

Analysing VR and 360-degree video apps and sections. A case study of seven European news media outlets

Las secciones y Apps de RV y vídeos 360° a examen.
Estudio de caso de siete medios con impacto en Europa

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ABSTRACT

Introduction. The evolution of the internet and new technologies have transformed the media ecosystem, opening the door to new narrative trends. In this scenario, many news media outlets have begun to use technologies such as virtual reality and resources like 360-degree video in their production processes, which constitutes a novel form of journalism production known as Immersive Journalism. **Methods.** The aim of this article is to analyse how European news media outlets organise and disseminate their immersive offer (360-degree videos) based on the study of seven case studies in order to determine whether their strategies in fact help users to locate, search and access such contents. **Results and conclusions.** The study concludes that the diverse sections and apps of the seven cases analysed exhibit several weaknesses that complicate the access and, consequently, the consumption of the 360-degree videos available.

KEYWORDS: immersive journalism; virtual reality; 360-degree video; Apps; responsive design; 360 storytelling.

RESUMEN

Introducción. La evolución de internet y las nuevas tecnologías han cambiado el ecosistema comunicativo abriendo así la puerta a nuevas tendencias narrativas. En este escenario, numerosos medios de comunicación han comenzado a emplear tecnologías como la realidad virtual y recursos como los vídeos 360° en sus procesos productivos, una forma de producción de contenidos denominada Periodismo Inmersivo. **Metodología.** El objetivo de esta investigación es analizar cómo organizan y distribuyen su oferta inmersiva (vídeos 360°) siete medios de comunicación de impacto en Europa con el fin de observar si las estrategias aplicadas mejoran y facilitan el proceso de localización, búsqueda y acceso a dicho apartado. **Resultados y conclusiones.** El estudio concluye que existen una serie de debilidades en las secciones y Apps de los siete casos analizados que complican y dificultan el acceso y, en consecuencia, consumo de los contenidos en vídeo 360° disponibles.

PALABRAS CLAVE: periodismo inmersivo; realidad virtual; vídeo 360°; Apps; diseño responsivo; 360 storytelling.

CONTENTS

1. Two decades of great transformations. 1.1. Immersive Journalism as a narrative renewal. 2. Methods. 3. Results. 3.1. The BBC. 3.2. *Corriere della Sera*. 3.3. *El País*. 3.4. Lab RTVE. 3.5. *Russia Today*. 3.6. *The Guardian*. 3.7. ZDF. 4. Discussion and conclusions. 5. References.

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1. Two decades of great transformations

The evolution of the internet, after the creation of the world wide web, created a favourable scenario for the migration of traditional print media to the online environment and for the beginning of a new era of journalism. Several researchers noted the great transformation that was about to happen, by way of journalistic revolution, and that the future of journalism was uncertain (Dahlgren, 1996; Singer, 1997; Deuze, 1999; Pavlik, 2001). During the second decade of the third millennium, there was an increase in the studies focused on this evolution (Deuze and Dimoudi, 2002; Boczkowski, 2004; O'Sullivan, 2005; Hermida and Thurman, 2008), a metamorphosis in the ecosystem of digital journalism that also opens new spaces and poses new challenges to the profession (López García, 2010).

Based on numerous works on the transformations of journalism, the profession reached the second decade of the 21st century, with software taking over (Manovich, 2008) and more voices highlighting the need to rethink journalism considering all the innovations (Paulussen, 2016) and bold formulas to fulfil its functions in the new social, political and economic context of the network society (Zelizer, 2017), which is on the eve of intelligent automation (Schwab, 2016).

While the communicative landscape has always been changing, processes have been accelerated by today's rapid technological evolution. In fact, digital development has driven numerous journalistic transformations in the third millennium. One of the most important transformations has been the emergence of multimedia production (Deuze, 2004; George-Palilonis, 2012), which has been easily consolidated in journalistic routines and has been assimilated by users, and has been followed by the rise of transmedia storytelling (Scolari, 2009; Rampazzo and Teixeira, 2016). The turning point made by user generated content and audience participation (Singer *et al.*, 2011; Carpentier, 2011; Holton *et al.*, 2016) should also be highlighted here.

However, the paradigm of change, at the production and consumption levels, is represented by the emergence of mobile journalism, or MoJo (Westlund, 2013; Paulussen, 2016). Mobile devices are currently the main point of access to the internet in many countries (Newman, 2018) and have become established as key tools for communication between audiences and the media (Meso *et al.*, 2014; Barnes, 2016). From the user perspective, consumption is increasingly carried out exclusively through mobile devices, which leads producers to work on responsive designs that adapt to these types of screens. In addition, while journalism was previously designed with mobile consumption in mind -mobile first- (Westlund, 2013), it is now evolving into an exclusive design for this type of access to content -mobile only.

In the first third of the 21st century, there has been an increase in the hybridisation of the practices that had been carried out in the late 20th century (Hamilton, 2016). Narratives have changed and adapted to the new times through the adoption of new techniques and technologies, as it is the case with immersive narratives based on virtual reality (VR) and 360-degree video technologies. At a time when 5G technology heralds radical change and intelligent automation is advancing strongly (Caswell & Dörr, 2017; López-García, 2018), the 360-degree video storytelling has defined its space and showed its contributions and possibilities for what already represents a renewal at the narrative level.

In the middle of the second decade of the 21st century, virtual reality and 360-degree video were introduced into news making routines as an alternative to enrich a multimedia language that, to some extent, had some rust in news storytelling (Salaverría, 2016), but also as a new genre (Jones, 2017), as a new way to produce and consume journalistic content (Pérez-Seijo & López-García, 2018).

1.1. Immersive Journalism as a narrative renewal

The introduction of virtual reality and 360-degree video technologies in journalistic production has given way to the emergence of a new narrative trend that De la Peña *et al.* (2010) have called Immersive Journalism. This form of immersive storytelling arises in response to the demands of renewed ways to tell and present stories, as well as the result of the increasing hybridisation of practices. In fact, its narrative foundations come from disparate areas, although close, in some cases, to fiction: film, theatre, interactive documentary and video games (Domínguez, 2013; Argyriou *et al.*, 2016; Elmezeny, Edenhofer & Wimmer, 2018; Soler-Adillon & Sora, 2018). However, the influence of video game logics is more noticeable in immersive apps, like those that introduce interactive navigation menus (e. g. *Cervantes VR* of *Lab RTVE*).

This news trend seeks to take users to the centre of the story through a first-person experience (De la Peña *et al.*, 2010), either as mere passive viewers or as simulated protagonists, which occurs in cases where the user immerses himself by adopting the body or identity of the protagonist or a character of the story, which is more common in fictional stories such as “The Party” of *The Guardian*, a piece about the life of a person with autism published in 2016.

Although immersive content can be consumed through mobile devices, they were mainly conceived for viewing with virtual reality glasses. In fact, the purpose of 360-degree videos and virtual reality experiences is to allow users to “experience incidents and situations first hand, placing the viewer at the centre of the experience and, therefore, generating the feeling of being in another place and time, living the lives and stories of other people” (Soler-Adillon and Sora, 2018, p. 56). That is, to have the feeling of “being there”, on the scene (De la Peña *et al.*, 2010; Domínguez, 2013; Sundar, Kang & Oprean, 2017; Van den Broeck, Kawsar & Schöning, 2017).

While the momentum of Immersive Journalism in the middle of the second decade of the 21st century (Doyle *et al.*, 2016; Barreda-Ángeles, 2018) is closely related to the virtual reality boom in the video game industry, its origins and roots date back to the end of the last century. In this sense, some American universities, such as Columbia and Southern California, conducted the first practical experiments in the 1990s (Domínguez, 2013).

During the first years of the third millennium, different media began to publish their first immersive content. They are mostly 360-degree photographs that, unlike spherical video, are static because they lack movement in the scene. One of the first media known to publish a 360-degree video is *MSNBC.com*. In 2005, this American news channel released its first spherical video, which was about Hurricane Katrina (Domínguez, 2013).

However, it was not until the late 2015 and early 2016 when multiple departments and innovation labs began to take an interest in this form of content production (Paino, Rodríguez & Ruiz, 2019). This started a stage of experimentation in the media all over the world, an era deeply marked by collaboration between journalistic companies and large technology companies, such as Samsung and Google (Watson, 2016). In many cases, these collaborations served and still serve as an incentive to test 360-degree video and the narrative possibilities of 360 video storytelling.

This was the case of *The New York Times*, which at the end of 2015 signed a deal with Google to distribute Google Cardboards -low-cost virtual reality viewers- among subscribers of the Sunday edition (Soler-Adillon & Sora, 2018). This was a meticulously planned decision aimed at making sure its audience had the necessary tools to watch its first 360-degree video documentary film. Thus, *The New York Times* premiered in November 2015 its already famous *The Displaced*, a work on the lives of three children fleeing war in their home countries. It should be noted that, along with this piece, the newspaper also launched its first mobile immersive content app, NYT VR.

In Spain, a prominent case is the first Immersive Journalism Lab. This initiative was launched in January 2016 with the collaboration of *Designit*, *The App Date* and news media such as *ABC*, *Eldiario.es*, *El Mundo*, *El País*, *Cadena Ser*, *Cuatro*, *La Sexta*, *Yorokobu*, and *Radio Televisión Española*. In this way, various Spanish news media organisations collaborate in the production of the first immersive journalistic pieces at the national level. This team created works such as *Urban beekeeping* and *Campo Urbano*, *Ciudad Rural* (Pérez-Seijo, López-García & Campos Freire, 2018: 65). Later, in May 2016, *El País* premiered its first official immersive report: *Fukushima: vidascontaminadas*, a piece about the areas surrounding the Japanese nuclear power plant that experienced a nuclear disaster five years earlier.

Facebook, YouTube and Google have also played a crucial role in the momentum of experimentation. First, Google with the launch in 2015 of the Google Cardboard, the low-cost virtual reality glasses that mounted on a smartphone allow users to enjoy an immersive experience with a 360-degree vision (Jones 2017; Sidorenko, Cantero de Julián & Herranz de la Casa, 2018). This commitment to reduce the cost of virtual reality viewers is a first step in the democratisation, both for producers and consumers, of access to immersive content (Pérez-Seijo and López-García, 2018). Moreover, in 2015, YouTube and Facebook materialised their interest in these contents by allowing users to upload and play 360-degree videos on their respective platforms.

Currently, media such as *The New York Times* (USA), *ZDF* (Germany), *BBC* (United Kingdom), *RTVE* (Spain), *El País* (Spain), *NBC* (USA), *Russia Today* (Russia), *The Guardian* (United Kingdom), *Corriere della Sera* (Italy), *El Comercio* (Peru), *Euronews*, *Clarín* (Argentina), *Die Welt* (Germany), *Nippon HōsōKyōkai* (Japan), *Le Monde* (France), *La Repubblica* (Italy), *VRT* (Belgium),

MSNBC (USA), *Al Jazeera* (Qatar), *ChosunIlbo* (South Korea), *Associated Press* (USA), *De Telegraaf* (Netherlands), *Público* (Portugal), *Expressen* (Sweden), *The Wall Street Journal* (USA). It is striking that these news media include a large number of newspapers and that the products they offer stand out, in some cases, for their complexity and depth, both technical and in terms of content. On the contrary, not all large audiovisual media corporations bet on this type of products and those that do, do not always invest so much in them.

To classify the immersive journalistic offer, Hardee and McMahan (2017) propose four categories: latest news in 360-degree video, simple pieces due to the immediacy that characterises them; mobile-immersive public-service pieces on issues of social relevance designed to be consumed from ordinary and, to some extent, affordable mobile devices, like the smartphone; immersive research based on CGI reconstructions, that is, virtual reality experiences such as those created by Nonny de la Peña, including *Hunger in Los Angeles*; and, finally, immersive explicative reports in which you can use any type of immersive technology and combine real and computer generated images to facilitate the understanding of a complex issue or topic.

At the level of genres, the news report is the most important in this type of productions (Pérez-Seijo & López-García, 2018). Such is their presence and relevance that authors such as Benítez de Gracia and Herrera Damas (2017) consider the 360-degree video report as a new aspect of the traditional journalistic genre. In this sense, the authors define it as a

Model of representation of reality that narrates and describes events and actions of human interest using real images recorded on 360-degree video and immersion technologies to generate in the viewer the illusion of being present in the event with a first-person perspective that improves the understanding of the circumstances, the identification with protagonists and even the experiencing of the emotions that accompany the reality that is being represented.

(Benítez de Gracia & Herrera Damas, 2017, p. 198)

2. Methods

The aim of this work is to observe how seven media outlets with impact in Europe organise their immersive content offer on their digital platforms. The aim is to observe the strategies they apply and whether they improve and facilitate the processes of location, search and access to 360-degree video and virtual reality content, as well as the levels of usability and accessibility of their sections and apps.

The analysis, which took place between January and July 2019, was divided into four parts: review of the literature on the subject, directly or indirectly related; selection of news media outlets for case study; analysis of the news media's sections and apps; and drafting of results.

The case study consists of seven media outlets that chose the 360-degree video as a journalistic innovation: *El País* (Spain), *BBC* (United Kingdom), *ZDF* (Germany), *RTVE* (Spain), *Corriere della Sera* (Italy), *Russia Today* (Russia) and *The Guardian* (United Kingdom). They were chosen for their innovation, production volume and, in some cases, for their quality. In addition, the sample selection aimed to represent both private and public media as well as audiovisual and print press, and different distribution models.

A quantitative analysis was performed with the help of three coding tables. Two of these tools were designed and used in similar studies carried out by Pérez-Seijo (2018) and Gutiérrez-Caneda and Pérez-Seijo (2019). The other instrument was developed by the authors of this article taking into account the indicators used in the aforementioned proposals. The tabs used in this study are presented below.

Table 1. *Coding table used to analyse access to immersive content sections or page.*

Access to immersive content section	
Main section	It has a category within the main menu of the home page.
Access from the website	The section is accessed through a menu or submenu.
Quick access	Access in 3-4 clicks to the section starting from the home page. Linked to the three-click rule.
Recognisable name	The user can easily identify the content of the section based on the title of the section.
Responsive design	The layout of the page adapts to access from a mobile device.

Source: Pérez-Seijo (2018).

Table 2. *Coding table used to analyse access to content.*

Access to content	
Immersive content aggregator	The section page collects all or almost all pieces, thus avoiding content dispersion.
Permanence of contents	Contents are not deleted after a certain period of time.
Description of content	Content is easily identified and is accompanied by a brief description.
Direct consumption	Content can be viewed in the same page without having to access another page or app.
Adapted to mobile consumption	The piece has a format adapted to consumption in mobile devices without errors.
Type of consumption	Virtual reality glasses, mobile viewing, manual interaction.
Search engine	There is a search engine that allows users to easily find the contents.
Type of order	Chronological, thematic, by format.

Source: Gutiérrez-Caneda and Pérez-Seijo (2019), based on a pre-design by Pérez-Seijo (2018).

Table 3. *Coding table used to analyse apps.*

Analysis of apps	
Property	Internal or external.
Typology	Video library (offers more than one product), monothematic (offers a single product or several of the same theme).
Access to content	Direct or requires download.
Exclusivity	Products can only be consumed from this app.
Number of downloads	-
Year	Date of latest software update.
Cost	Cost to the user.

Source: authors' own creation.

Table 4. *Coding table used to analyse the content of sections and apps.*

Content analysis	
Image type	Animated or real.
Content type	Fiction or nonfiction.
Format	360-degree video or Virtual Reality

Source: authors' own creation.

3. Results

3.1. The *BBC*

The *BBC* is one of the public audiovisual media with the most immersive and in-depth content. At the time of the research, it had three sections dedicated (completely or partially) to immersive productions: Connected Studio's Virtual Reality, Virtual Reality and Taster.

Connected Studio's Virtual Reality (section). It is an informative page that provides data on immersive *BBC* productions. It includes links to different articles related to different projects and immersive products. With this in mind, we decided not to label the section as immersive because its function is not to offer such products, but simply to report on the projects that the *BBC* carries out using VR technologies.

Virtual Reality (section). It is a section that works as an immersive content aggregator. Apparently, since no other organisation or logical correlation between the contents is appreciated, contents are ordered chronologically and remain on the page (are not removed over time). It should be noted that, despite hosting different contents, it does not have its own search engine to speed up the search.

When the user clicks on a content, it is usually accompanied by a brief description and sometimes a trailer. Consumption is not direct as the user must download the content for a specific virtual reality viewing device, such as *Gear VR*, *Oculus Go* or *HTC Vive*. It is striking that not all products are available for all devices.

Some products also offer a 360-degree video version that the user can view via YouTube. In these cases, consumption can be done using a computer or a mobile device. Smartphone viewing is therefore possible through YouTube, although the page does not offer a consumption mode tailored specifically for these devices.

As for the correspondence of the terms used with the formats offered, there were several errors. The first is that the section title does not refer to all the formats available, since there are also 360-degree videos. Some, but not most, pieces include in their title a reference to the format in which they are made, such as *Congo VR* or *Home: A VR Spacewalk*. Only three of the 14 pieces offered at the time of the research referred to their format in the title.

In terms of accessibility and usability, it is impossible to access this section from the *BBC* homepage, resulting in a slowdown in access that can become counterproductive despite having a recognisable name.

Taster Virtual Reality (section). The *BBC Innovation Lab* page includes a section called Taster Virtual Reality. This subsection does not have a category within the home page of the company, nor can be directly accessed from a menu. However, Taster can be accessed from a submenu on the main website, and access to this category is fast. Its name is recognisable and its design responsive.

The section does not have its own search engine and there is no clear order, as the products are removed over time. For this reason, it seems content is chronologically organised. This section does not work as an immersive content aggregator due to the conception of Taster: the *BBC Innovation Lab* offers users its products for a limited time to test and then deletes them after it has collected

enough consumer data. Most content is eliminated after a while, although some of them remain available but in the history section. Thus, the section cannot function as an immersive content aggregator since it does not keep the entire offer of the medium.

As for the correspondence of the titles with the contents, the name of the section, Virtual Reality, does not match all the products offered, which include 360-degree real-image videos and content combining VR and CGI.

In short, the main weaknesses identified in the *BBC*'s immersive offer are poor accessibility from the home page; absence of a search engine of its own in the immersive sections; errors in the use of terms related to immersive technologies. The strengths detected include the offer of a kind of immersive content aggregator that prevents dispersion, as well as the offer of trailers of the content.

3.2. *Corriere della Sera*

Its website has a section dedicated exclusively to spherical videos, within the *Corriere TV* section. It is called *Corriere 360°*, a section that offers spherical videos of various themes. At the time of the research it hosted 32 immersive products.

Corriere 360° does not have a category within the home page of the network and is not accessible through a menu or submenu of it. However, *Corriere TV*, the section that houses *Corriere 360°*, does have a category on the home page, which makes the immersive section quickly accessible, just two clicks away from the home page. The section's name is recognisable, and its layout is responsive.

The section functions as an immersive content aggregator hosting all the spherical videos offered by the medium. As for the design, the thumbnails of the spherical videos appear on the page along with the title of the videos, and once the user clicks on the content, the video appears accompanied by a brief description. On the other hand, the contents of the section are sorted according to a thematic criterion.

Consumption is direct because the piece can be viewed without having to leave the page where it is located. Consumption can be done directly through the website, through manual interaction when using a computer or a mobile phone viewer equipped with glasses.

The classification of products, as mentioned above, is thematic. In fact, it is divided into three subsections depending on the theme: *Video 360*, *Le storie* (The Stories) and *Le città* (The Cities). The first one offers spherical videos whose main element is the place to which the user is transported, such as the interior of a volcano or the planet Mars. The second category includes stories of very diverse themes, from sports, social content or curiosities. And the third one includes videos about the history or architecture of Italian cities. There is a fourth category, *Mostra del cinema di Venezia*, but it was empty at the time of the analysis.

In short, the main weakness is production, which is broad yet quite simple. The only format used is spherical video and the products offered are not very complex. The strengths detected include the ease of consumption from computer and mobile devices; the option to view content with virtual reality glasses; the use of the section as an immersive content aggregator, which prevents content dispersion; and the thematic organisation of the products, which facilitates the location and search of the videos.

3.3. *El País*

El País newspaper was one of the first Spanish media to venture into immersive production. Currently, the immersive offer of this newspaper is collected in its own app called *El País VR*, although it has also published some of its 360° reports on its YouTube channel.

El País VR (App). The medium's website does not mention this app beyond references about it in some articles and the 360° reports it contains. Therefore, the immersive content in offer does not have a category within the homepage, nor are quickly accessible through the website.

The name of the app, *El País VR*, does not refer to the formats it hosts since the three products it offered at the time of the research were 360-degree videos. In addition, the titles of the reports do not refer to the format.

The app is owned by *El País* but the products it offers have been created by external producers or by special teams. It is a video library or immersive content aggregator app that collects all the products the medium offers with these features. It is not an exclusive offer, since all the pieces the app offers can also be consumed through YouTube.

Once the app is installed, each of the contents must be downloaded independently. The app does not allow streaming consumption and during the download of the content the user cannot leave the screen. Navigation is simple, as the three reports on offer are on the main screen. When you select one of them, the app takes the user to the download screen. Once the content is downloaded, the user can play it virtual reality glasses or without them (mobile viewing).

In short, the positive aspects are the quality of both content and production of the reports offered, as well as that the intuitive and simple operation of the app. On the contrary, one of the problems is the use of confusing terms, using VR when 360° or spherical video should be used. On the other hand, to consume the products, the user must first download the app and then the content, which complicates access and slows down the viewing process.

3.4. *RTVE*

RTVE is another Spanish medium that stands out for its immersive content, which has been almost entirely produced by its Innovation Lab: *LabRTVE.es*. These products can be consumed through a section of the website, *Lab RTVE VR*, and through apps such as *RTVE VR 360°* and *Cervantes VR*.

Lab RTVE VR (Section). It is the immersive section of the Innovation Lab of *RTVE*. This section does not have a category or direct access on the main page, but it does in the main page of *LabRTVE*. On the other hand, it has a recognisable name and a responsive design.

This section does not function as an immersive content aggregator, although it may seem so, as there are immersive contents distributed in other sections of the Lab. All available products include a brief description and are arranged chronologically. While some contents can be consumed directly from the page, and are accessible from a computer or mobile device, others require the downloading of an app. When accessing the section on a smartphone directly, the consumption of some products is not comfortable and does not support viewing with VR glasses.

The name of the section, VR, does not refer to all the formats present in the section, as the vast majority are spherical real-image videos. As for the titles of the pieces, most of them include the correct format.

Cervantes VR (App). It is a monothematic app produced by Iralta VR that offers a single immersive product. It is a piece about Cervantes and his work *El Quixote*. In this case, the name of the app and the product is the same and refers, in part, to the immersive format used. The work is divided into various episodes, some of which are spherical real-image videos and one is a 2D animated recreation. As for consumption, it is straightforward: once the user downloads the app it is not necessary to download any more content.

RTVE 360° VR (App). The app works as an immersive content aggregator and video library, collecting much of the immersive productions of the *RTVE* Lab. The offer is not exclusive as users can consume the products through other platforms, like the website and YouTube. Once the app is installed, the user can decide whether to download or stream each content.

The app name reflects all the formats it includes. The title of the pieces does not contain references to the format of the video. Only the title of one of the sections that it offers does: *Escena 360*. One important aspect of this app is that it offers instructions for use in the main menu, as well as the possibility to delete the videos after watching them.

The app is divided into three sections that classify the products by theme: *Ingeniería Romana*, *Goya 2019* and *Escena 360°*. The first section offers seven spherical videos on Roman constructions in Spain. In the second there are two products that relive the most striking moments of the Goya award gala and the rehearsal of the musical number of the event. *Escena 360°* includes six pieces that allow the user to visit the rehearsals of the Royal Choir and the Royal Orchestra, as well as various theatrical plays.

In short, the immersive section of the website, *Lab RTVE VR*, appears to act as an immersive content aggregator but it is not, which can lead users to deception. For the consumption of some of its products it is necessary to download specific apps, so consumption is difficult and slow given these requirements.

3.5. *Russia Today*

This newspaper has an immersive section and an app that offer 360-degree videos. Both the immersive section and the app are named *RT360*.

RT360 (Section). It is the only immersive section of the sample that can be considered a main section within the medium's website, since it has a category within the home page. Users can therefore access the section from the main menu and access is fast. The name is recognisable, allowing users to easily identify the content of the section, and the layout of the page is responsive.

RT360 works as an immersive content aggregator. Although the contents are not accompanied by a description in the section, it appears once the user clicks and accesses a specific video. The contents can be consumed directly on the page, both from a computer and a mobile device through manual interaction. However, it should be noted that the section does not have its own search engine, nor uses any organisational criterion, apart from a chronological organisation.

As for title-content correspondence, *RT360* is one of the sections that complies with most indicators. The section's name refers to all the formats presented and virtually all the pieces indicate their format.

RT360 (App). The name of the app does refer to its contents. In this case, there are pieces that indicate their format in the title and others that do not. It is a video library app that offers very

different products, although the offer is practically the same as that of the web section. The pieces are sorted by theme and can be viewed right there without extra download: once the app is installed, the user can start to watch the different pieces.

In short, there is a huge offer of immersive content available to this medium, and both the section and the app function as immersive content aggregators, which prevents content dispersion. The negative aspects include the lack of a search engine that facilitates navigation, both in the immersive section and in the app, especially given the large number of pieces on offer. In the case of the app, the problem is less serious, as it classifies the products by themes and tags. In fact, the same criterion could be applied in the section to alleviate the search and navigation problem.

3.6. *The Guardian*

The Guardian newspaper offers its immersive products through *The Guardian VR* app. Its website also has a page dedicated to these products, but it is not a section as such as, hierarchically, the web map sorts it more as a newspaper article than as a section. This page is titled *The Guardian VR* and provides information related to immersive technologies and their consumption. In addition, it contains links to download the different apps that allow the consumption of the immersive contents offered by the newspaper. Consumption of an online product is also offered through the YouTube platform.

The app designed to consume immersive products is *The Guardian VR* and is available for Android and IOS. In addition, such products generally require VR glasses to be viewed. Some contents are offered as if they could only be consumed with VR glasses of Google Daydream but, in reality, the link leads to the download page for Android so, in principle, they can be consumed using other models.

During the research we found another app apart from *The Guardian VR*. It is a monothematic app that includes the product 6x9, a piece about isolation in American prisons.

The Guardian VR (App). It is the main app for the dissemination of immersive content of *The Guardian* newspaper. The name of the app is recognisable as it allows the user to know that it contains immersive products, although it does not refer to all the formats that it includes because this section offers both VR products and 360-degree, real-image videos. Titles, as a rule, do not refer to the video format.

The app is owned by the medium and works as a video library and immersive content aggregator. Downloading the content is required to consume it, that is, the user must first download the app and then each of the pieces in order to watch them. The offer is exclusive, as content is not available in other platforms, except for a video that was also available on YouTube at the time of the research.

When this study was carried out, the app included 11 immersive experiences, some based on real images and others on animated images. All the contents fall within the category of nonfiction; the topics covered are varied, but social products predominate.

6x9 (App). This App has a monothematic character and offers a single piece, a virtual reality experience that moves the user to an isolation cell in an American prison. Its viewing does not require a pre-download. As for the name of the App, it is not recognisable, does not refer to the formats used, nor to the title of the piece.

In short, the monothematic app is not necessary as this product is also available for viewing in the general app. As in *El País VR*, having to download the app first and then the content makes the process difficult to some extent, but allows the user to decide the space and connection. In addition, once downloaded, it can be watched again without an internet connection. As for the page, it should be more visible and used as an access portal for new users.

3.7. ZDF

The German channel ZDF offers immersive content in two sections: *360° staunen* and *History 360°*. The first one is a completely immersive section, while the second is a multimedia monothematic section that includes works of various kinds, but also 360° videos. It is precisely for this reason that it has been excluded from this analysis. In addition, it also has its own app: *ZDFVR*.

VR ZDF 360° Staunen (Section). ZDF offers its contents mainly through this section, named *VR ZDF* with the subtitle *360° Staunen*. The name of the section is recognisable, i.e., it allows the user to infer that it offers immersive content.

This section is not in one of the categories, menu or submenu of the medium's home page. In fact, during this research, the medium's homepage had not route to allow access to this this section. Its design is responsive, and its contents can also be consumed from a mobile device.

The section acts as an immersive content aggregator that uses a chronological criterion (from most to least recent), and everything seems to indicate that it keeps content over time, as the first published content was published in 2015. The different pieces are accompanied by brief descriptions of one or two lines, which facilitates search and identification. However, like most of the sections analysed, it does not have its own search engine. Consumption is done through manual interaction using a computer or mobile device.

With regards to the correspondence between contents and the terms related to immersive technologies, we should point out that the assessment is not as clear as in other cases. The name of the section includes the term VR and its subtitle mentions the "360°" adjective, so it refers to the immersive formats it offers: spherical videos with real and computer-generated images, and even hybrid parts. As for the titles of the pieces, a large part of them make explicit reference to the format.

ZDF VR (App). It is a video library app that facilitates the consumption of immersive products through mobile devices. The name of the app is recognisable but does not refer to the formats it offers, which are mostly 360° real image videos. As for the titles of the videos, not all of them include references to the format. The content, which can be viewed after downloading, is not exclusive, i.e., some 360-degree videos are also available in the web section mentioned above.

In short, the negative aspects include the terms used, as it uses the concept of virtual reality to refer to 360-degree real-image video. In addition, the absence of a search engine in the web section makes it difficult to consume and locate content given the large volume of products available.

4. Discussion and conclusions

In short, a number of weaknesses have been observed in the selected sample of sections and apps. These flaws should be understood as challenges that these and other news media must overcome in the near future:

- Difficult access. There is no quick access, and sometimes users need to download the content even after having downloading an app, which delays consumption and turns access into a cumbersome process, which in turn can result, in certain cases, in the loss of the user.
- Confusion of terms. Terms related to immersive technologies are misused. The main error detected is the use of the term ‘virtual reality’ to refer to 360° real-image videos.
- Content dispersion. In some cases, there is no immersive section and, even when it exists, it does not always collect all the immersive products created by the medium, that is, it does not act as a immersive content aggregator. This situation can confuse users and make it difficult to search and consume such specific content.
- Lack of search engine of its own. Some news media have a large volume of immersive products, but the absence of a search tool complicates the location of specific content.
- Technical and compatibility errors. The products are not compatible with all electronic devices (even if indicated) and in certain cases their image quality is poorly.

Throughout this study it has been shown that the communication strategies implemented by the sample of new media outlets for their immersive content on their official websites fail in many cases, as they do not meet minimum requirements of accessibility and usability. Most media do not have an immersive section or does not function as a immersive content aggregator, leading to content dispersion.

In cases where this section exists, it is not always accessible in less than three or four clicks from the home page menu. This complicates and slows down access, which can lead the user to give up searching for the section in question. In fact, during this research, it could not be confirmed that all the immersive sections could be accessed from the main page of the medium in question, including the *BBC's Virtual Reality* and *VR ZDF 360° Staunen*. In these cases, access was made through an external search engine, like Google's. Only *RT360* had its own category in the main menu dedicated exclusively to its immersive section.

The misuse of the terms virtual reality and 360° is a general problem. This confusion leads to misunderstandings and is a particularly relevant mistake when we consider the role that the media play in the digital literacy of audiences. However, this confusion sometimes aims to differentiate immersive content from traditional information formats called 360°, contents in which a topic is analysed in depth or taking into account all possible perspectives. However, the excessive use of the term virtual reality should be avoided to facilitate consumer's learning and improve user's experience.

On the other hand, to facilitate navigation new media outlets should incorporate their own search engines into the immersive sections, as none of them did so. In addition, being able to consume the products directly from the website, both through smartphone and computer, improves user experience. In a society that is moving towards consumption exclusively through mobile devices, it is important for the design of these sections to be responsive and for mobile consumption to be adapted.

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