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Is YouTube being used to its full potential? Proposal for an indicator of interactivity for the top YouTuber content in Spanish

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Abstract: The objective of this study is to analyze the relationship between views (popularity) and social interaction generated by YouTuber videos in Spanish. A quali-quantitative analysis is conducted on a sample of 100 videos, 10 YouTube channels, 997 minutes of video, with 116,934,321 views, 12,297,021 likes/dislikes, and 1,041,191 comments on YT, 306,000 retweets/favorites on TW and 140,852 comments, shares, and reactions on FB. The existence of social media tools on YouTube does not in itself guarantee interaction by users who prefer to watch videos and adopt a passive attitude. In this analysis, we propose a social interaction indicator that takes into account the total number of social media reactions made on social networks (YT, TW, and FB) and the age of the video. Cultivating realistic conversation and interaction on platforms with audiences numbering in the millions represents a serious challenge for YouTubers.

Keywords: social network, interactivity, YouTube, YouTubers, influencers, virtual community

1 Introduction

YouTube has transformed the way audiovisual content is consumed, providing users with one of the richest, most entertaining, and most versatile online experiences.

In the same year that YouTube (hereinafter, YT) was created, Jenkins, Puroshotma, Clinton, Weigel and Robison (2005) posited the key factors for explaining the transformation that the development of the internet had brought about in user activity, taking a participatory culture perspective in the era of media convergence. This new culture offers unlimited possibilities for creative, individual

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self-expression facilitated by the accessibility and user-friendliness of technology. It generates spaces for civic engagement and encourages knowledge transfer between experts and amateurs in a genuinely horizontal manner. It operates on the basis of shared interests, self-affirmation, personal brands and the exchange of opinions. Participatory culture is also useful for explaining new emerging phenomena in other spheres, such as education (Aparici and Osuna Acedo, 2013), social networks (Burgess and Green, 2009; Chau, 2011), or journalism (Deuze, 2006).

YT can be defined as a storage and viewing platform for both professional and user-generated videos, with social-network functions. The platform meets most of the needs arising from the prevailing participatory culture: image-based self-expression of identity; simple, easy, and automatic sharing; and compatibility with a travelling lifestyle. It also offers social-media tools to express opinions, comment, subscribe to and create communities around shared interests. It facilitates the sharing of videos on Facebook, Twitter, Google+, Blogger, Tumblr, reddit, Tuenti, Pinterest, and via e-mail, along with geographically restricted social networks in other languages. YT also has a variety of other complementary functions: easy file uploading; simple metadata tagging; the embedding of videos in users' websites; video resizing; the option to choose the point in the video where to begin viewing; the choice of video playback quality; translation of subtitles; or marking the point in a video to continue watching later. Some are more widely known and used than others, but all these features taken together explain the intense experience offered to users.

YouTube, which won the Primetime Engineering Emmy Award in 2013, is available in 76 languages in 88 countries covering 95 % of the world's population with internet access. The magnitude of the phenomenon is huge, and its future potential is promising.

The main objective (MO) of this article is to analyze the relationships between views (popularity) and social interaction generated by YouTuber videos in Spanish on YT itself as well as on FB and TW. The aim is to propose an indicator of interactivity for the video and for the YT channel that will facilitate comparison. To do this, we will place the focus on comparing the social-media tools available on YT, FB, and TW that facilitate interactivity.

Our focus is on YT content by YouTubers who are recognized as video creators with a major influence on their numerous followers. Since 2018, YT users have had the option of monetizing their channels once they have videos with 4,000 hours of viewing time, 10,000 visits, and 1,000 annual subscribers. As spaces with a high level of interaction, they are ideal for studying this concept.

It is important to clarify the meaning of the terms "social media" and "social networks" as used in this study. According to Kaplan and Haenlein (2010), "social

media” refers to a group of internet-based applications that build on the ideological and technological foundations of web 2.0 and that allow the creation and exchange of user-generated content. “Web 2.0” refers to internet functions that allow users to share information, collaborate, and operate on the web as content creators in an environment with a user-centered design. The creations produced by users in this environment are called “user-generated content”. In contrast, “social networks” can be defined as web-based services that allow individuals to construct a public or semi-public profile within a bounded system, articulate a list of other users with whom they share a connection, and view and traverse their list of connections and those made by others within the system (Boyd and Ellison, 2007). Based on these definitions, it can be concluded that YouTube is a social-media platform, devised especially for facilitating the exchange of audio-visual content, and which has assumed the role of a social network over time. This dual classification and the complexity involved in integrating the two concepts explains why researchers sometimes refer to YT as a platform where all functions converge: both those functions characteristic of its social media dimension and those inherent to its status as a social network.

The key to YouTube: Interaction facilitates the dissemination of the videos

Interaction is a communicative act established by users, in this case through the videos uploaded by YouTubers to their channels. But interaction is not possible if the platform does not permit interactivity. Interaction and interactivity are therefore understood to be two interdependent concepts. Interactivity is the capacity that an environment possesses to facilitate interaction, while interaction refers to the actions performed by users when they make use of the interactivity offered by that platform. Interactivity is thus a capacity that is realized and rendered meaningful by the performance of specific interactions generated spontaneously by each user. An environment may offer interactivity without actually giving rise to interactions; however, an interaction can only occur in an environment where interactivity is present. In this sense, our study explores the tools that permit interactivity on YT, on the one hand, and analyzes the volume, level, and type of interaction (user activity), on the other, in order to determine whether the users make exhaustive use of the interactivity available on the platform.

Interactivity has been defined from three different perspectives, as described by Ariel and Avidar (2015): a perception, a process, and a characteristic of certain media that generate activity. Combining these aspects, Liu and Shrum (2002)

propose that interactivity is “the degree to which two or more communication parties can act on each other, on the communication medium, and on the messages and the degree to which such influences are synchronized” (p. 54). It is a multidimensional, measurable concept that offers a suitable means for explaining why some YT users only watch videos while others feel the additional need to express something about what they have seen. This marks the difference between one channel and another. It is common to determine the value of a YT channel based on the number of subscribers it has. To analyze the influence of a channel, the tracking site Social Blade¹ considers subscribers, views, and profits. It presents the aggregate data, average, last month, and estimate of future profits. This approach may be wrong, or at least inaccurate, since many subscribers may be inactive and viewing does not guarantee any kind of social interaction (sharing, commenting, liking, etc.). The total number of views with social interactions would be a better indicator of the potential dissemination of the video.

In this study, we propose an index for measuring the interactions generated by a video, not only on YouTube but also on Facebook and Twitter, to obtain an integrated indicator that expresses the overall social-media activity that a YT video is capable of generating. This implies a more complete measurement of the social-media activity offered by each platform separately, and responds better to the transmedia dimension of current media consumption because it combines data from three social networks simultaneously and is more useful for quantifying the volume of interaction with a video over the course of its life cycle.

Although the YT platform offers many benefits (the uploading, managing, sharing, and viewing of videos online), the platform’s success lies in its user-friendliness (Yang, Hsu, and Tan, 2010; Courtois, Mechant, and De Marez, 2011) and in the recommending of related videos (Zhou, Khemmarat, and Gao, 2010). Added to these tools is the ability to post comments and offer opinions, actions that are all very useful for users with defined interests and a desire for social interaction. They are also determining factors in fostering the creation of communities. YT thus provides a forum for presenting user-generated audiovisual content, alongside professional content, together with tools that help disseminate it. These two dimensions—video-viewing platform and social network—is what distinguishes YT from other options like Vimeo (no advertising; weekly upload limit), Dailymotion (more flexible than YT), DTube (blockchain-based and no advertising), Vevo (extensive catalogue of music videos) or Veoh (for longer videos).

However, the definition of YouTube as a social network is controversial. Media convergence offers multiple media platforms and different options to channel the

1 <https://socialblade.com/youtube/top/country/es/mostsubscribed>

desire for social engagement. Some studies view YT as an emerging community based on social interaction (Putnam, 2001) motivated by shared interests, which uses a virtual platform to interact normatively and create culture (Rotman and Preece, 2010).

Others, however, argue that YT was not originally designed as a space for collaboration and participation (Burgess and Green, 2009). It is clear that YT is essentially a platform for uploading and viewing videos, while its social media tools for rating, commenting on, discussing, and sharing the content viewed do not appear to be used as actively. The possibility of interaction does not necessarily mean that interaction will occur, as corroborated in studies of YT by Gallardo Camacho and Jorge Alonso (2010, p. 425), who confirm that YT users have the same passive attitude as a television viewer: watching without interacting.

The low level of interaction is further confirmed in studies by Shoham, Arora and Al-Busaidi (2013), who suggest that the interaction could be described as a kind of cyber-graffiti: “Participation on the site is largely passive, with few users participating actively, and even fewer interacting with others” (p. 3959).

In view of the literature cited above, we have posited the following as our first research question:

RQ1: In the most viewed content generated by YouTubers, can viewing activity be compared with social activity on YT?

The answer to this question will enable us to verify whether the definition of YT as a social network is sustainable and whether social activity is comparable to viewing activity or represents a different type of behavior.

The studies cited reveal different positions in relation to whether YT can be defined as a social network. However, the differences of opinion on this question do not pose an obstacle to studying the uses that followers of videos make of the social-media tools available on YT and comparing them with the tools on other platforms that are unequivocally identified as social networks (FB and TW). This will make it possible to determine which platform inspires the greatest confidence in users for performing their interactions when the content is the same (YouTuber videos).

Interactivity about YouTuber content on other social networks (TW and FB)

Social networks depend on user activity for their operation. Their slogans invite such activity: “Broadcast Yourself” (YouTube, until 2012); “Share your life in

photos” (Flickr); “Yours to discover” (Twitter); “Be connected. Be discovered. Be on Facebook.”

In the era of media convergence, all media platforms operate as potential channels for content dissemination. The transmedia effect offers users countless possibilities for action and interaction, extension, reworking existing content, and producing new content (Tur-Viñes and Rodríguez Ferrándiz, 2014, p. 117). YT videos generate an interaction that extends naturally to other social networks. To explore this point, we will compare the power of YT as a social network with other social networks like TW and FB in reaction to the same content originally generated on YT.

YT users often share videos on their social networks and interact with other users both online and offline, and the activity they engage in determines the extent to which YouTube is used as a social network (Haridakis and Hanson, 2009, p. 320). In this sense, Hidalgo-Marí and Segarra-Saavedra (2017, p. 51) confirm that Facebook and Twitter are used as part of a transmedia expansion strategy as they can act as accelerators for the consumption of YouTuber videos more than Instagram (preferably static images) due to their origins and their better relationship with audiovisual content. The users are drivers of content expansion and their abilities shape the use, type, and impact of their actions.

Professional YouTubers share their videos much more rapidly on TW than amateur users, and there are clear correlations between behavior on TW and the content of YT videos, as well as thematic alignments between the two networks (Abisheva, Garimella, Garcia, and Weber, 2014). Most YT channels promote their videos on other social media platforms such as Facebook, Twitter, and/or Instagram, generating an intertextuality that reinforces the identity of the channel and allows people to discuss videos in forums outside YT (Martins Flores and Muniz de Medeiros, 2018). But the fact that the technology offers these tools does not necessarily mean that followers will decide to use them. The aim of our study is to evaluate the social-media tools available on each platform and how users make use of each tool. Social media conversations are often analyzed on each media platform individually. In this study, we place the focus on a combined evaluation of multiple social networks in order to study their behavior comparatively and cumulatively.

The interconnectedness of all social networks as spaces for conversation about the same content supports its dissemination, resulting in a transfer of users between different networks. To determine the use made by YouTubers of other social platforms in order to increase the dissemination of their videos, we posit another research question:

RQ2: How does each social network behave in relation to each video?

Proposal of an index of interactivity for YT videos and channels

YT differs from other social networks in relation to the number of assortative linking, user homophily, reciprocity, and a type of interaction focused more on the video than on the conversation with others (Wattenhofer, Wattenhofer, and Zhu, 2012, p. 356). The prevalent relationship is user–content (likes, dislikes, comments) not user–user (replies to, or likes for, comments), demonstrating that the interaction is superficial as there is no real conversation with a reciprocal exchange (Ksiazek, Peer, and Lessard, 2016; Wattenhofer, Wattenhofer, and Zhu, 2012). This distinguishes YT from other social networks, according to Xiang, Neville and Rogati (2010) and Kahanda and Neville (2009), who observe a surprising disparity between comment activity and the number of subscribers on the YT platform.

Ksiazek, Peer and Lessard (2016) suggest that user behavior on YT should be considered on a continuum of engagement, from exposure to interactivity, where more (quantity) and better (quality) ways to interact with content and with other users indicate deeper engagement (p. 505). The two extremes of this continuum would depend on passivity (viewing) or activity (answering the comments of others) and would determine the intensity of interaction.

But not all content generates the same degree of interactivity. A video's characteristics may influence interaction levels (Wattenhofer, Wattenhofer, and Zhu, 2012). In one of the largest-scale studies conducted to date (including 3,269,030 YT videos), Cheng, Dale and Liu (2008) analyzed the social network generated around YT videos. They identified three categories of videos that were the most popular: music (17.8 %), entertainment (17.8 %), and comedy (12.1 %). They also found that the vast majority of videos (99.1 %) had a duration of less than 700 seconds or 11.6 minutes (p. 231). The age of the video affects the number of visits because older videos have had more opportunities to be viewed, but the correlation between video age and popularity (number of views) is not significant as there are older videos with very few views and newer ones with many views (p. 233). The number of ratings (likes/dislikes) and comments is what best reflects user interaction behavior, and both have a similar distribution with tails that do not decrease as quickly as views.

To identify the type of video, we will refer to the classification established by Himma-Kadakas, Rajavee, Orgmets, Eensaar and Kõuts-Klemm (2018): sit-down (YouTuber framed in close-up or medium-shot in their room); live (YouTuber presenting an event or situation as it happens, unedited); screen-sharing/collab (the video features more than one person, or, in the case of video gamers, the screen is shared so that the viewer can see what is going on in the game and, at the same time, the reactions of the gamer, who normally appears in a small frame

in the corner of the screen); sketch (the YouTuber acts out different situations to illustrate something humorously, with a specific theme and pre-scripted content, short clips, and rapid edits); music video (detailed, pre-scripted, elaborate videos where a YouTuber performs or presents music); and vlog (narrates the YouTuber's everyday life, with some editing).

After viewing content on YT, users can perform various actions reflecting different levels of engagement, interest, and reach:

- Like/Dislike (rating): The emotion generated by viewing is so intense that it invites users to take an action that is visible to others. This represents a direct form of emotional feedback comparable to a non-verbal gesture of approval or disgust, and forms part of the non-verbal communication present on social networks. It is equivalent to TW's "favorite" button and the different emoticon reactions offered on FB.
- Share with your contacts: The content is deemed interesting enough to share with others, spontaneously and naturally contributing to its dissemination to the user's network of contacts. This is equivalent to a retweet on TW and a "share" on FB.
- Subscribe: reflects the desire to highlight content and continue receiving similar content; gives preference to the channel. This action is important because the number of subscribers is a key indicator for assessing a channel's monetization potential. It contributes decisively to making that channel stand out over others. It implies loyalty and consolidated approval and expresses a desire to keep abreast of new content on the channel.
- Comment: Posting a comment requires time and effort to write something; it therefore denotes a very high level of engagement as it is the most demanding and participatory action available to users. However, posting a comment does not directly represent a significant contribution to increasing content interactivity. This will depend on responses by other users to the comment concerned.

These online activities have been researched in studies of virality. Alhabash and Mc Alister (2015, p. 3) propose three dimensions to take into account: affective evaluation (Like/Dislike); viral reach (total number of views and other interactions); and message deliberation (comments, which may also contain an affective evaluation). It is important to distinguish between viewing a video and other actions such as liking, commenting, sharing, or subscribing (Ksiazek et al., 2016, p. 506). Each action represents a different level of experience for the user (Deuze, 2003). The number of views indicates the level of exposure of the video, its reach, while the other interactions fall within the spectrum of recommendations.

Each type of interaction involves a specific user motivation, something that drives the user to ‘give back’ to the community after viewing the video. Taken together, all these possible interactions contribute to the establishment of the level of interactivity achieved by a video or a channel. If we analyze the relationship between the number of views and the number of interactions, we will be able to calculate an indicator of interactivity for the video. To this end, our last research question is:

RQ3: Is it useful to determine an index of interaction for videos and channels?

2 Methodology

To answer the research questions posed, a quali-quantitative exploratory study was conducted to analyze the relationships between views (popularity) and social interaction generated by YouTuber videos in Spanish on YT, FB, and TW, and to propose an indicator of interactivity for the video and the channel to facilitate comparison.

The sample is made up of 100 videos, 10 YT channels, 997 minutes of video, with 116,934,321 views, 12,297,021 likes/dislikes, and 1,041,191 comments on YT, 306,000 retweets/favorites on TW, and 140,852 comments, shares, and reactions on FB. Table 1 shows the details of the channels chosen for the study.

The 10 channels with most subscribers were chosen out of a ranking of the 250 accounts with the most subscribers provided by Social Blade in September 2018. The selection criteria for the channels were: YouTuber channels in Spanish with the most subscribers, together with the presence of monetization, and parallel profiles on TW and FB. In addition, the 10 videos with most views on each channel were identified (100 videos). The study period ran from September 14, 2018 to February 22, 2019 (5.3 months). Any channels that failed to meet the monetization criterion or to generate 10 new videos in the period studied were excluded from the study. Also excluded were videos that were not shared on other social networks. Since the intention was to compare social activity with views, content and channels with high-traffic volumes were chosen to ensure large quantities of relevant data. YT’s filters do not allow users to select content by YouTubers only or by language.

Table 1: Channels, average duration of videos and number of subscribers.

Sample	YT channel	Average time/vid *	Subscribers (millions)
1	elrubiusOMG	0:11:28	33
2	VEGETTA777	00:48:53	25
3	TheWillyrex	00:24:29	15
4	ExpCaseros	00:11:36	10
5	Makiman131	00:10:54	10
6	luzugames	00:31:30	8.6
7	TheGrefg	01:14:05	9.6
8	sTaXxCraft	00:12:42	7.2
9	gymvirtual	00:08:04	6
10	el churches	00:13:10	5.6

$$*average\ time = \frac{\sum_1^{10} Time\ of\ each\ video}{Num.\ of\ videos\ per\ channel(10)}$$

The identification variables considered for each video were: channel, video title, video description, type, theme, and date published. For the measurement of user activity, the variables listed in Table 2 were taken into account.

Table 2: Metrics of user activity and equivalence between networks.

YouTube	Twitter	Facebook
Num. of views of video on YT		
Num. of likes for video on YT	Num. of likes on TW	Num. of reactions received on FB
Num. of dislikes for video on YT		
Num. of comments on video on YT	Information on TW replies not available on Twitter API	Num. of comments received on the link to the video on FB
The information on sharing on other channels is not available on the YouTube API and is not visible on the channel.	Num. of retweets on TW	Num. of shares on FB
Total num. of interactions (YT, FB, and TW) with video per day		

To answer the research questions, variables have been organized for the purpose of comparability on the three social networks. It has not been possible to find data on TW replies (comments) via the Twitter API² platform. However, the YouTube API only offers data on sharing on its own channel but does not provide sharing data on other unrelated channels. Moreover, YT favorites are not broken down by the YouTube API although they are included in the number of reactions as aggregate data.

Procedure

Once the channels were chosen, we searched for the videos on each channel that had obtained the most views. The company Metric Salad facilitated the data available on the study variables via the APIs of YT, TW, and FB.

The starting point for the mining of data from the accounts analyzed was the URLs or links to their public profiles on each social network. This allowed us to submit the relevant queries to the APIs to obtain the desired information. The system developed is designed firstly to retrieve data related to the YouTube channels and videos, and then to do the same with Twitter and Facebook. Using the YouTube Data API (v3) and its functions “Channels:list”, “Search:list”, “Videos:list” and “CommentThreads:list”, information on all the channels (num. of comments, num. of visits, num. of videos, etc.) and available videos (num. of likes, num. of dislikes, num. of views, num. of favorites, etc.) posted by the account holders was stored in the database. Taking into account the dynamic nature of the data, especially the videos, the system updates the values if it detects that a new video has been uploaded to the channel or if the number of views has increased by 1,000 since the last time data on the account was stored. To extract data from Twitter, the “statuses/user_timeline” function of its API for developers was used. The process in this case involved mining all the possible tweets that the account owner had posted. However, when storing these posts, a filter was applied so that only those that made reference to one of the YouTube videos present in the database were kept. Finally, all these tweets mentioning YouTube were reviewed to identify the interactions that the videos had received on Facebook. This time the tool used was Facebook’s Graph API (v2.11) and its URL query function.

² An application programming interface (API) is a set of programming code that enables data transmission between one software product and another. It also contains the terms of this data exchange. Twitter bases its application programming interface (API) off the Representational State Transfer (REST) architecture. REST architecture refers to a collection of network design principles that define resources and ways to address and access data.

The tool used for the sentiment analysis of the comments was TextBlob. TextBlob is a Python library for processing text that offers a way of obtaining a text's subjectivity and polarity percentage, among other things.

Information was recorded on the YT videos that had been mentioned in the tweets and FB posts stored (since the last download). This provided us with dynamic data that grew and changed with the passage of time. For example, as YouTubers posted new tweets mentioning the videos chosen, these data would be added to the existing data. Each video chosen has a publishing date and a different period of activity depending on that date.

The Twitter API has a limit on obtaining old posts (old tweets) on an account, so that it was only possible to obtain the 3200 most recent tweets. This means that we have Twitter data covering the 3200 most recent posts at the time of the first download and through to 14 January 2019.

During the study period, the Facebook API underwent various changes, and a lot of data were not available. Data on the social action "Favorite" could not be compiled because they appeared in all cases with a value of 0.

The data resulting from the social networks' APIs were compiled in a CSV file. The data were updated daily beginning in September 2018, so that the database built up and the information was kept updated through to the end of the study (February 22, 2019).

Data analysis

A descriptive analysis was conducted on the frequencies and percentages of each variable. We used a Pearson linear correlation coefficient, which measures regression in order to quantify the degree of joint variation between two variables. It was calculated whether there was a relationship between the variables studied and how strong it was, with errors of 1% and 5%. The positive sign of the coefficient indicates a direct positive relationship, and the negative sign shows an inverse relationship. Coefficients not indicated with a * have a linear relationship between variables that is low enough to be dismissed.

3 Results

Comparing viewing activity with social activity on YT (RQ1)

Social activity is defined as the total number of likes, dislikes, and comments generated by the most viewed content on each YouTuber channel. First, we calculated all the channels grouped together and then analyzed each one separately.

The 10 videos per YT channel included in the sample had a total of 116,934,321 views and a total of 13,600,074 social actions, of which 90.4 % (n=12,297,021) were likes, 1.9 % (n=261,862) were dislikes, and 7.6 % (n=1,041,191) were comments. There is an extremely disproportionate use of the two functions offered by YouTube (video viewing and social networking): Grouping the ten channels chosen for the sample together, video viewing represents 89.6 %, while social network actions represent only 10.4 % of total activity on YT.

Table 3: Correlations between number of views and social action on each channel.

Correlation coefficient	elrubiusOMG	luzugames
Num. YT views – Num. YT likes	0.53**	0.25
Num. YT views – Num. YT dislikes	0.11	0.24
Num. YT views – Num. YT comments	-0.18	0.27
	VEGETTA777	TheGrefg
Num. YT views – Num. YT likes	0.62**	0.70**
Num. YT views – Num. YT dislikes	0.27	-0.07
Num. YT views – Num. YT comments	0.47*	0.31
	TheWillyrex	sTaXxCraft
Num. YT views – Num. YT likes	0.91**	0.58**
Num. YT views – Num. YT dislikes	0.15	0.61**
Num. YT views – Num. YT comments	-0.02	0.46*
	ExpCaseros	gymvirtual
Num. YT views – Num. YT likes	0.87**	0.41**
Num. YT views – Num. YT dislikes	0.92**	0.67**
Num. YT views – Num. YT comments	0.63**	0.59**
	Makiman131	el churches
Num. YT views – Num. YT likes	0.70*	0.67**
Num. YT views – Num. YT dislikes	-0.07	0.36*
Num. YT views – Num. YT comments	0.31	0.33

**Significant at 1%; *significant at 5 %

Table 3 shows the calculation of the Pearson linear correlation coefficient that makes it possible to relate the number of video views with the likes, dislikes, and comments for each YouTuber. The results indicate that the correlation coefficient is significant for all channels except for the channel luzugames, for which the values in all categories of social activity are statistically insignificant. It was observed that the channels exhibiting a more significant relationship between the number of views and dislikes are in turn the ones with the most interaction in terms of comments. This is the case of sTaXxCraft and gymvirtual. Meanwhile, the channels with the fewest dislikes receive no comments, as is the case of elrubiusOMG and TheWillyrex. The only exception can be found in the case of the channel ExpCaseros, which has a high correlation between the number of views and the number of likes, dislikes, and comments.

Comparing YT, FB, and TW interactivity about the same content generated by YouTubers (RQ2)

The volume of social activity varies greatly between the three social networks. The activity generated on all three social networks taken together in the period studied comes to 10,257,852 social actions. YT has the largest volume of social activity (96.2%; $n=9,866,928$) in likes+dislikes+comments. It is followed by TW, with a significant difference in the volume of social activity in retweets+favorites (3%; $n=308,132$). FB has the lowest volume of activity of the three social networks (comments+share+reactions) (0.8%; $n= 82,792$).

The calculation of the daily average of social interactions confirms that the distribution is not uniform, proving largely insignificant for three channels (Vegetta777, luzugames, and el churches). However, if we relate the daily average of interactions with the number of views, the correlation is positive and significant for the channels TheWillyrex, ExpCaseros, and sTaXxCraft (see Table 4).

Table 4: Correlation between number of views and daily average of social actions on each channel.

Channel	Pearson correlation
elrubiusOMG	-0.7839**
VEGETTA777	0.1125
TheWillyrex	0.7564**
ExpCaseros	0.5299**
Makiman131	-0.3691*
luzugames	0.0036

Channel	Pearson correlation
TheGrefg	-0.8250**
sTaXxCraft	0.4072**
gymvirtual	-0.6128**
el churches	0.0135
Total	0.5693**

**Significant at 1%; *significant at 5%.

Proposal of an interaction indicator (RQ3: Is it useful to calculate an indicator of interaction for videos and channels?)

This is described as an indicator of interaction and not of interactivity because we seek to measure the actual activity of users in response to the video, not the potential activity. For each YT channel in the sample, an indicator of social interaction has been calculated that takes into account the total number of social actions performed on the social networks (YT, TW, and FB) and the age of the video (time since published). The social interactions that have been taken into account for each channel are:

YT= Num. likes+Num. dislikes+Num. comments on YT

TW= Num. TW+Num. RTW

FB=Num. shares+Num. FB reactions

The index of social interaction has been calculated for each video and for each channel on each network (YT, TW, and FB). To take into account the age of the video, the indicator calculated for each channel is based on the oldest video published for the period from September 2018 to February 2019:

$$\text{Corrected time indicator} = 1 - \frac{\text{time of publication of video}}{\text{Time of publication of oldest video per channel}}$$

Thus, the oldest time indicator for each YT channel is 1, and if we subtract the proportion of time that each video has been published, we will have the remaining time that the video should be published for its time to be the same as the time of the oldest video. Multiplying the time factor index by the number of actions on each social network, we approximate the number of social actions that should have been performed on each network if the video had been on the network for the same length of time as the oldest video. It is important to consider that this approximation is based merely on the time factor and not on other factors that

might have conditioned the social actions during this approximate time. This time indicator has been calculated for each video on each social network:

$$\text{Indicator of interaction per video on YT} = \frac{\sum \text{social actions on YT} * (\text{time indicator})}{\text{Num. views 1 video}}$$

$$\text{Indicator of interaction per video on TW} = \frac{\sum \text{social actions on TW} * (\text{time indicator})}{\text{Num. views 1 video}}$$

$$\text{Indicator of interaction per video on FB} = \frac{\sum \text{actions on FB} * (\text{time indicator})}{\text{Num. views 1 video}}$$

For each channel and for the total sample the same indicator has been calculated:

$$\text{Indicator of interaction per channel on YT} = \frac{\sum \text{social actions on YT channel} * (\text{time indicator})}{\text{Num. views channel}}$$

$$\text{Indicator of interaction per channel on TW} = \frac{\sum \text{social actions on TW channel} * (\text{time indicator})}{\text{Num. views channel}}$$

$$\text{Indicator of interaction per channel on FB} = \frac{\sum \text{actions on FB channel} * (\text{time indicator})}{\text{Num. views channel}}$$

A total sample indicator has been calculated as an aggregate average of the indicators for each video (and/or channel):

$$\text{Indicator of interaction sample} = \frac{\sum_1^{10} \text{indicators}}{\text{Num. of channels}}$$

Table 5 presents the indices of social interaction for each YT channel and for each social network. Clearly, the number of subscribers to the YT channels influences the number of views. As noted above, the channels with the most subscribers are also the ones that have the biggest number of views. However, the calculation of the indices of social interaction reflects a smaller gap between YT channels when only these two indicators are analyzed. Thus, the difference in the number of views is quite pronounced between the first two channels. This difference increases in a smaller proportion than the number of views and subscribers.

Finally, the index of social interaction on YT is higher than on the rest of the social networks.

Table 5: Summary of indicators of social interaction per channel on each social network.

YT channels	Subscribers (millions)	YT	TW	FB	Total social interaction index
elrubiusOMG	33	21.169 %	0.504 %	0.222 %	7.298 %
VEGETTA777	25	17.888 %	0.436 %	0.185 %	6.170 %
TheWillyrex	15	11.723 %	0.447 %	0.001 %	4.057 %
ExpCaseros	10	6.705 %	0.013 %	0.011 %	2.243 %
Makiman131	10	9.961 %	0.034 %	0.060 %	3.352 %
luzugames	8.6	17.487 %	0.474 %	0.009 %	5.990 %
TheGrefg	9.6	9.854 %	0.205 %	0.008 %	3.356 %
sTaXxCraft	7.2	10.431 %	0.289 %	0.002 %	3.574 %
gymvirtual	6	6.782 %	0.108 %	1.460 %	2.783 %
el churches	5.6	7.845 %	0.022 %	0.003 %	2.623 %

If we consider the channels as a unit and only on the YT network, the interaction indicator does not exhibit a direct relationship with the number of subscribers, as can be observed in Table 5.

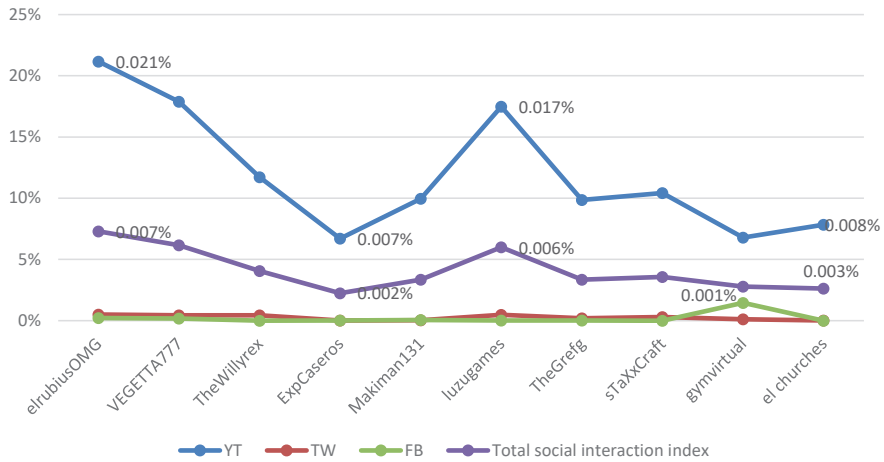


Figure 1: Indicator of total interaction for each channel on each social network.

The biggest volume of social interaction (Figure 1) occurs on the YT network with differences ranging from 6 points (ExpCaseros) and 21 points (elrubiusOMG) when compared with the other social networks. The bigger the dimensions of the

YT channel in terms of subscribers and views, the bigger the difference between the interaction on the YT channel itself and interaction on TW and FB. Interaction occurs first on the YT network itself, then on TW (the channel with the second most interaction), and finally, to a lesser extent, on FB.

If we analyze each network separately, we find that the interaction on TW is fledgling or substantially less than the interaction occurring on YT itself. But it does not follow the rule that channels with more subscribers have a bigger volume of interaction. There are several cases that deviate from this pattern: on TW, interaction for *luzugames* and *TheWilyrex* is close to, or even greater than, the channels with the biggest numbers of subscribers and views on YT.

The same is the case of YT–FB interaction for *gymvirtual*, which comes out well above other YT channels in terms of interaction on FB.

The variable of video duration does not influence the interaction indicators. Among the video types, the screen-sharing/collaboration format stands out as its interaction is either exclusively on YT with very high indicators of interaction there, or it shares this interaction between YT and TW. Whenever this occurs, the indicator for YT interaction cedes some ground to TW, although to a much lower extent. The video format with the second biggest volume of interaction is the short-duration sit-down format, predominant on the *gymvirtual* channel.

4 Discussion and conclusions

The content generated by some YouTubers is shared on their official social networks almost simultaneously, in a clear transmedia strategy that helps both to extend the video's audience reach and to disseminate the content by making it visible in spaces other than those for which it was created. In all the channels studied, YouTubers have profiles on other social networks, supporting the findings in the studies by Haridakis and Hanson (2009) and Martins Flores and Muniz de Medeiros (2018). This plurality of profiles creates optimal conditions for facilitating transmedia interaction. In this way, content that originated on one platform (in this case, YT) colonizes other spaces, expanding its dissemination exponentially, quickly, and practically without limits, supported by communities of contacts. This expansion is atemporal. Some of the channels studied did not update any content in the period analyzed, yet their most viewed videos continued to generate comments and interactions months after their posting, on all the networks studied. All the social networks contribute to this phenomenon. The content that generates the most interest and interaction has a very long life cycle.

The facility for sharing links on YT explains why everything begins on this platform, but the expansion strategy is no longer a single-platform strategy since it includes simultaneous promotion on other media. Social networks function as accelerators of the dissemination of the video. Thematic alignment can be identified in the content of the three social networks, as suggested by Abisheva et al. (2014). It is a strategy used by the YouTubers themselves, in which their followers collaborate spontaneously.

In relation to interconnectivity between networks, until January 2019, YT allowed automatic sharing of a YouTuber's public activity with their channels of followers on Twitter and Google+. This option is no longer automated, but the videos can be shared manually. YT claimed that sharing content on social networks is more effective when the messages are not generated automatically and also when the advantages offered by each network (e. g., mentions) are exploited. Without providing data to support the claim, YT asserts that the experience is better when publications are personalized, both for YouTubers and for their followers. All of this indicates that YT itself does not greatly facilitate sharing of videos on other social networks. Measures like this one demonstrate that the openness and interconnectivity permitted by the network is only used in certain cases and responds to vested interests and policies that users are unaware of. These practices may generate some frustration among users as at one time they were able to enjoy and share content more simply and easily. The media platform's interests are not always aligned with those of the users and, paradoxically, are not always aimed at enhancing their experience. The modern digital world effectively reproduces the same economic and corporate conflicts of the past. Technology is now the battlefield for new and sophisticated corporate wars.

One of the difficulties identified is that the information available on the APIs of the three social networks does not cover all possible actions, and some functions are only available in specific time periods. This hinders analysis and compromises the commitment to transparency claimed by each social network. Moreover, this situation constitutes a massive obstacle to comparison and studies with secondary data. All of this has coincided with an increasing concern around the world about data protection and security. The balance between transparent, responsible and secure practices represents a pressing challenge that is already having consequences with increased regulation of data protection.

This study has effectively answered the research questions posed, contributing data that help to better explain the interaction generated by the content of YouTubers with large numbers of followers. We have also met our main objective, as we have explored the relationships between viewing and social interaction resulting from the videos.

Our comparison of viewing activity and social activity on YouTube (RQ1) confirms that the number of views is much higher than the volume of use of social media tools. Only one out of every ten views generates a social action (like, dislike, or comment). The existence of social media tools on YouTube does not in itself guarantee interaction by users who, on this network, prefer to watch videos. The data presented in this study thus call the definition of YT as a social network into question. YT potentially promotes interactivity because, as defined in the introduction, it has tools that facilitate interaction but its users hardly ever use them; they prefer mostly to use the video-viewing functions, while actual interaction is very limited.

The selection criteria (YouTubers in Spanish with the most followers, according to Social Blade) have produced a sample with a large proportion of gaming channels (80 %). This might constitute an involuntary limitation on our study, as gamers make use of a specific streaming social network (Twitch) where much of their social interaction takes place. For future studies of this kind, it would be advisable to include thematic diversity as a criterion for sample selection. This idea is supported by the fact that the specific theme of household experiments (ExpCaseros channel) had a significant positive correlation between views and all social actions. As a future line of study, we plan to conduct an in-depth analysis of the possible correlations between the video topics and formats and the interaction indicators.

The channels exhibiting a more significant relationship between the number of views and the number of dislikes are in turn the ones with the most interaction in terms of comments. This demonstrates that disliking a video represents a powerful motivation for commenting.

Given that YT is preferred for viewing videos and has a low level of interactivity, as we have shown, it was reasonable to ask whether discussion of YouTuber videos was happening on other networks such as TW or FB (RQ2). The data confirm that 96.2% of interactivity about YouTuber videos is generated on YT, with only 3% on TW, and 0.8% on FB. The generalist networks thus have only an incidental role in the transmedia expansion of the original video. TW and FB together do not even account for 4% of the volume of social interaction generated by the most viewed videos. This confirms that watching videos does not in itself mean any parallel social activity. The volume of views reveals that watching videos is a mass activity. The more subscribers a channel has, the more views it receives.

As a proposal, the study posited the creation of an indicator of interactivity for YT videos and channels (RQ3). The indicator takes into account most of the social actions available on the official channels where YouTubers usually disseminate each new video.

The indicator also considers the number of views and the lifetime of a video. The indicator is useful for comparison between channels and videos, and for

providing information on the interactive potential of each video or channel. This indicator could serve as a basis for the future construction of a realistic model to measure the capacity for interaction of a YT video or channel. In this way, with broad-enough time series, such a model could have predictive capacity. At the same time, for the indicator to become a useful model it would be necessary to add key variables like the video type or theme, among others. As a preliminary approach to measuring the interactivity of video content, the indicator developed in this study has proven acceptable and revealing. It is a measurement of greater quality than the correlation of the number of subscribers or views with their average activity (active v. inactive user), which is the most common calculation used by agents that manage YouTuber contracting and is usually considered an indicator of the channel's solvency. The combined analysis of interactions generated by the same video on three different social networks (FB, TW, and YT) represents an original contribution that enriches the research in this field and takes into account the actual practices of users who do not limit their actions to a single media platform. It is more realistic because it reflects the transmedia nature of user behavior in relation to interactions.

YouTuber channels attract users with a markedly passive profile, as confirmed in previous studies by Gallardo Camacho and Jorge Alonso (2010) and Shoham et al. (2013). YT users prefer watching videos to interacting. In this context, YT's social-media tools are hardly used at all. These data rekindle the debate mentioned in the introduction related to YT's classification as a social network. It also raises the question of whether YT's social-media tools actually represent added value recognized by users.

Audiences in the millions with a level of interaction that is barely perceptible, with users who are invited to interact and share but who prefer only to watch: This is how we could define the activity of YouTuber audiences in the case studied. How can users converse and interact realistically in spaces with audiences in the millions? This is a major challenge for the technology and for the management of communities of YouTubers.

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