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Progress or regression in the practice of immersive journalism? Immersive storytelling in the productions of the *Samsung VR* platform between 2015 and 2020

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Abstract

Journalism has undergone countless changes in recent years, especially since the emergence of the network of networks. As digital technologies have gone from strength to strength, new ways of doing journalism have also gained traction, focusing on the potential offered by “going digital”. This perspective goes hand in hand with another linked to virtual reality (VR) and 360-degree video, with additional technical characteristics. Since 2010, there has been talk of so-called “immersive journalism”, which uses the above-mentioned technologies to narrate events, introducing a perspective into journalism that breaks with the classical concepts of working with information and making it available to the viewer, who now becomes an immersive user. This is the context of the present investigation, which focuses on the change of immersive journalism over the last five years. To this end, 1713 pieces available on the *Samsung VR* platform are analysed. The results reveal that there have been some changes in terms of production; however, in narrative terms, when it comes to reporting reality, the only evident change has been the way in which the functions of immersive storytelling elements have been updated.

Keywords: virtual reality, 360-degree video, immersion, journalistic practice

1. Introduction

The expansion of digitalisation has not only modernized our way of managing communication at the business level, but has also changed aspects pertaining to professional practices and routines within the various media, which are still being adapted to the Internet environment. Long gone are the days of a journalist rushing to write the last details of a news article on his typewriter to ensure that it would be ready for publication in the next day’s paper. Today’s communication professionals, whether they work for the press, radio or television, must be able to work from a hypermedia perspective on the information, which is published minute by minute on the Web, while consulting and updating the media’s social networks, all the while receiving the latest news directly on their smartphones. In the 21st century, with the establishment of a multi-screen system (smartphone, tablet, PC), information consumers are increasingly active and have become prosumers (Toffler, 1981). This need for reinvention, imposed by digital convergence (Jenkins, 2008), has led the media to create new

and innovative ways of representing reality. The latest innovation has been the use of virtual reality (VR) and 360-degree video as a means of narrating informative content, which has given rise to immersive journalism (de la Peña, et al., 2010) and, with it, new ways of doing and consuming journalism. These are the main novelties that immersive technologies have introduced into the world of journalism, and it is from here that the proposed investigation arises. Specifically, the possible changes that immersive journalism has undergone in the last five years will be analysed, with special emphasis on issues related to production and immersive storytelling.

2. Theoretical framework

2.1 Immersive technologies expansion and conceptualization

Devices related to immersive technologies are achieving great prominence in many different contexts of daily life, and this is perhaps the most significant aspect. It is

interesting to consider data in terms of their business penetration. The global market size of VR, augmented reality (AR) and extended reality (XR) is increasing year over year and could reach 297 billion dollars by 2024 (Statista, 2021a). Moreover, in relation to the total annual growth rate, the VR sector is expected to grow by 21.6 % each year between 2020 and 2027 (Grand View Research, 2021). Consumer demand of immersive devices is also increasing. More than 43.5 million AR and VR headsets are expected to be owned by private users by 2025 (Statista, 2021b). Some authors justify this rise in demand in the situation caused by the COVID-19 pandemic, which has imposed new ways of working (Baileson, 2019) and even learning (Cáceres-Piñalozza, 2020; Flores Cruz, Camarena Gallardo and Avalos Villarreal, 2014; Martínez-Garcés and Garcés-Fuenmayor, 2020).

Leisure and entertainment are fields where immersive content has developed the most, with a wide range of video games leading the way. By 2027, VR is expected to reach 92.31 billion dollars in the video game market. The demand will be driven by younger users, who are becoming very demanding in terms of entertainment and they are the potential consumers of these advanced technologies (Grand View Research, 2020; Martín-de-Santos, 2020). *Samsung Electronics, Google, Microsoft, HTC, Oculus, Apple, and Eon Reality* are the most prominent and leading companies offering immersive devices (Markets and Markets, 2020).

As another proof of the increasing relevance of the immersive context, *Facebook* has announced to include in its long-term business strategy the idea of *Metaverse*, which relates to the interaction with virtual worlds. In this context, immersive technologies will acquire an even greater importance from now on. *Facebook* has rebranded its name to *Meta* empowering with this decision its business goals (Casillas, 2021; Valladares, 2021; Vergne, 2021). As a result of the extensive development of immersive technologies, some concepts, such as VR or AR, have emerged. Also, the less widespread in the scientific literature, XR, which includes the two previous ones and has its origins in the reality-virtuality continuum provided by Milgram and Kishino (1994).

“Extended reality allows us to imagine scenarios to change the world, to simulate and represent situations or events, or to imagine ways of transmitting knowledge and discoveries and to find new relationships with information through interaction and immersion” (Rubio-Tamayo and Gertrudix, 2020, p. 106).

This terminological variety adds some complexity when it comes to defining the boundaries among them, especially when it is a field that is undergoing an unstoppable evolution (Rubio Tamayo, 2019).

2.2 Immersive journalism in the scientific literature

Focusing the attention on VR, which is addressed in this study, it is necessary to point out that from a theoretical point of view it has become a very recurrent subject in the scientific literature, since it has been applied to multiple other areas of knowledge, such as medicine (Joda, et al., 2019; Persky and Lewis, 2019; Riva, Wiederhold and Mantovani, 2019), psychology (Bouchard and Rizzo, 2019; Riches, et al., 2019; Yaremych and Persky, 2019), architecture (Nguyen, et al., 2016) and tourism (Juca Maldonado, Lalangui Ramirez and Bastidas Andrade, 2020; Taufer and Todeschini Ferreira, 2019), to give but a few examples. Moreover, it has, of course, also reached the media. The first journalistic content developed through VR emerged in the university environment in the 1990s, giving rise to several pioneering examples in this area which revealed the potential of VR to create immersive stories (Domínguez, 2013). In 2010, researcher Nonny de la Peña proposed the concept of “immersive journalism” to refer to “the production of news in a form in which people can gain first-person experiences of the events or situation(s) described in news stories” (de la Peña, et al., 2010, p. 291). From this moment onwards, while such media content has been being developed around the world, a bibliographical corpus has started to emerge, in which the academic concern for this object of study has been considered and presented from different perspectives: technological aspects (Gutiérrez-Caneda, Pérez-Seijo and López-García, 2020), ethics (Kang, et al., 2019; Sánchez Laes and Utne, 2019), production (Cantero de Julián, Calvo Rubio, and Benedicto Solsona, 2020), concepts of immersion and presence associated with consumption (Van Damme, et al., 2019; Nielsen and Sheets, 2019), the inclusion of VR in journalism studies (Sissons and Cochrane, 2019) and, of course, the topic of immersive storytelling (Caerols Mateo, Sidorenko Bautista and Garrido Pintado, 2020; Paíno Ambrosio and Rodríguez Fidalgo, 2019), are just some of the topics from a research perspective.

A key date that marks a turning point in the production of immersive content is 2015, when certain media started to make frequent use of VR and 360-degree video. Some would even go on to create teams and laboratories exclusively dedicated to this work. Moreover, the reduced cost of omnidirectional cameras, along with technological improvements in these devices, which can record in high definition, have led journalists to use them more and more. In fact, it is a much faster option in terms of production times than the pieces created digitally, as they spare the producer the task of designing and constructing a digital environment (Jiménez, et al., 2021). For this reason, it is important to highlight the difference between the var-

ious productions that are considered immersive: projects produced in computer-generated environments, based on a synthetic recreation of scenarios and situations, are one thing; but those that choose to use 360-degree video are another. The first group includes the works developed by de la Peña and Emblematic Group, such as *Hunger in L.A.* or *Project Syria*; and pieces like *Harvest of Change* developed in 2014 by *Des Moines Register*. In the second group, *MSNBC* stands out as the first media outlet to use 360-degree video, in this case, for a project on the effects of Hurricane Katrina. Since those first pieces, immersive production related to informative treatment has continued to open new doors to research, which has ultimately enhanced immersive journalistic practices.

3. Research approach

Next, we will examine the methodological aspects that support the study.

3.1 Hypotheses and objectives

Firstly, the two research hypotheses can be summarised as follows:

- Immersive journalism has gone through a first phase marked by a ‘boom’ in immersive productions, and is currently entering a second phase of adoption, which implies less production.
- In the last five years, the storytelling guidelines used by most producers/directors currently producing immersive information have begun to consolidate, sharing aspects with classic narration while showing innovation in other areas.

These hypotheses have given rise to the following general research objective:

- To determine the changes produced in immersive news content on the *Samsung VR* platform, both in terms of production and from a narrative point of view.

This general objective includes, in turn, the following specific objectives:

- To analyse the aspects that identify the immersive productions under investigation.
- To analyse the narrative elements and the function they fulfil in the productions examined.

3.2 Sample selection and justification

The selection of the sample has been limited to the content in VR and 360-degree video published on the *Samsung VR* platform (formerly available at <<https://bit.ly/2wNMiea>>). The reason for this is that this platform offered an extensive catalogue that users could

access openly and free of charge until 2020 and it was possible to access content published since 2015. This is a significant date for this study, as it marks the moment when a great development in immersive journalism began to take place. Also, as indicated in the theoretical section, *Samsung* is one of the companies that made significant investments in immersive technologies.

There are other platforms that also host VR/360° content, such as *YouTube*, *Littlestar*, *Veer*, *Within*, *Oculus* or *Dark Corner*, among others – some of them more focused on leisure and entertainment content, and they have been the subject of study in some previous works; see for example Barbera Hernández (2020), Benítez de Gracia and Herrera Damas (2019), Gutiérrez-Caneda, Pérez-Seijo and López-García (2020), Ivars-Nicolás, Martínez-Cano and Cuadra-Martínez (2020); Rodríguez-Fidalgo and Paño-Ambrosio (2020), Sirkkunen, et al. (2016), Pérez-Seijo (2021). Compared to them, *Samsung VR* established a categorisation of content. Among these categories, “news and documentaries” is the one used for this study because of its direct link to the journalistic field of the news genre.

The classification of themes is based on that provided in a previous research by Fernández Jara (2013) and which was applied to audiovisual journalistic documentaries. In order to carry out the proposed analysis, it has been modified and adapted to the proposed object of study.

Specifically, the themes are: 1 = Government, 2 = Armed and unarmed conflicts, 3 = Economy and employment, 4 = Activism, 5 = Terrorism, 6 = Migration, 7 = Prisons, 8 = Crimes and violent acts, 9 = Situation of women in the world, 10 = Gender violence and domestic violence, 11 = Gender identity and sexual orientation, 12 = Education models, 13 = Childhood, 14 = Poverty and inequality, 15 = Nature, 16 = Natural disasters, 17 = Pollution and natural disasters, and environmental awareness, 18 = Lifestyles, 19 = Personal profiles, 20 = Health, 21 = Science and technology, 22 = Culture, 23 = Production and consumption, 24 = Death, 25 = Religious practices, 26 = Media, 27 = Tourism and travel, 28 = Sports and motoring, 29 = Performing arts, 30 = Fiction, 31 = Experiences, 32 = Parades and military training, and 33 = Others. It should be specified that all of them were defined in the codebook for further categorisation.

This classification allows us to approach the object of study proposed here with greater depth and perspective, both in terms of time and content, and the result of this is the configuration of a significant and systematised sample from a scientific point of view, as it allowed access to a wide variety of productions. Specifically, the period of analysis runs from 15th December 2019 to

31st March 2020, which has allowed us to collect a sample of 1713 productions published between 2015 and 2020, that had the appropriate characteristics to be able to analyse the variables established for the analysis.

3.3 Methodology

As regards the methodological aspects followed when addressing the object of study, an analysis sheet and a codebook have been drawn up that include the variables that have been taken into account. In this regard, it must be said that there was no previous system of categories for analysing this type of platform (*Samsung VR*), which made it necessary to create a specific methodological tool to undertake the research. Specifically, the codebook used to approach the study has been divided into two blocks that clearly include all the relevant variables for the analysis, as shown in Table 1.

The variables that have been taken into account allow us, on the one hand, to identify the context in which the immersive production is classified and, on the other, to analyse narrative elements and the function that they serve. All of this was done with a view to analysing the changes produced in the use of VR and 360-degree video when relaying facts.

The data obtained has been processed with the SPSS statistical analysis program. To check the reliability of the analysis variables, a sample of 5.0 % of the proposed pieces was randomly selected, which meant a total of 86 pieces that were first analysed, identifying those variables that needed to be expanded or on which it was necessary to focus, and at the same time those that could be disregarded as they did not offer relevant data for the research. This pre-analysis made it possible to configure and readjust the variables in those cases where it was

necessary to configure those that finally form part of the definitive file, as described above. The coding of the 1713 items was carried out by one researcher, giving rise to the same number of analysis files, following the previously established instructions. However, in order to check the reliability of the coding process of the sample, a second researcher was used to check the reliability of the coding process (Krippendorff, 1990). To perform the intercoder reliability calculation, 257 immersive news items were randomly selected, corresponding to 15.0 % of the sample. In this case, using SPSS software, Cohen's Kappa coefficient was calculated. The results show that all variables will have a value higher than 0.9, which indicates an almost perfect degree of agreement (Landis and Koch, 1977).

4. Analysis and results

The results obtained in the analysis of the productions published on the *Samsung VR* platform are listed below.

4.1 Identifying aspects of immersive journalistic content

When it comes to analysing immersive journalistic productions, it is first necessary to address four fundamental factors: the year of publication, the authorship, the geographical distribution and the language, as these data provide the context in which the projects under analysis originate and develop.

4.1.1 Year of publication

When considering the progress or regression of the immersive contents on the *Samsung VR* platform, it is essential to analyse the year of publication of each

Table 1: Analysis sheet

Variable	Indicator	Value	
Identifying aspects of production	Year of publication on the platform	Specify: 2015, 2016, 2017, 2018, 2019 or 2020	
	Author of the piece	Name	
	Producer type	Specify: media, audiovisual producer, non-governmental organisation, non-media company or others	
	Producer's nationality	Geographic region Country	
Narrative elements of immersive productions	Duration	Specify	
	Topic	Specify	
	Image type	Specify: 360-degree video or recreation	
	Audiovisual resources	Text	
		Photography	
		Video	
Sound			
	Video effects		
	Other resources		

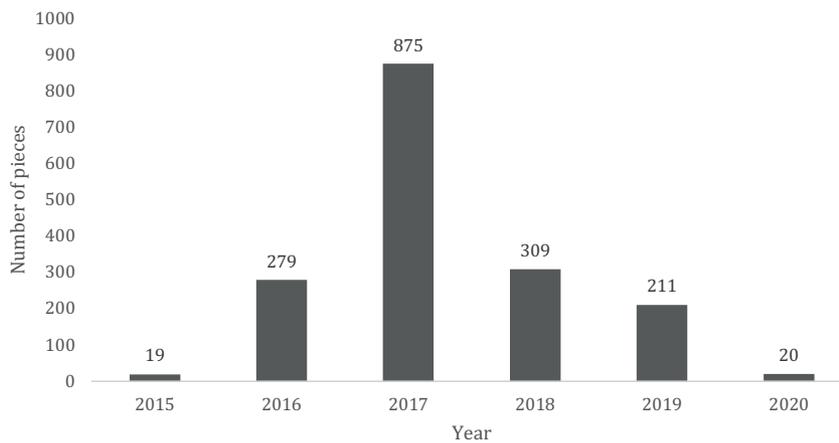


Figure 1: Distribution by year

piece (Figure 1). In this regard, the chronological distribution of the sample under investigation reflects a significant increase in production between 2015 and 2016, becoming even more pronounced in 2017. In total, 68.5 % of the sample was published in these first three years. However, a marked decrease is observed in 2018, when the number of productions decreases by almost two thirds compared to the previous year, a downward trend which also continues in 2019. Additionally, the data available from January to March 2020 seem to indicate that this decline is continuing.

4.1.2 Authors of the pieces and type of producers

Another aspect that contributes to a greater knowledge of immersive production is its authorship. In this case, the codebook included five variables: 1 = Media, 2 = Audiovisual producer, 3 = Non-governmental organisation (NGO), 4 = Non-media company, and 5 = Others. When coding the sample, the authorship indicated in

the credits of the pieces was taken into account, as well as the metadata included in the *Samsung VR* platform. In this way, digital or printed newspapers, television channels, radio stations or news agencies were considered as “media”. “Audiovisual producers” are those companies dedicated to the audiovisual sector that work independently and may, or may not be, linked to the media. Unlike the previous ones, the variable “company” includes those entities whose main activity is not directly linked to the media. Finally, the NGO is category is clearly defined, and for those cases that could not be classified in any of the previous categories, the variable “others” was designed.

By breaking down the data relating to the year of publication of productions by the type of producer, the results are revealing (Figure 2). Between 2015 and 2017 the media accumulated the highest volume of productions, while in 2018 and 2019 the authorship appears more widely distributed.

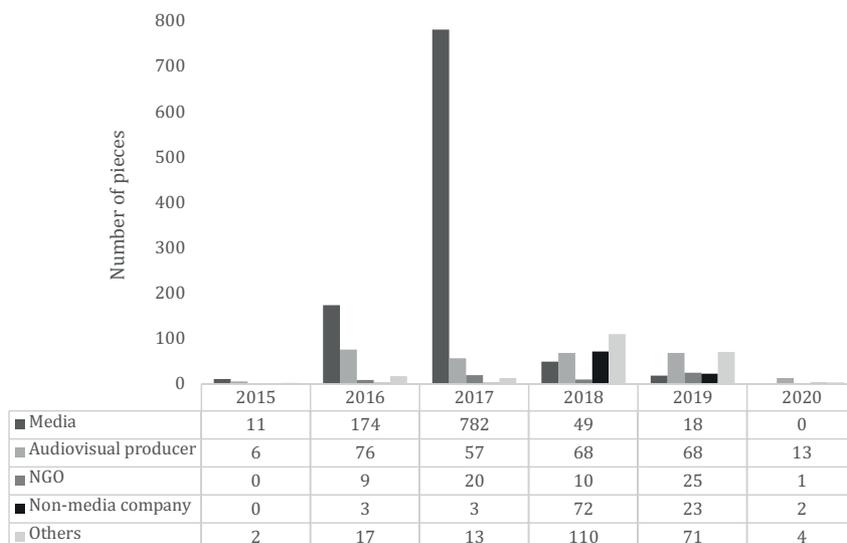


Figure 2: Distribution by type of producer

When it comes to communication media, one must not only consider those which are exclusively public or private, but also those of a diverse nature (e.g. news agencies, newspapers or television stations). In total, up to 32 media have been identified, with different production volumes. This is the case with *CNN* (with 83 pieces), *Contrast VR – Al Jazeera* (25), *Die Welt* (1), *Discovery Communications* (7), *Euronews* (40), *RT – Russia Today* (15), *Sports Illustrated* (6), *The Associated Press* (10), *The New York Times* (429), *The Wall Street Journal* (8), *Time* (11), *Todo Noticias* (17), *USA Today* (24), *Yonhap News* (298) or *ZDF Enterprises* (2), among others.

It has also been possible to confirm the importance of audiovisual producers, some of which have specialized in creating content in VR and 360-degree. In this case, as can be seen in Figure 2, the volume of pieces from producers remained stable between 2015 and 2019. More specifically, 93 different producers have been counted, the most prolific being *RYOT* (with 49), *Whitstag* (39), *Targo* (11) and *Dreamo VR* (with 11 pieces).

Something similar occurs with non-profit organizations, whose production is widely distributed in the period analysed, except for 2015 and the first months of 2020, when this study was conducted, where no productions with this authorship were found. In total, up to 23 different organisations were identified, including *ChildFund International* (1), *Gates Notes* (22), *Greenpeace* (2), *Wisdom Teachers VR* (17) or *World Call to Action* (2), among others.

It is also interesting to highlight projects coming from companies not directly linked to the audiovisual sector, whose production increased rapidly between 2017 and 2018. Twenty-two companies were found,

including *FLO* (28), *SamsungVR US* (10), *Red Bull* (4) or *Turistika.cz* (27).

Lastly, the volume of pieces from associations, educational centres, other organisations and institutions, and even individuals, is also significant, totalling 77.

Specifically, these are the main producers in 2018 and 2019. In this regard, authorships as diverse as the *Film Academy* (1), the *American Society of Landscape Architects* (1), the *Centre for Social Impact UWA* (1), the *Geographical Society* (1), the *USC Annenberg School for Communication and Journalism* (1) or the *Novosibirsk Planetarium* (1) can be mentioned.

4.1.3 Geographical distribution

Lastly, geographical identification data allows us to create a location map of the immersive projects that have been created globally over the last five years and which have been published on the *Samsung VR* platform. The data from the analysis show the presence of the pieces examined in eight major geographical regions: North America, Latin America and the Caribbean, Western, Central and South Asia, Eastern and Southeast Asia, Europe, and Oceania. The results obtained are shown in Figure 3.

One can observe a predominance of pieces made in North America compared to the other regions, constituting more than half of the sample examined, with 922 pieces. Europe, with 351 pieces, and East and Southeast Asia, with 305 pieces, follow second and third, respectively. The analysis by country has revealed that there are 37 different nationalities among the producers identified in the *Samsung VR* platform. Few countries accumulate the highest volume of pro-

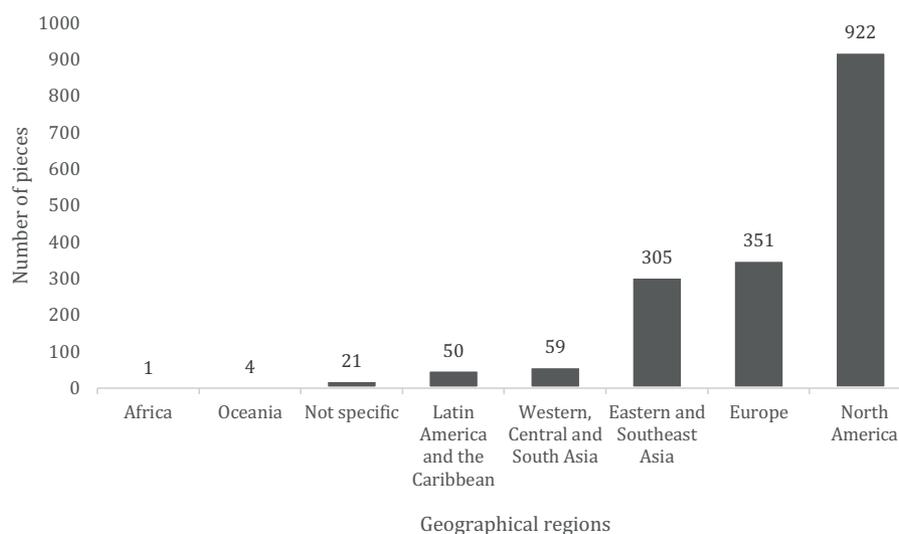


Figure 3: Distribution by geographical regions

duction, the United States being the main producer of this type of content, with 911 pieces; followed by South Korea, with 299; and Spain, with 101. In contrast, in the analysed category of “news and documentaries”, countries such as the Philippines, Hungary, Italy, Japan, Kenya, Peru, Sweden, or Vietnam, only feature a single production on the platform.

When it comes to the distribution results by provenance, it should be noted that, while in some countries, such as the United States, there are many producers of VR and 360-degree content, in others, only one or two producers were identified. This means that countries with a similar number of producers also have a similar production volume. However, the case of South Korea is especially significant, where only the media *Yonhap News* accounts for 17.4 % of the total sample (with 298 pieces), while in the case of the United States, which was mentioned above, more than 114 account for only 53.2 % of the sample (with 911 pieces).

As the nationality of the productions also influences the language of production, English, used in 60.1 % of the sample (1029 pieces), stands out, followed by Korean, in 17.4 % (298). Much further behind are Spanish, at 3.0 % (52 pieces), German, 1.3 % (23 pieces) and Russian, 0.9 % (15 pieces).

4.2 Narrative elements of immersive journalism production

In addition to the identifying data described in the earlier paragraphs, which contextualise the immersive journalistic production, it is now necessary to provide a deeper analysis of the aspects of storytelling. Narrative elements in the projects under investigation and their function are analysed below. Specifically, the duration, subject matter, type of image and audiovisual resources have been examined.

4.2.1 Duration

The analysis of the 1713 pieces shows the great diversity of their duration, which ranges from 10 seconds for *Springtime in Massapequa* [by Dick Houghton, 2019] to 1 hour and 10 minutes for *Beto O'Rourke Townhall, Good Street Baptist Church (SamsungVR US, 2018)*. However, the most interesting fact in this regard is the average duration of the pieces, which is 3 minutes and 7 seconds. Moreover, if we analyse the distribution of the duration by ranges, the data reveal that 53.5 % of the sample lasts less than 2 minutes; and only 11.7 % is longer than 6 minutes. This shows a clear preference for short-duration projects, as can be seen in Figure 4.

When entering into a more detailed analysis of the sample, another object of interest is the type of stories that are being narrated through the use of VR and 360-degree.

4.2.2 Theme

In this regard, it has been possible to identify pieces corresponding to 33 mutually exclusive general themes.

As can be seen from Figure 5, the tourism and travel is the most common subject [*The 360° Crossing of the Andes, All News, 2017*], followed by cultural topics [*Michelangelo and the Sistine Chapel at the Met, The New York Times, 2017*], and sports and motoring [*Ski with Ted Ligety, USA Today, 2016*]. The least common are those addressing issues of gender violence [*Don't Look Away, Movistar Plus, 2018*], death [*The Legend of the Black Angel, Meteor Station, 2019*], gender identity and sexual orientation [*Orlando vigil: Tears, chants, and hugs at NYC's Stonewall Inn, CNN, 2016*]. Nature projects are very frequent, although these are divided into three blocks: nature from a general perspective, such as flora and fauna [*Lazovsky reserve, Planetpics, 2017*]; pollution

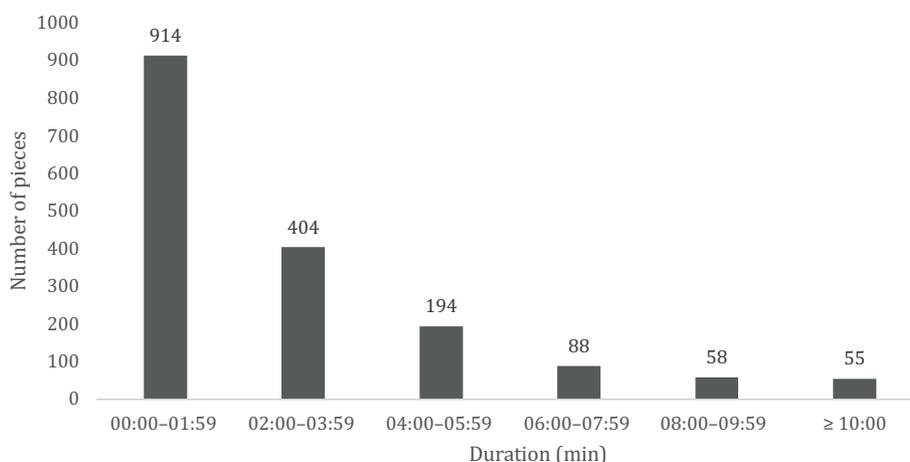


Figure 4: Distribution by duration

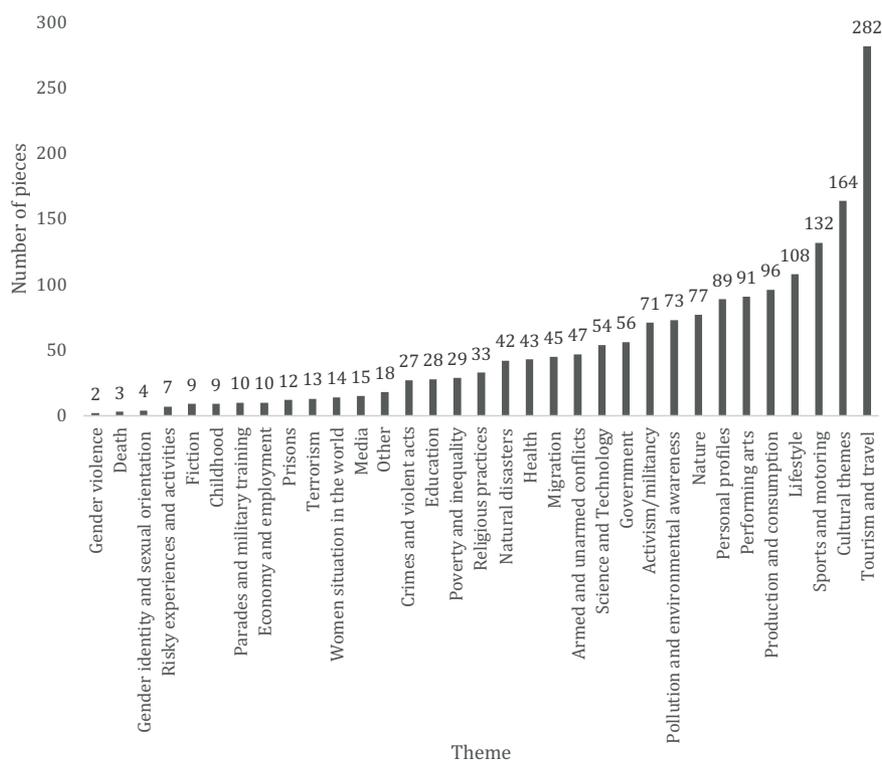


Figure 5: Distribution by theme

and environmental awareness, relating to the negative effects of human activity on the environment [*Global Warning: Arctic Melt*, CNN, 2017]; or natural disasters and their consequences for the population [*Living with a Hurricane's Devastation*, *The New York Times*, 2016].

On the other hand, when it comes to the journalistic perspective, it is necessary to enter into a more detailed analysis of media production topics. The data show that some media prioritise certain subjects over others. This is visible in those with the highest production volume, such as *The New York Times*, where, of the 429 productions analysed, the main topics are culture (60), tourism and travel (46), and production and consumption (33). Another example is that of *Yonhap News*, where, of the 298 pieces featured, the majority are linked to sports and motorsports (55), culture (55) or activism (25); or *CNN*, with 83 pieces which, in this case, embrace more evenly distributed themes, with tourism and travel (8), culture (8) and armed conflict (7) being slightly higher.

Lastly, it is necessary to cross-check the data related to the duration, firstly with the subject and secondly, with the type of author. As to the first cross-checking of variables, no type of relationship was identified that would lead us to believe that a direct relationship should exist. In other words, topics are neither more nor less prone to a longer or shorter duration. As to the second cross-checking of variables related to author-

ship, the data reflect that the producers do not have a fixed duration established when creating their pieces; that is, the same author can have projects of very different durations.

4.2.3 Image type

Another narrative element that defines immersive productions is the type of image used, since this introduces the most notable difference in relation to traditional journalistic productions. The analysis has allowed two methods to be established: 360-degree video and three-dimensional recreation (computer-created image). One can observe a clear predominance in the use of 360-degree video, with 1646 pieces using an omnidirectional camera; this is the case of *I Struggle Where You Vacation* [RYOT, 2016] or *Seeking Home* [The Associated Press, 2015], for example. Only 23 immersive pieces opt for three-dimensional recreations, which, unlike earlier ones, have been generated with specific software; an example of this is *How animals react to an eclipse* [CNN, 2017], *Michelangelo – Sistine Chapel* [ILH Studio, 2019] or *Volcanos – An Immersive Experience* [ZDF Enterprises, 2016].

What is striking in this analysis is that, in addition to the use of VR and 360-degree video, some pieces (specifically, 44) make use of a combination of both types of images. This method begins to be used from 2017, as shown in Figure 6.

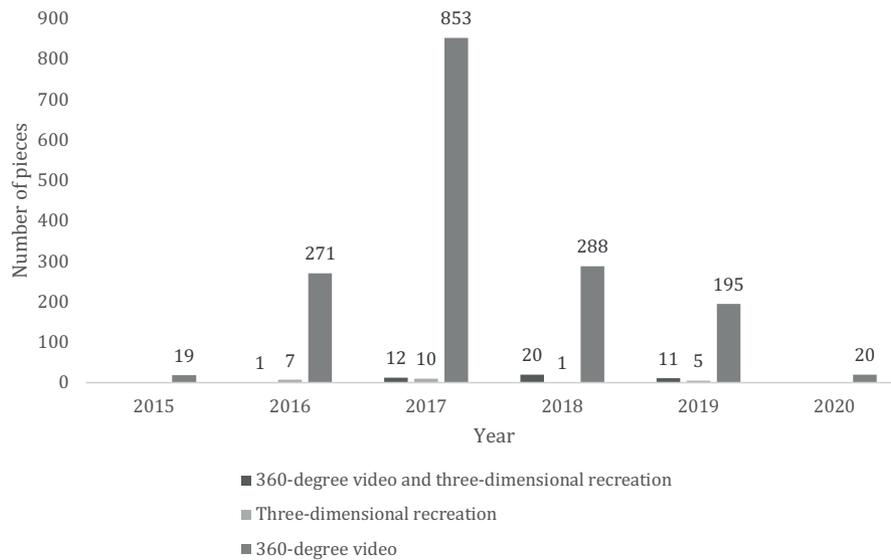


Figure 6: Distribution by image type and year

Certainly, although there are not many productions of this kind, it is significant that their number remains stable in the following years, until 2019, and even in 2018 they increase considerably, something which does not happen with pieces involving VR and in 360-degree videos. Generally, this option would occur in those productions where some type of simulation is performed. To show how a certain catastrophe has occurred, such as the spread of a fire, for example in *The Fire in Our Backyard* [360 Labs, 2018]; to reconstruct events, such as the dumping of polluting products [*Oil in Our Creeks, Contrast VR*, 2018]; to create artificial settings, such as a screening room [*Hitler's Secret Weapons, Targo*, 2019]; or to represent what some iconic places, that no longer exist today, would have looked like [*Guardian of Guge Kingdom, Creative autel*, 2018].

4.3 Audiovisual resources

When analysing narrative elements, audiovisual resources take on a special role. Their use is directly linked to the journalistic aspect of immersive production. In other words, traditional narrative elements (text, photography, video, sound, effects and other resources) are employed to determine their use and function when using virtual technologies in an informative context.

4.3.1 Use of text

As regards the presence of text, the results obtained show that 67.8 % (1162 pieces) of the analysed pieces introduced this resource at some point. In pieces where it has been identified, five varieties have been found, each depending on their required purpose: contextualization, location, identification, information and

quotations. The differences between each of the identified functions are explained below.

- **Contextualisation:** these texts place the user in a situation, providing the historical context of the events that are going to be narrated or offering a short introduction to the topic addressed in the piece. These types of texts usually appear right at the beginning or in the first few seconds of the video, generally appearing on a black background or on a relatively still image, so as not to divert the user's attention. This contextualisation function appears in 281 projects (16.4 %), among which are pieces such as *Guardians of the Forest* [Co.Reality, 2020], *Nimrud's Riches: The Islamic State seeks to erase history* [The Associated Press, 2017] or *Skies of Terror* [Contrast VR, 2018].
- **Location:** this serves to let the user know where he/she is (where the piece takes place). It can be a country, a city or something more specific, like a street or a building. This type of text is found in 656 pieces (38.3 %). Sometimes, some more specific information may also appear, such as the proximity to a better-known city, the date, the temperature at that time, and even the geographic coordinates. Some of the pieces that include this type of localization text are *Bethphage* [Discover Holy Places, 2018], *Seeing the Internet in Real Life* [The New York Times, 2017] or *Visit an Austrian Village, Replicated in China* [The New York Times, 2017].
- **Identification:** this type of text appears in 584 productions (34.1 %). In most cases, it serves to identify the people who appear in the image or the voice-overs (a journalist or a source) so that

their name and, sometimes, a short description with their age or profession appear as ‘television tags’. Additionally, they can be used to identify some objects, such as a certain car model in a car-themed piece, or an artwork in a gallery in a cultural-type piece. *Strong Coffee, Stronger Women* [Gates Notes, 2017], *When Pigeons Become Art* [The Wall Street Journal, 2016] or *The Circus: Donald Trump Rally in 360 VR* [Showtime, 2016], are some examples where the text has been used with an identification function.

- Information: this category includes brief informational data that cannot be shown in images or which complement the information; unlike the previous cases, this type of text does not serve a merely descriptive function, but also offers relevant data for the whole story. This method is also used in pieces where the journalist does not appear, either physically or in the form of a voice-over, so that all the information is provided in writing. This informative function is the most frequent in the sample under analysis, being present in 696 pieces (40.6 %). In *Caucasus Reserve* [Planetpics, 2017], for example, this resource is used repeatedly, when indicating the size and weight of the buffalo that appears in the image; while in *A Toxic Part of Texas* [The New York Times, 2017] this type of text is used throughout the piece, in the absence of a journalist or narrator.
- Quotes: on some occasions, a text is found that includes a famous or well-known quote, or which highlights a phrase that a source may have used during the piece. However, this type of text is not very frequent and has only been found in 15 pieces (0.9 %), examples being *Sumergite (sic) en el mundo del Combate Medieval en 360°* [Todo Noticias, 2017] or *Theirworld | Safe Schools: Nepal* [Freelance Society, 2018].

4.3.2 Presence of photographs

In the sample under analysis, only 5.2 % (90 pieces) include photographs at some point. Among the pieces where photographs are observed, three kinds have been identified, depending on the type of information they provide to the narration: archive, location or visual support. The differences between each of these functions are detailed below.

- Archive: photographs that refer to a past moment, prior to the one shown by the piece, as a flashback. They can show, for example, what a person looked like in the past, or how a city looked before or after a natural disaster. These types of photographs have been observed in 51 pieces that

include this resource (3.0 % of the sample). One example of this is *Betty Reid Soskin – “White Towels and Imaginary Gateposts”* [Wisdom Teachers, 2019], where different family photographs of the main character are shown.

- Location: satellite or similar photographs indicate where a certain place is. These could also include other images that indicate a location mentioned in the piece but which is not the one where the story is taking place. However, location photographs are not widely used, being found in only 3 projects, such as *The Summer Palace trailer* [VR China-Shambala, 2018].
- Visual support: 39 projects include photographs used to this end. These are photographs that serve to complement the information provided in the piece, but which, for some reason, cannot be shown directly in the form of a video. A photograph can appear as an overlapping photograph in 360-degree videos, or can be placed on a black background, so that the user’s attention remains undivided. Similarly, more than one photograph can appear at any given time. A project where these types of resources can be seen is *Embroidering with Björk’s Maskmaker* [The New York Times, 2017], in which photographs appear to show the result of the masks that the artist is making in his studio.

4.3.3 Presence of a video

As regards the use of 2D video, that is, one that is not recorded in 360 degrees, only 6.4 % (109 pieces) make use of this resource. As in the case of photographs, three kinds of 2D videos have been identified: archive, location or visual support. The differences are similar to those of photographs, since they fulfil the same purposes.

- Archive: these videos correspond to a moment prior to the event narrated in the piece. They have been found in 59 productions, in total. These can show, for example, what a city looked like before a natural disaster, or how a job or process was performed in the past; as in *Nepal Quake Project* [RYOT, 2015], where, at the beginning of the piece, images of the earthquake that shook Nepal are displayed, with a later 360-degree video showing its consequences.
- Location: satellite or similar videos that serve to indicate where a certain location is. Generally, these feature maps, with a zoom being applied to the location where the story takes place. However, not many examples of its use have been found: only

3 pieces, including *The Weekend Soldiers* [Targo, 2019], where it is used to explain, using a map, troop movements in an episode of World War II.

- Visual support: videos that complement or reinforce what is shown in the piece and which, for some reason, cannot be seen directly in the 360-degree video. This may be a detailed map of a manufacturing process, or images transferred in that format (2D). This “support” function is found in 54 pieces of the analysed sample; this is the case of *John Law – “Bringing people together”* [Wisdom Teachers, 2019].

4.3.4 Sound

The narrative element of sound acquires a relevant role. As is already known, the expressive and dramatic meaning of the events narrated is not only translated through the image, but comes fundamentally from the sound. The effect is multiplied through the use of VR and 360-degree video, as it increases the degree of immersion and generates a greater sense of presence in the user-spectator.

On this basis, sound element analysis makes a distinction between diegetic sounds (the voice of the journalist and the sources that speak to the camera and ambient sound) and extradiegetic sounds (voice-over narrator and music).

It is especially significant that a large part of the sample combines both diegetic and extradiegetic sounds within the same piece, highlighting, in this case, the different varieties of sound that the journalist and the source can use. Thus, if the variables linked to the intervention of the journalist and the source are combined, the results are distributed as shown in Table 2.

As can be seen in the Table 2, the pieces in which only the source or the voice-over journalist take part are the most common (extradiegetic sound). Examples such as *Small Innovations – Big Impact* [Gates Notes,

2017] or *The Circle of Rice* [Fresheyes, 2019] can be mentioned in this regard. Pieces in which the journalist or the source is physically involved (diegetic sound) accumulate a lower volume of productions. This happens in *Philanthropists in Golf Carts Eating Dilly Bars* [Gates Notes, 2016] or *Flying High at the Coupe Icare* [Euronews, 2016].

However, cases have been identified that combine the voice-over and a physical presence, either that of the journalist or that of the source (diegetic and extradiegetic sound). An example of this can be found in *360 video vr Museum of the History of Medicine First MGMU IM Sec* [360 video vr Mu, 2017].

Likewise, all the pieces examined also include ambient sound, as in the case of *Crossing Cultures: Black K-Pop Fans in America* [The New York Times, 2017] or *Refugee: ‘We are not animals’* [CNN, 2016]. On the other hand, the use of extradiegetic music has been found in a large part of the sample, in 53.7 % of the cases (919 pieces). In this case, projects such as *Experience Michigan’s ‘Magic Hour’ in Virtual Reality* [USA Today, 2017] or *Valen’s Reef* [Here Be Dragons, 2016] are also worth mentioning. Certainly, the treatment of ambient sound in most productions is subject to the incorporation of music.

No relevant results have been obtained that could indicate any kind of relationship between the decision to incorporate music and the topic of the pieces, so it can be deduced that this matter depends more on the author. Thus, by cross-checking the variables of authorship and music, some media such as *CNN* or the *Korean Yonhap News*, or producers such as *RYOT* or *Whitestag*, incorporate this resource into most of their projects. In contrast, other media such as *The New York Times* prefer, in most of their pieces, to dispense with the use of music (352 pieces versus 78 that they do use). However, in other cases, such as *Todo Noticias* or *USA Today*, it has not been possible to identify a clear preference for the use or non-use of music in their immersive productions, so the results are widely distributed.

Table 2: Sound presence of the journalist and the source

		Journalist				Total
		Physically involved and speaks to the camera	Voice-over and to the camera	Voice-over	Does not take part	
Source	Voice-over and to the camera	4	4	19	150	177
	Physically involved and speaks to the camera	12	13	26	122	173
	Does not take part	22	13	237	742	1014
	Voice-over			34	315	349
Total		38	30	316	1329	1713

4.3.5 Video effects

Video effects have been interpreted to be those that imply some kind of editing by the journalist or editor. In some pieces, we have observed some modifications that affect the playback speed, such as accelerated, slowed down or frozen videos; the colour of the image, converting it to black and white; or the use of opposing images, with two or more 360-degree videos that are played simultaneously. In total, we have identified effects in 266 pieces (15.5 % of the sample), some of which use more than one effect within the same piece.

While no relationship can be observed between the use of video effects and authorship, there does appear to be a relationship to the topic addressed in the pieces, with some showing a preference for using these types of resources, such as those related to sports or tourism. In contrast, productions that address social issues, such as domestic violence, women's situation in the world, death or gender identity and sexual orientation, do not usually introduce this type of effect and, if they do, it is in a limited way.

As regards the modification of the speed to accelerate the image, this occurs in a total of 153 pieces (8.9 % of the total productions) and mostly in topics related to tourism and travel (19 pieces), sport and motorsport (17), production processes (17), lifestyle (12) and culture (16); although, examples of accelerated image have also been identified in other themes, but to a lesser extent. This is the case of *An Art Deco sensory feast in 360 degrees* [Euronews, 2017], *Floating University 360* [Russian Geographical Society, 2016] or *Autumn in Paris* [NowThis 360°, 2017].

On the other hand, 23 pieces (1.3 %) slow down or freeze the image. These are mainly about themes related to sports and motorsports (5 pieces) and tourism (4), although, as happened in the previous case, they also appear in pieces on other topics, to a lesser extent. Examples of the use of this effect can be found in *6 Longest Minutes* [3DigitalVision, 2016] or *The Future of New York City* [The Wall Street Journal, 2015].

The modification of the video to black and white is present in 34 pieces (2.0 %); most of them correspond to a lifestyle theme (25 pieces), while the rest are widely distributed: migration (2), armed conflict (2), crimes and violent acts (1) or government (1), among others. This effect is used, for example, in all of the pieces in *Alte Handwerke – Folge series* [Whitestag, 2018].

As for the use of opposing images, these have only been identified in 6 projects (0.3 % of the sample). The topics of these pieces deal with poverty and inequality (2), but also with migration (1) or culture (1), among

others. This effect can be found in productions such as *Bill Gates on how we can bring clean energy to one billion people* [Gates Notes, 2019] or “환호 혹은 통곡” 대통령 파면 선고에 표정 극과극 (in English: “Cheers or weeping” The expression on the president's dismissal is extreme) [Yonhap News, 2017].

Moreover, the use of other types of effects has been observed in 2.1 % of the sample (53 pieces). These include the application of colour filters [Metropolitan Wildlife Haven, FLO, 2018], spotlights that illuminate different characters to direct the user's attention [For My Son, RYOT, 2016], image pixelation [One-on-one: meet a naturalist, Targo, 2019] or soft focus [How To Change Your Mind VR: The Whole Earth Experience, Time, 2018].

4.3.6 Other resources

With regard to resources such as graphics, illustrations, maps (not photographs) and arrows or marks, these do not appear to be specially used either, having only been identified in 9.6 % of the sample (164 pieces). In some cases, more than one may appear in the same piece.

Graphs are used to represent figures and numerical data, but are not very common; in fact, they have been found in only 4 pieces. Among them, we can mention *Bill Gates on how we can bring clean energy to one billion people* [Gates Notes, 2019], *Experience A Zero Gravity Flight* [The New York Times, 2017] or *The crossing of the Andes in 360°* [All News, 2017].

Drawings and illustrations are evident in 24 projects. These are very diverse, so may represent a person or animal, or an object or abstract element. Sometimes, the journalist or source is able to interact with them, as in the case of *I Am Rohingya* [Contrast VR, 2017], *Firsthand Account: The Assassination of Malcolm X* [The New York Times, 2017] or *Peninsula Valdés and the dance of the Right Whale in 360* [Todo Noticias, 2017].

Arrows and markers are used to direct the user's gaze, and are the most commonly used element featured in the pieces containing these resources (85 pieces). Sometimes they are accompanied by a text (for example: look up or turn around) although they can also appear without it. In some cases, arrows or marks can be used to indicate the exact location of an element being discussed in the piece. Examples include *What Do Dogs Do Alone?* [BuzzFeed, 2017], *Elephant Rescue in 360°* [NowThis 360°, 2017] or *Losiny Ostrov* [Planetpics, 2017].

Sometimes, as has been seen in the section dedicated to photographs, they fulfil a location function (satellite photography), but it is also possible to find other types of maps, as occurs in *Experience the Early Sounds* and

Visions of La Paz [Discovery Communications, 2017] or in *Preventing Conflict, Promoting Peace* [World Bank, 2019]. Forty projects using this resource have been found.

On the other hand, 13 pieces incorporate other resources that do not correspond to any of the aforementioned, such as emoticons, striking transitions or different filters. This is the case of *Desconecta2* [3GO Video, 2018] or *Athletes at Home – #MeetTheDetermined* [Word Games AD, 2019].

5. Discussion and conclusions

Within the journalistic context, and in order to meet the demands of adapting to the digital reality, new forms of storytelling are imposed and are reviewed in the academic literature by authors such as Lopezosa, et al. (2021). The latest to arrive on this stage have been immersive technologies, and as a consequence, there is a need for research that delves into the issues related to immersive journalism; some recent contributions show an interest in the opportunities and challenges faced by immersive information (Pereira, Zanotti and Rodríguez Bazi, 2020; Uskali, et al., 2021). In this sense, one of the main characteristics of the study carried out here is its novel approach, since it offers important advances in two dimensions: the one that has to do with production aspects and the one related to the narration of the 1713 immersive journalistic pieces. This complements other contributions made recently, which in this case address the motivations of journalists when making immersive stories and which are linked to the contributions of producers and directors (Goutier, et al., 2021).

From the approach set by the starting hypotheses of this research, the results obtained now allow us to establish the following discussions. In relation to the first, it has become clear that after a first phase (between 2015 and 2017) marked by a boom in immersive productions, this production is now in full decline, to the point that the platform under study (*Samsung VR*) is no longer operational. This aspect reinforces what other authors have already corroborated in their latest research, such as those carried out by García Caballero, Sidorenko Bautista and Herranz de la Casa (2021), Rodríguez-Fidalgo and Paño-Ambrosio (2020), Seijo (2021) and Sidorenko Bautista, Herranz de la Casa and Molina Díez (2020). This fact finds a connection with other results obtained in this study that have to do with the type of producers or filmmakers who are currently making immersive information. In this regard, it can be said that the *Samsung VR* platform shows a loss of the traditional legitimacy attributed to the media as the main producers of information, insofar as VR and 360° video technology now contemplates other pro-

ducers of information. The main characteristic of these is that they are not directly related to the large media conglomerates, and proof of this is that NGOs, universities, other types of institutions and even individuals have been identified.

These results suggest a reality that clashes with the technological context: while the technological context is favorable in terms of market penetration and consumption of VR (Grand View Research, 2021; Statista, 2021a; 2021b), the production of immersive news content seems to have stagnated. However, it should not go unnoticed that although VR within the journalistic context is losing prominence, there are other fields related mainly to education and the business environment, following the emergence of COVID-19 and, of course, leisure and entertainment that are experiencing great popularity (Demers, et al., 2020; Nalluri, Reshma and Munavalli, 2021; Ying, et al., 2021).

In relation to the second hypothesis, the results obtained show that in the last five years, narrative patterns that are used by most of the producer-directors who are currently making immersive information, which share aspects with the classic narrative and innovate in others, are beginning to consolidate. From this perspective, there are several studies that have been providing guidelines in this regard but, to date, it is not possible to speak of a true consensus when it comes to making such immersive productions (Benítez de Gracia and Herrera Damas, 2021; Seijo, 2021).

For this reason, the following proposal is necessary for what could be called ‘immersive journalistic narrative guidelines’, which arise from the sample analyzed, which has contemplated a diversity of producers, nationalities, themes and audiovisual resources that are used in these productions.

- Immersive pieces are characterized by a short duration, i.e. of under two minutes.
- Virtual reality and 360-degree video are used to tell all kinds of stories, although topics related to culture, tourism and travel, sports, lifestyles and nature are the most attractive for producers.
- 360-degree video is the preferred option considering the large number of productions identified, in relation to those involving three-dimensional recreations, which have higher production costs. We must bear in mind that 360-degree technology is becoming more democratic thanks to its increasingly affordable prices and its easy treatment from an editing and post-production point of view. Although a combination of both types of technologies is now scarcely used, it may result in a more

attractive product in informational terms. These aspects are linked to one of the lines of research that has been most developed in recent years in relation to immersive technologies, namely the concept of presence and user experience. Here the consensus among authors is evident, as most point out that VR in which the user can interact through haptic devices is more immersive and generates a greater sense of presence in the user than 360° video (Ahn, Bailenson and Park, 2014; Hardee, 2016; Shin and Biocca, 2017; Slater, Steed and Usoh, 2013).

- The use of audiovisual resources within immersive pieces is more directly linked to journalistic process than to the previous elements. These are the ones that allow us to differentiate them from mere recordings that serve no informative purpose. In relation to this aspect, the function of text, photography, video, sound, video effects and other resources can be identified.

Specifically, text, photographs and video serve the same function that they had in classic narrative: to complement or support information. Moreover, in the case of text, which is the most widely used resource, identification and location functions have not changed and are assimilated within the signs. However, contextualisation, information and quote functions acquire a new meaning within immersive pieces, even replacing the narrator in some cases, which would be inconceivable in traditional information. With respect to photographs and video, the functions of archive, location and visual support can be identified with this type of resource.

The sound element in immersive productions is used to generate greater immersion and presence for the user. In this sense, sound is used from both a diegetic and extradiegetic standpoint. The first one is associated with sounds linked to ambient sound, the journalist and to different varieties of sources. The second one is related to the use of the music as a soundtrack and voice-overs.

Video effects and other resources, such as maps, graphics or illustrations, although not widely used, offer a certain visual appeal to the information. The most important of these graphic resources are dates or markers, which direct the user's gaze, and are not normally considered in traditional information.

As a result of the aforementioned narrative patterns, it can be concluded that these are widespread among immersive journalism producers, but it should not be forgotten that they are constantly changing due to their intrinsic relationship to the development and advancement of immersive technologies, both in terms of recording devices and the way in which they are consumed.

It is evident that these virtual technologies are bringing innovations into the field of informative journalism, especially in terms of production and consumption. This study allows us to discuss progress and advances from a production point of view, but not so much from a narrative one. We can conclude that the advances that have taken place in the period analysed are more from the productive point of view, and not so much from the narrative point of view. That is, there is not a complete break with the previous practices in traditional journalism, but rather a redefinition of the meaning of the new uses and functions that informative narrative elements adopt when VR and 360-degree video are used.

The lines of research that arise from the discussion generated by this object of study under the double methodological perspective proposed (production and narration) are diverse. Firstly, comparative studies are proposed that include other platforms that have not been considered here and that allow us to check whether the decline noted in immersive productions can be extrapolated to other journalistic contexts. Secondly, and related to narrative elements and their use within immersive storytelling, it would be interesting to further explore the potential offered by other types of technologies framed within XR, as well as post-production resources that provide greater interactivity, both with the user and with the development of journalistic content.

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