capturing news items for archiving using screen recording applications.
- 2nd. Watching the news programmes.^{3º}- Dumping by chains of news in Excel tables for their codification.
- 3rd. Dumping of the results of the thematic areas by chains in Excel tables for quantification.
- 4th. Creation of Excel tables by chains with the 41 parameters and variables of the NCs extracted in the previous steps.

Figure 1 shows an example of an analysis of a TV news broadcast from Aragon. We see in green those news items whose main source is a press release issued by the UCC of Unizar. We have marked in red those news items from the field of Science and Technology (CT), in order to be able to identify our units of measurement more quickly. The letters are green when the NC has a Unizar UCC press release as its primary source.

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CIENCIA Y TECNOLOGÍA	CORONAVIRUS	SOCIEDAD	TRIBUNALES	POLÍTICA	ECONOMÍA	CULTURA	METEO	TOTAL
1	0	3	2	8	1	4	0	19
1	0	2	1	12	0	3	0	19
2	0	0	2	13	1	3	0	21
0	0	3	1	9	2	3	0	18
1	0	5	2	9	3	1	0	21
0	0	1	7	9	2	1	0	20
0	0	2	1	13	3	2	0	21
0	0	6	1	9	3	4	0	23
0	0	4	2	9	3	4	0	22
2	0	5	0	17	0	3	0	27
2	0	9	0	8	1	2	0	19
1	0	7	0	11	3	2	0	24
1	0	6	0	8	0	4	0	19
0	0	3	1	2	2	2	0	10
0	0	6	1	1	2	2	0	12
0	0	11	0	11	1	3	0	26
0	0	10	2	11	0	1	0	24
0	0	10	0	8	1	5	0	24
0	0	5	0	10	1	1	0	17
1	1	2	2	9	1	1	0	17
1	1	3	0	11	3	1	0	20
0	2	3	2	10	1	3	1	22
0	1	2	0	14	3	4	0	24
0	1	2	0	17	0	4	0	24
1	1	1	0	14	3	1	0	21
0	1	6	0	12	2	2	0	23
0	1	5	1	9	2	4	0	22
0	2	5	0	9	4	7	0	27
0	1	2	1	8	3	4	0	19
0	1	4	0	11	2	3	0	21
0	1	2	1	10	2	3	0	19
0	1	3	1	14	1	5	0	25
0	1	2	0	6	2	6	0	19
0	1	7	1	7	3	2	0	21
0	1	5	0	13	1	2	0	22
0	3	2	1	9	4	6	0	25
0	3	5	0	15	2	2	0	27
0	2	4	1	11	2	2	0	22
0	6	3	0	7	2	6	0	24
14	32	175	36	412	75	128	1	873

Note: This table shows the TA of the regional and local block of Aragon TV news. The date, the link to the audiovisual recording of the news programme and the number of news items in each area and sub-area are given (A) and in the same table the totals of the macro-areas are calculated (B).

Figure 3 shows an example of a science news analysis table taken from A3 news programmes.

Figure 3. Example of quantitative and qualitative analysis of an A3 CN

ID	TEMA	Nº	MEDIO	DÍA SEMANA	FECHA	ÁREA TEMÁTICA	MACROÁREA	ÁREA /SUBÁREA	VALOR DEL CONTENIDO	DUR TOT INF	DUR PAR NOTICIA	DUR ENTRADILLA	DUR DTO	DUR NC	TOTAL TEMAS INFORMATIVOS	POSICIÓN	SUMARIO
1A3L100220CTE	LANZAMIENTO MISION SOLAR ORBITER	1	A3	L	100220	CT	E	AA06	H09	0:37:59	0:00:24	0:00:07	-	0:00:17	31	28	0
CEBO	PRESENTA INFORMATIVO	PRESENTA NOTICIA CIENTIFICA	FORMATO	NEVERA	VOZ PERIODISTA	VOCES DECLAS	TIPO IMÁGENES	IMÁGENES TIEMPO %	IMÁGENES TIEMPO								
-	M	-	3	0	-	-	4	82,5%	14"								
							6	17,5%	3"								
FUENTE SECUNDARIA NOTICIA											FUENTE PRIMARIA NOTICIA						
INTERNACIONAL AGENCIA AFP	INTERNACIONAL REUTERS	NACIONAL AGENDA EFE	NACIONAL AGENCIA CIENCIA EFE	NACIONAL AGENDA EP	NACIONAL AGENDA CIENCIA EP	EUROPA PRESS ARAGÓN	ARAGÓN PRESS	UCC UNIZAR	TEMA PROPIO	GRUPO INVESTIGAZ UZ	OTROS GRUPOS DE INVESTIGACIÓN						
1	1	0	1	0	1	0	0	0	0	0	0						

OBERVACIONES
<p>Ese día todas las agencias nutren de contenido científico el lanzamiento del Solar Orbiter, tanto las nacionales como las internacionales. Mucho material es proporcionado por la fuente: ESA/NASA. No hay convocatoria de las agendas de las agencias.</p>

Source: Own elaboration. In this table we see the different variables and units of measurement (41 in total) both qualitative and quantitative of a science and technology news item.

Analysing these parameters helps to study the channel's editorial line and the content on which the news edition is based. With the topics they decide to develop on set or highlight in live broadcasts, the channel shows the audience the news that is of most interest.

2.2.5. Hierarchisation of Scientific Information

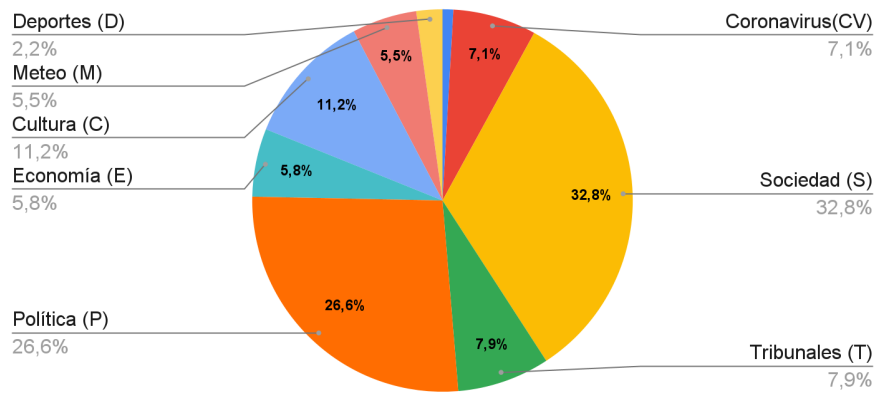
In order to analyse how the channels rank science and technology information, we will analyse several parameters. On the one hand, we will observe the representation of NCs in the summaries. On the other hand, the position of the NCs within the news block. Finally, we will analyse the number of NCs accompanied by live coverage.

For the analysis of the news hierarchy, we have used our own methodology by creating a hierarchical index. In this sense, we have used the system of analysing the results through the relative position that each NC occupies within its news item, assigning each news item a number between 0 and 1, which we will call Hierarchical Index (HI). This is a form of description that allows a comparison of the distribution of the data obtained, taking into account the disparity in the total number of news items in the 202 news programmes. An illustrative example is given below: Suppose that a news programme has 35 news items in which an NC is placed in the first position, i.e. it is the most important one that opens the news item. To this situation we associate the number $1/35 = 0.028$, which we will call the hierarchical index, abbreviated HI. It is also worth noting that the last news item would correspond to an HI of $35/35 = 1$. Thus, smaller values of IJ correspond to better positioned news items in the news hierarchy and vice versa; larger values of IJ correspond to worse positioned news items. Let's look at another example of a NC that is positioned in the first news item in a news hierarchy of 15 news items. In this case the position is 1, so $1/15 = 0.06$. This value is closer to 1 than, for example, another news item with 40 news items in which the NC is placed in position 1, in which case the result is $1/40 = 0.02$, which is closer to 0 than in the previous example. This means that it has a higher hierarchical value if the channel chooses to place an NC in the first position in a news item with 40 news items than in one with only 15. The IJ therefore takes values in the interval $[0,1]$ and this interval is divided into four parts or quartiles: $Q1=[0, 0.25]$; $Q2=[0.25, 0.5]$; $Q3=[0.5, 0.75]$ and $Q4=[0.75,1]$.

3. Analysis of the Results

With regard to the general data on thematic areas, we can see in Figure 4 that the highest percentage of news items analysed, almost 33%, belong to the macro area of "Society" (S). This is followed by 'Politics' (P) with 26.6%, 'Culture' (C) with 11.2%, 7% were news about the 'Coronavirus' (CV) and economic news (E) did not reach 6%. The rest represent a small percentage, those belonging to "Meteo" (M) and "Sports" (D), as they are usually integrated in spaces outside the news. Lastly, without even reaching 1%, news from "Science and Technology" (CT).

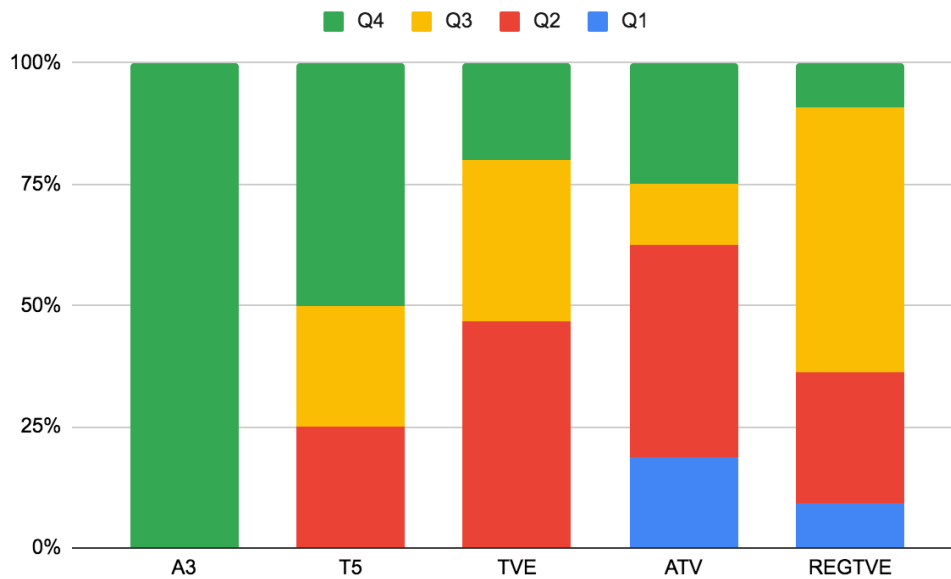
Figure 4. Thematic macro-areas of all analysed news items in the body of all news programmes.



Source: Own elaboration.

Another key finding of the analysis is that science news does not occupy a prominent position in the news hierarchy of the news programmes analysed. Although science news is present in the news programmes, it tends to be presented in less relevant segments within the news programmes. This is reflected in Figure 5, which compares the quartile results by channel. As noted above, only ATV and REGTVE have NCs in Q1. Specifically, almost 19% of ATV's NCs and 9% of REGTVE's NCs.

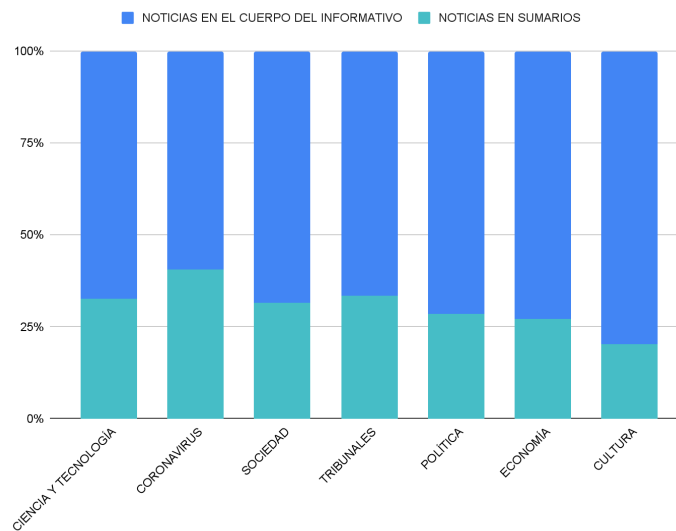
Figure 5. Results of the position of the NCs within the news items per channel



Source: Own elaboration.

Continuing with the results of the hierarchy of science and technology content, 32.7% of the total number of SNs broadcast were found on the front pages of news programmes. If we compare the number of news items in each area with the percentage of news items appearing in summaries, we can see in Figure 6 that the percentage of SNs is not a low or problematic figure. In fact, it is one of the highest percentages, next to coronavirus news.

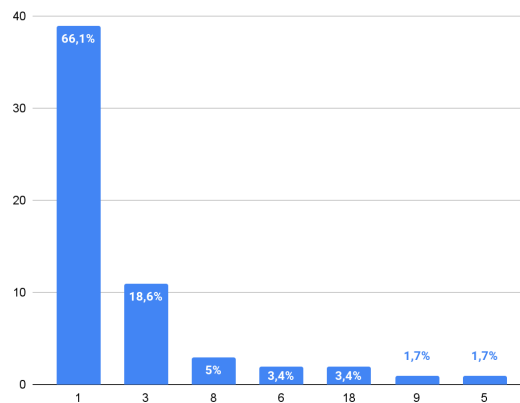
Figure 6. Comparison of the number of news items in the different thematic areas with the number of such items in the summaries.



Source: Own elaboration. This figure does not include data on sports news or weather, as these are areas that are usually left out of the news and would distort the results.

As regards the audiovisual formats used to broadcast the NCs, of the 18 different formats described in the methodology section, only seven were used by the five channels analysed. As shown in Figure 7, the most frequently used formats are VTR and queues.

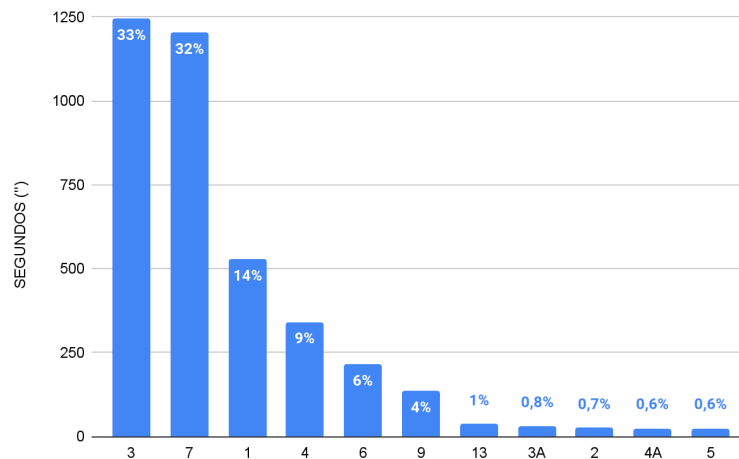
Figure 7. Results of the NC formats used in all the chains



Source: Own elaboration. This figure shows the various audiovisual formats of the NCs of the different channels. The different formats are: 1 = VTR, 2 = RECAP, 3 = CUTAWAYS (@), 4 = TOTAL (T), 5 = TOTAL + CUTAWAYS, 6 = CUTAWAYS + TOTAL, 7 = ON-CAMERA NOTE, 8 = LIVE (DTO), 9 = DTO + @, 10 = DTO + @ + T, 11 = DTO + @ + T, 12 = PLATO LIVE , 13 = PDTO + @, 14 = PDTO + @ + T, 15 = PDTO + @ + T, 16 = GRAFISMO, 17 = VTR and 18 = PLATO LIVE INTERVIEW WITH CUTAWAYS.

With regard to the type of images used and the time spent on each of them, we can see in Figure 8 that, of the 17 types of images that could be used, we were able to clearly distinguish 11 of them in the CBCs analysed. Thus, for all the channels, we can distinguish between the use of most images taken during the day (3) and the totals collected by the channel for the production of the NC (7).

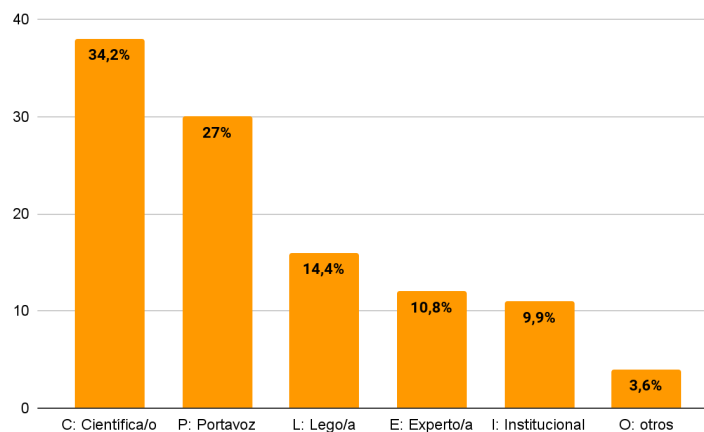
Figure 8. Result of the type of images and the time spent on each image in all chains.



Source: Own elaboration. This figure shows the 11 types of images used in the NCs of all the channels of the 17 categorised, which are: 1 = Stock image; 2 = Image from films or video games; 3 = Image of the day; 3A = Images of the day from agencies; 4 = Images loaned; 4A = Totals provided by the same source that created the news item; 5 = Own graphics; 6 = Loaned graphics; 7 = Own total; 9 = In Situ Active or Passive; 13 = In Situ Active or Passive Live + @.

Figure 9 shows that 34.2% of the people who intervene in the news are scientists, 27% are spokespersons, 14.4% are non-specialists in science and technology (laymen), almost 11% are experts, one of the lowest percentages is occupied by institutional personalities (I) and only 3.6% could not be categorised as they were not labelled in the news programme.

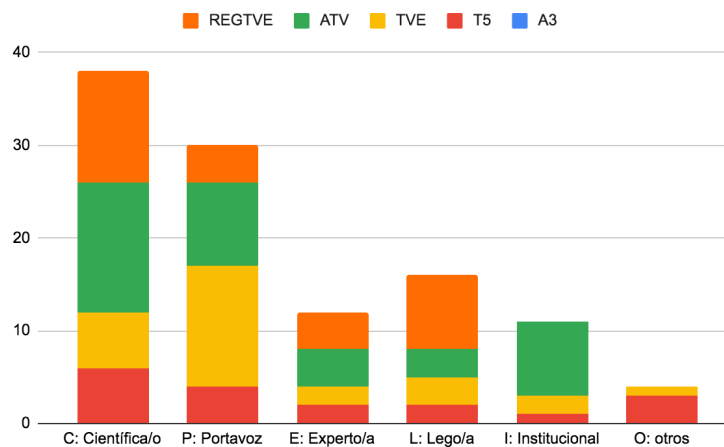
Figure 9. Voices of the NCs of all channels



Source: Own elaboration. "O" (other) refers to the totals that appear in the broadcast without a label and therefore cannot be determined or categorised.

When analysed by channel, Figure 10 shows that the regional channel ATV has more scientific voices in its NC, followed by REGTVE. The national channels TVE and T5 have the same number of "total" scientists.

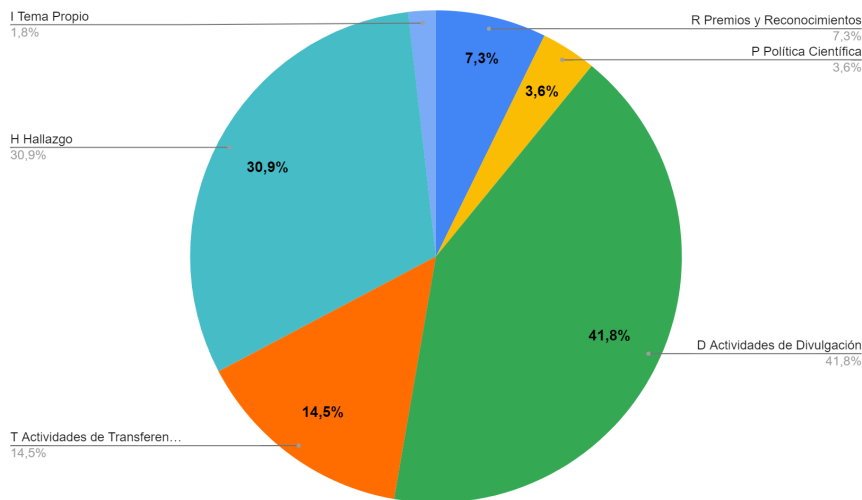
Figure 10. Voices of the NCs by chains



Source: Own elaboration. "O" (other) refers to the totals that appear in the broadcast without a label and therefore cannot be determined or categorised.

Regarding the subject matter of the news values in the agenda setting, we observe quite a difference in terms of the news rationale of the NCs. As we can see in Figure 11, almost half of the news items broadcast corresponds to D (dissemination activities, communication to society) with 41.8%. This is followed by H news (findings) with 30.9%.

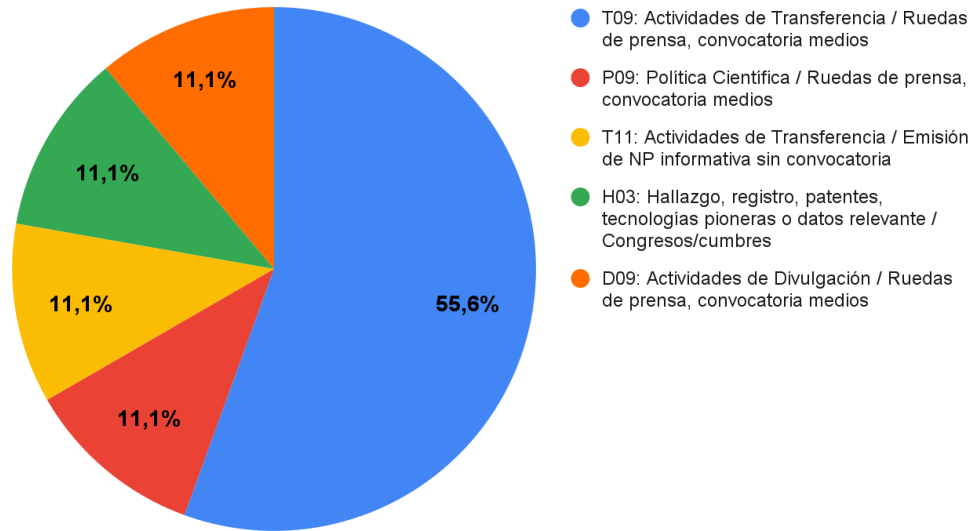
Figure 11. NC percentage result according to value in *agenda setting*



Source: Own elaboration.

With regard to the value of the content and format of the scientific dissemination of Unizar NCs, we can see in Figure 12 that more than half of them belong to transfer activities, which are disseminated thanks to press conferences and calls for papers. The rest, with the same percentage of 11%, are science policy NCs and dissemination activities whose format of science dissemination continues to be the organisation of press conferences and media calls; also transfer activities, but with the sending of NPs without calls and, finally, results, registrations, patents, cutting-edge technologies or relevant data in congresses or summits.

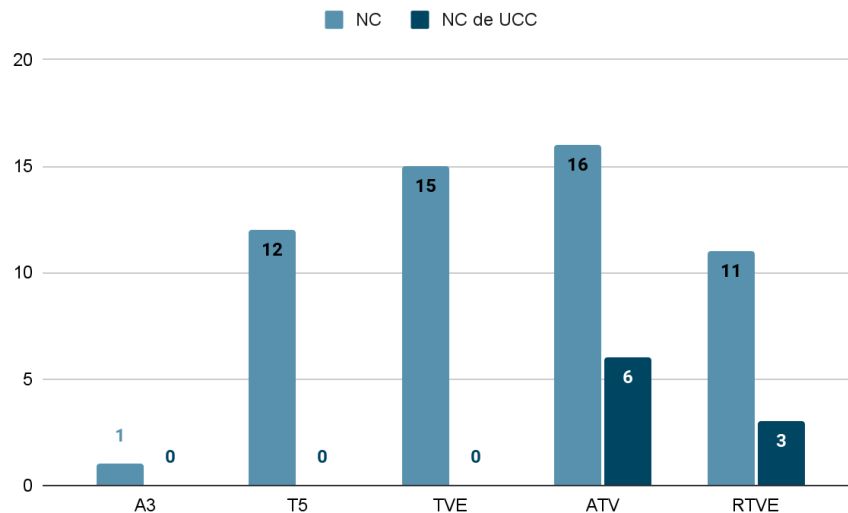
Figure 12. News value and science dissemination format of Unizar NCs



Source: Own elaboration.

The results of the analysis also show that the University of Zaragoza issued a total of 80 press releases, of which 11.25% reached Aragonese society through the regional news programmes with the highest audience in Aragon and none through the national channels. As can be seen in Figure 13, most of this information was broadcast by the regional channel Aragon TV, with 66.6% of the total, while the rest was broadcast by TVE's news programme "Noticias Aragón".

Figure 13. Science and technology news (NC) originating from the Scientific Culture Unit of the University of Zaragoza (UCC Unizar).



Source: Own elaboration.

As we said, of the 55 NCs analysed, nine have the Scientific Culture Unit of the University of Zaragoza (UCC Unizar) as their main source, representing 16.3% of the total. Of these, none have switched to the national channels, which means that the percentage in relation to the two regional channels is 33.3%. This means that of all the NCs broadcast by the regional news channels, less than half come from Unizar. Of all the Unizar NCs shown in Figure 14, only one is broadcast live, one is on the front page of the news programme (summaries) and the other is in "Teasers (Cebos)", the same subject but on ATV.

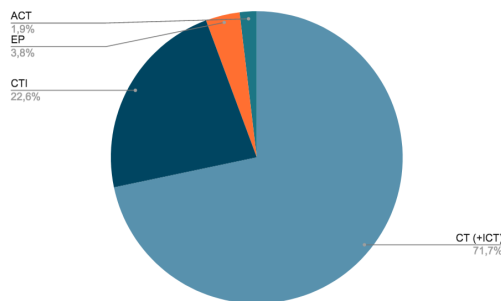
Figure 14. Result of all Unizar NCs sent by the UCC

ID	TEMA	CADENA	ÁREA TEMÁTICA	MACRO-ÁREA	ÁREA /SUBÁREA	VALOR DEL CONTENIDO	DUR PAR NOTICIA	TOTAL NOTICIAS	POSICIÓN	SUMARIO	CEBO	FORMATO
2ATL181119CTH	WEB JULIO VERNE (HUESCA)	ATV	CT	H	HI99	D09	0:01:32	30	28	0	0	1
5ATV221119CTE	MEDICIÓN AMBIENTAL (ZARAGOZA)	ATV	CT	E	CE13	T09	0:01:26	29	11	0	1	1
6ATV221119CTB	USO ANTIBIÓTICOS (ZARAGOZA)	ATV	CT	B	CM09	T11	0:01:43	29	12	0	0	1
9ATL021219CTIE	VISITA DE LA NANJING TECH UNIV. A UNIZAR (ZARAGOZA)	ATV	CTI	E	MIX	P09	0:00:20	34	11	0	0	3
13ATJ051219CTIM	30 AÑOS CREACIÓN OTRI (ZARAGOZA, UZ)	ATV	CTI	MIS	MIX	T09	0:01:42	31	12	0	0	1
15ATM040220CTIB	PRESENTACIÓN PROYECTO ERA4TB (ZARAGOZA)	ATV	CTI	B	MIX	T09	0:01:30	27	15	0	0	1
5REM221119CTE	MEDICIÓN AMBIENTAL (ZARAGOZA)	REGTVE	CT	E	CE13	T09	0:01:44	19	13	1	-	1
10RELO30220EPM	ENTREVISTA IX CONFERENCIA INTERNACIONAL INSTITUTO BIFI (ZARAGOZA)	REGTVE	EP	MIS	MIX	H03	0:04:35	13	8	0	-	18
11REM040220CTB	PRESENTACIÓN PROYECTO ERA4TB (ZARAGOZA)	REGTVE	CT	B	MIX	T09	0:01:37	18	10	0	-	1

Source: Own elaboration. Sample of all NCs whose main source is the University of Zaragoza. The topic marked in green indicates the only NC that goes live. NCs that are featured in summaries and teasers (cebos) are marked in gray.

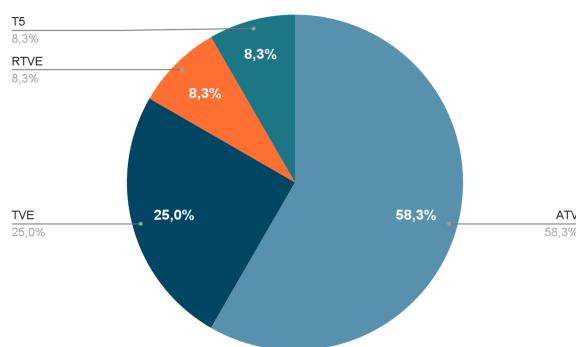
With regard to the thematic area of the NCs, as indicated in the codebook, we have distinguished whether they are institutional (CTI) or non-institutional (CT). In this way, we have coded as CTI those media calls that contain institutional or political statements. The result is that just over 22% are institutional, as shown in Figure 15. Most of these ECIs are concentrated in the Aragon TV news programme, that is, in the Aragon regional channel, as shown in Figure 16.

Figure 15. NC results by thematic area



Source: Own elaboration. The thematic areas of the NCs are ACT: Aragonese NCs that are broadcast on national news programmes; EP: NCs with a live interview format on set; CTI = institutional NCs; CT = science and technology (ICT = NCs in an international context).

Figure 16. Breakdown of institutional NCs by chain



Source: Own elaboration.

4. Conclusions

Through this research, we have found that there is a small amount of science news content, and it is poorly positioned in the media, as none of the NCs received a Q1 rating. Despite this, broadcasters consider it relevant to feature this information on the front page, as it occupies the same or more space in news programs than other topics such as society and politics. Despite the fact that S&T news does not occupy a prominent space or position in the news programs of the most popular television channels in Aragon, we can conclude that the regional public channels favour the broadcasting of S&T news. Specifically, with regard to scientific information from the University of Zaragoza, these are the only news programs in which they have a place. The news agencies that serve as content for the media have a large amount of scientific information, most of it in text format. Therefore, we can conclude that the problem of the low number of NCs is not due to a lack of raw material.

Regarding the difficulties in producing scientific information, one of the main problems is the lack of audiovisual resources. Most of the press releases sent out by Unizar's UCC are in text format with photos attached. However, television stations use audiovisual formats when preparing scientific information: VTR, closed pieces with voice-over, images, "totals," and "cutaways." As for the type of images used, most of them are images and summaries recorded during the day. The regional channels, TVE's regional news programs, and Aragon TV, are the ones that allocate the most resources to the production of NCs, followed by TVE, i.e., they allocate equipment and resources for recording. In conclusion, the regional and public channels favour quality in the coverage of science and technology information. The use of graphics and infographics to illustrate complex scientific topics is very low. Graphics produced by the media themselves are almost non-existent.

In terms of territoriality, Unizar's scientific topics do not reach the national news agendas. At the regional level, science topics from Zaragoza are the most numerous. In addition, there is a clear lack of NCs of an international nature in the news programs analysed. Finally, the media coverage of the coronavirus went from being a topic far away from Spain and Aragon to occupying a large part of the national and regional news when the first cases were detected. All of the above and this change in coverage of COVID-19 reflect the importance of news proximity in media agenda setting, which is accentuated when it comes to scientific issues.

Researchers are more visible on regional channels, as we have seen in the voices in the news. However, some of the NCs broadcast on Aragon TV (including the Unizar news) have been included in the media agenda because they are institutional announcements. However, TVE's regional news program treated the NCs differently and decided to give a higher percentage of voice to the scientific community.

Regarding the news value and the reason for their inclusion in the agenda of the TV channels, we can also say that the news that is most widely disseminated is that of dissemination and results. However, this is contradicted when we compare this general data with the NCs of Unizar in particular, whose news value is mostly the transfer activities. Moreover, in general, the format of science dissemination that works best in the newsrooms is the organisation of press conferences and calls to the media. It can therefore be concluded that the science and technology topics most covered in the regional media are transfer activities communicated through press conferences and press calls. For example, companies and institutions requesting the services of Unizar, presentation of projects and programs with companies or activities related to the OTRI (Office for the Transfer of Research Results/Oficina de Transferencia de Resultados de Investigación).

Essentially, the key to getting an S&T news item on the media agenda depends on the number of current issues on the agenda, the audiovisual resources it contains, the time needed to prepare it, the availability of equipment or, in the case of Aragon, whether the requests are of an institutional nature.

5. Acknowledgements

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