

Activity of universities in social networks. Correlations of rankings, students, followers and interactions

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Abstract

The Internet and social networks are widely used by students. For higher education, which operates in a highly competitive environment, marketing is a fundamental tool for universities to distinguish themselves and attract new students. Social networks are one of the best options for influencing university choice. The objective of this study is to analyze the relationship between some indicators related to universities and their use of and results on social networks. We carried out quantitative correlational research to study the number of students and ranking position as university indicators as well as the number of followers, posts, and interactions (likes, comments, and shares) weekly and per post on *Facebook*, *Instagram*, *Twitter*, and *YouTube*. Data were collected from 83 Spanish universities over 14 weeks in 2021. Correlation analysis showed that the number of students is closely related to the number of followers and interactions, although to varying degrees. The position of a university in the rankings exhibited a particularly significant correlation with their number of followers on almost all the networks. In addition, the higher the university in the ranking, the higher the number of interactions per post that it obtained on *Facebook* and *Twitter*. It was also found that universities with more followers had more interactions (likes, comments, and shares) with their posts. Finally, the number of posts was found to be positively related to the interactions per week but not to the interactions per post. This study has identified some significant relationships between the characteristics of all Spanish universities and their performance on four social networks, which may help universities become better at acting and communicating on them.

Keywords

Communication; Communication 2.0; Education; Higher education; Universities; Marketing; Digital marketing; Rankings; Students; Followers; Interactions; Social networks; Social media; *Facebook*; *Instagram*; *Twitter*; *YouTube*; Spain.



1. Introduction

Every year in Spain, thousands of students finish their post-compulsory secondary education studies and take university entrance exams [*Evaluación para el Acceso a la Universidad (EvAU)* or *Evaluación del Bachillerato para el Acceso a la Universidad (EBAU)*] to continue on to more specialized and professionally focused studies. As there are a wide variety of higher-education institutions and study programs, universities use various marketing tools to influence the choices made by their prospective students (Farinloye *et al.*, 2020; Fayos *et al.*, 2011).

The *American Marketing Association* (AMA, 2017) defines marketing as the activity, group of institutions, and processes for creating, communicating, delivering, and exchanging offerings that have value for customers, partners, and society at large. To meet the needs of these stakeholders, the marketing mix variables, the “4 Ps” –product, price, place, and promotion (or communication)– are used (Perreault; McCarthy, 2002). Promotion/communication in particular is an important element of the marketing mix that can be implemented through a variety of channels according to the strategy chosen. The current rise of the Internet and Web 2.0 makes them the correct scenario in this context.

Marketing in higher-education institutions began to be studied in the United States and the United Kingdom in the 1980s (Hemsley-Brown; Oplatka, 2006), paying particular attention to its effect on consumer decision-making (Chininga *et al.*, 2019). Currently, the Internet has become one of the main sources for searching for and obtaining information, specifically for the generations of digital natives who commonly enter university (Flores-Alarcia; Del-Arco-Braco, 2013). In this digital environment, social networks have established themselves as the platforms where information can be obtained more quickly, making them a powerful marketing tool for higher-education institutions to attract new students (Consantinides; Lorenzo-Romero; Alarcón-del-Amo, 2013).

For this purpose, numerous Spanish universities maintain active profiles on various social networks, such as *Facebook*, *Twitter*, and *YouTube* (Zarco; Del-Barrio-García; Cordón, 2016). However, it seems that Spanish higher-education institutions have had difficulties in adapting to the digital 2.0 environment (Paniagua-Rojano; Gómez-Calderón; Fernández-Sande, 2012) and may use social networks to varying degrees. Against this backdrop, a study has been designed with the aim of analyzing the relationship between indicators related to higher-education institutions in Spain and these institutions’ results on some of the social networks available.

2. State of affairs

2.1. Marketing and universities on the web 2.0

University marketing practices have developed in response to the growing competition among institutions and the demands of social agents (Doña-Toledo; Luque-Martínez, 2017). Specifically, Spanish universities’ implementation of communication was the result of the creation of communication offices at the universities between the 1980s and 1990s. Their prevalence in the institutions increased considerably in the 1990s, owing mainly to the appearance of new private universities but also to the design of new marketing techniques that helped disseminate and position the institutional image (Parejo-Cuéllar, 2015).

In a context marked by the importance of internationalization and research, a large number of institutions, and difficulties in obtaining funding, universities have been forced to seek new ways to promote themselves, finding in marketing a vital tool for communicating their services to the public (Doña-Toledo; Luque-Martínez, 2017). Beyond education, which is a fundamental and intangible service, universities offer a variety of even more important, ancillary services such as extracurricular activities, libraries, or international mobility (Fayos *et al.*, 2011). A suitable marketing strategy that promotes all of these services would be very useful for increasing the institution’s appeal over others for those interested in accessing higher education.

The target audience for such marketing carried out by universities and their admissions offices is formed of prospective students, primarily those finishing post-compulsory secondary education, as from the many options, they must choose the institution that best suits their educational needs and career goals (Lewison; Hawes, 2007). Studies have shown that, among the marketing strategies that these entities can employ for this purpose, the Internet proves to be very powerful for attracting students to institutions that use it appropriately (Hemsley-Brown; Oplatka, 2006).

However, it seems that there was some delay in Spanish universities’ adaptation to Web 2.0. and, more specifically, to social networks, wasting a great deal of its potential (Reina-Estévez; Fernández-Castillo; Noguer-Jiménez, 2012). One of the main reasons for this was that they used unsuitable, poorly developed digital marketing strategies without an effective community (Paniagua-Rojano; Gómez-Calderón; Fernández-Sande, 2012). However, more and more national higher-education institutions have corporate profiles on social networks, and the number of networks on which they are active is increasing, as well (Blázquez; Rodríguez; Teijeiro, 2020; Zarco; Del-Barrio-García; Cordón, 2016).

Academia and the research world have benefited from the advent of 2.0 technologies and social networks in another way. Thanks to networks, it is now possible to report scientific studies and disseminate them farther than the traditional form of dissemination through

Universities’ marketing focuses primarily on influencing their prospective students’ choice of institution

scientific journals, which allows them to reach a wider audience (**Torres-Salinas; Delgado-López-Cózar**, 2009). Networks specifically used for scientific dissemination are called scientific digital social networks, among which *ResearchGate* and *Academia.edu* are the most widely used in Spain (**Campos-Freire; Rúas-Araújo**, 2016). However, in Spain, use of them by university researchers remains not very prevalent and has a long way to go (**González-Díaz; Iglesias-García; Codina**, 2015).

Moreover, the Web 2.0 has become an effective alternative to traditional modes of marketing, primarily because it allows companies to gain a foothold in the everyday lives of consumers, including the youngest ones (**Fondevila-Gascón; Carreras-Alcalde; Del-Olmo-Arriaga**, 2012; **Martínez-Costa et al.**, 2019; **Santana; Franco; Hernández**, 2014). Statistics show that, in Spain, 87% of Internet users aged 16-65 years use social networks (*IAB*, 2020). If we focus on the percentage of young people who use the Internet regularly, this rises to 93.6%, with social network engagement being one of the main reasons for Internet use (*Fundación Telefónica*, 2020). Considering these data, it is logical to view social networks as a powerful space for implementing marketing strategies specifically aimed at younger generations.

Information obtained from social networks is observed to have a strong influence on consumer decision-making, partly because it connects emotionally with consumers (**Blázquez; Rodríguez; Teijeiro**, 2020; **Stephen**, 2016). A university can use social networks to influence interested people's perception of and attitudes toward the institution, thereby encouraging them to choose it (**Santana; Franco; Hernández**, 2014).

Social media also influences customer loyalty and satisfaction and extends organizations' reach (**Brandão; Faria; Gadekar**, 2019). As a result, through the use of social networks, universities can keep students happy with their decision throughout their studies and, at the same time, reach different sectors of society.

2.2. Social networks and universities

As mentioned above, social networks are an important digital marketing tool, having a great influence on young people when they are choosing their future university (**Constantinides; Lorenzo-Romero; Alarcón-del-Amo**, 2013). By facilitating a twofold presence of institutions, the use of these networks increases the visibility of those who use them compared with those that do not, while enabling interaction with users at the same time (**Blázquez; Rodríguez; Teijeiro**, 2020).

Their target audience essentially consists of the younger generations of digital natives, that is, young people who have grown up in a world where technology and Internet-connected devices are an integral part of life and thus show a greater capacity for learning and adaptability to virtual environments (**Prensky**, 2001). In this sense, the use of social networks has been found to be beneficial for universities when it comes to increasing student enrollment (**Doña-Toledo; Luque-Martínez**, 2017).

In general, universities around the world use social networks to increase their visibility and communicate their educational offerings in an increasingly competitive environment (**Amaral; Santos**, 2020; **Kimmons; Veletsianos; Woodward**, 2017; **Rodríguez-Fernández; Sánchez-Amboage; Martínez-Fernández**, 2018). In Europe and North America, *Facebook* and *Twitter* are used the most, followed by *YouTube* and *Instagram* (**Motta; Barbosa**, 2018). However, some research has observed differences in higher-education institutions' performance on social networks depending on institutional characteristics; For example, it seems that higher-education institutions with a higher volume of students tend to be more active on networks such as *Facebook* or *LinkedIn* in terms of posting content and engagement, whereas universities with fewer students achieve greater visibility on the Internet (**Amaral; Santos**, 2020). In addition, prestige or quality is an important factor for increasing the number of followers, since it appears that those with the best positions in university rankings have, for example, more followers on *Facebook* (**Lund**, 2019).

Furthermore, disparities have been found in terms of universities' use of their social network accounts. This is the case with posting frequency and the number of posts, which seem to show no relationship with the number of followers or the degree to which users interact with the content (**Lund**, 2019). Meanwhile, likes of posted information drive engagement with posts, but not proportionally; that is, institutions that post more frequently have fewer overall interactions with each post compared with those that share less content (**Peruta; Shields**, 2017). Finally, even if universities do not have many followers on their networks, their performance on these networks can be considered to be satisfactory if users interact with the content by liking, commenting, or sharing the posted material (**Blázquez; Rodríguez; Teijeiro**, 2020).

Although some studies have analyzed the characteristics of universities and their performance on social networks in Spain (**Blázquez; Rodríguez; Teijeiro**, 2020; **Paniagua-Rojano; Gómez-Calderón**, 2012; **Simón-Onieva**, 2014; **Reina-Estévez; Fernández-Castillo; Noguer-Jiménez**, 2012; **Zarco; Del-Barrio-García; Cordón**, 2016), these factors have not been analyzed for all institutions across the board or for more than two social networks at once. Given that higher-education institutions' success on social networks may vary according to their characteristics, research analyzing this relationship at the national level could help identify those variables pertinent to universities' presence on social networks.

“ A significant correlation was found between the size of the institution's student body and its number of followers ”

3. Objectives, research questions, and hypotheses

Starting from the question of whether there is a relationship between the indicators related to Spanish universities and their use of and performance on social networks, the objectives of this study are:

- (1) To explore the relationships existing between university indicators (number of students and position in rankings) as well as their use of social networks and the results they obtain on them (number of posts as well as the numbers of followers and user reactions), and
- (2) To analyze the relationships between the variables related to universities on the networks (numbers of followers, posts, and interactions received by the university on social networks).

The starting hypotheses indicate that there could be a positive correlation between the number of students attending an institution and their use of social networks and their performance; that is, the greater the number of students, the greater the number of followers, posts, and interactions. When it comes to the position of a university in rankings, we expected that, the better an institution's reputation, the better its results on social networks.

In regard to the second objective, we expect that there will be a positive relationship between the number of followers and the number of reactions to posts on all social networks; in turn, there will be a positive relationship between the number of posts and the number of followers, weekly interactions, and reactions per post.

4. Methodology

A correlational, observational, and analytical research design was adopted for this study.

4.1. Population and sample

Data were collected from the total population, that is, from 83 Spanish universities. The institutions were selected using the inclusion criteria that appeared in the state report "Facts and Figures of the Spanish University System. Publication 2020–21" (*Ministerio de Universidades*, 2021a) and that were academically active. Of the higher-education institutions included, 60% were public ($n = 50$) while 40% were private ($n = 33$). The focus of the analysis was to study these universities' official profiles on social networks.

When mentioning social networks in Spain, *Facebook* springs to mind first, followed by *Instagram*, *Twitter*, *WhatsApp*, and *YouTube* (in that order) (*IAB*, 2020). Therefore, this article studies the universities' profiles on these social networks, with the exception of *WhatsApp*, as most universities do not yet use this network to communicate with the public.

4.2. Variables

The number of students enrolled in each university, the university's position in the rankings, their number of followers, and the number of posts they made per week on four social networks (*Facebook*, *Instagram*, *Twitter*, and *YouTube*) were used as university indicators:

- Number of students: The number of students studying to obtain university degrees at each institution was obtained from secondary information sources, specifically from the statistics and reports on Spanish universities (*Ministerio de Universidades*, 2021b; 2022).
- Position in university rankings: This information was obtained from a secondary source of information, in this case the *Ranking of Synthetic Indicators of Spanish Universities* of the *BBVA Foundation* and the *Valencian Institute for Economic Research* (Pérez; Aldás, 2018). This ranking of national universities is one of the most complete and up-to-date available, as in addition to scientific production, it assesses the quality of teaching, research, and innovation (Zarco; Del-Barrio-García; Cordón, 2016).
- Number of followers on the universities' social networks: This variable was identified by this study itself by observing the public information on the higher-education institutions' official accounts on each of the mentioned social networks. Thus, the numbers of *Facebook*, *Instagram*, and *Twitter* followers and *YouTube* subscribers were quantified (DeVries; Gensler; Leeflang, 2012). These data were collected once a week for 14 weeks.
- Number of posts: As in the previous case, these data were derived from research and observed weekly over a period of 14 weeks. In this case, the numbers of *Facebook* and *Instagram* posts, *Twitter* tweets, and *YouTube* videos from each university (Simón-Onieva, 2014) in the last seven days were recorded.

Regarding the dependent variables, we used the number of followers and the number of posts (both described above) as well as the number of interactions with these posts on the four studied social networks. All of these variables were obtained through primary information sources through this research. The authors collected these data from the universities' official profiles on the aforementioned networks:

- Number of user reactions in the form of likes: The number of likes of each post, tweet, and video from the university was recorded for each social network they used and for each week (Ashley; Tuten, 2014).
- Number of user reactions in the form of comments: In this case, the comments left by users (on *Facebook*, *Instagram*, and *YouTube*) per post and per week were studied.
- Number of user reactions in the form of shares: The number of times posts were shared (on *Facebook* and *Twitter*) per post and per week was recorded.

Interactions (likes, comments, and shares) were measured per post to prevent the number of posts from distorting these measurements, because one of the initial assumptions is that this variable could affect a university's results on the networks (Peruta; Shields, 2017).

4.3. Procedure

Data collection was carried out for 14 consecutive weeks. This period of time, from April to July 2021, which corresponds to the end of the academic year in Spanish high schools, was chosen because it is presumably a time during which the institutions' marketing activity is focused.

Their purpose is to attract students finishing their post-compulsory secondary education studies so that they choose to register and later enroll at their institutions. More specifically, university entrance exams and pre-enrollment for undergraduate studies begin during June and end in July, although in the months leading up to this, students are already beginning to form ideas regarding their options and preferences.

Under these assumptions, the information used in this study was collected between March 29 and July 4, 2021. The procedure adopted consisted of collecting the values for the variables for the 83 universities from their official profiles on the four selected social networks. The values of the variables for the institutions' performance on these social networks were obtained through the authors' direct observation of the universities' official accounts every seven days. In this way, the posts made and the likes, comments, and shares received in the seven days preceding were counted, and the number of followers on the final day was recorded, because, as this is a cumulative value, it cannot be added up. The data used are public data from the universities' profiles on networks and were extracted following Palmer (2013), Simón-Onieva (2017), and Zarco, Del-Barrío-García, and Cordón (2016).

Table 1. Correlations studied between independent and dependent variables

	Indicator/independent variable	Dependent variable
Objective 1	Number of students	Number of followers
		Number of posts
		Number of reactions per post
	Position in ranking	Number of followers
		Number of posts
		Number of reactions per post
Objective 2	Number of followers	Number of reactions per post
	Number of posts	Number of followers
		Number of reactions per week
		Number of reactions per post

4.4. Data analysis

IBM SPSS version 27 statistical software was used to analyze the information collected. A correlational analysis of the four independent variables or university indicators and the set of dependent variables or the institutions' results on their social networks was carried out. The Pearson correlation coefficient was used to study these relationships.

The correlations studied are presented below in Table 1.

5. Results

5.1. Correlation between number of students and university performance on social networks

Table 2. Pearson correlations between the number of students and the universities' results on social networks

	Facebook	Instagram	Twitter	YouTube
Number of followers	0.513**	0.514**	0.707**	0.240*
Number of posts	0.120	0.080	0.096	0.068
Number of likes per post	0.344**	0.218	0.429**	0.242*
Number of comments per post	0.759**	0.014	-	0.293*
Number of shares per post	0.398**	-	0.531**	-

Note: ** $p < 0.01$; * $p < 0.05$

The results presented in Table 2 reveal a significant correlation between the size of the universities' student body and their number of followers on *Twitter* ($r = 0.707$) and a moderate correlation in the case of the number of followers for *Facebook* ($r = 0.513$) and *Instagram* ($r = 0.514$). On *YouTube*, the correlation with the number of subscribers was significant but weak ($r = 0.240$).

When the number of weekly posts on the universities' social networks was taken as a dependent variable, the data did not reveal any significant correlation with the number of students. This result suggests that the number of posts an institution makes depends on the communication department of the university itself but is not affected by the number of students.

With regard to the number of likes per post, there was a moderate correlation for *Twitter* ($r = 0.429$) and a significant albeit weaker correlation for *Facebook* ($r = 0.344$) and *YouTube* ($r = 0.242$). For *Instagram*, there was also a positive correlation, but it did not reach significance. Note that, in the correlation between the numbers of students and likes on

Instagram, the Universidad de Navarra was an exception, as it was an extreme case that distorted the rest, having only 8,858 students but achieving an average of 1,223.52 likes per post.

Finally, some correlations were observed regarding the number of comments or shares per post. Between the number of comments and the number of students, a significant positive correlation was found for *Facebook* ($r = 0.759$) and a weaker one for *YouTube* ($r = 0.293$). Regarding the number of times posts were shared on *Twitter* and *Facebook*, a moderate positive correlation was found for *Twitter* ($r = 0.531$) and a weak positive correlation for *Facebook* ($r = 0.398$).

5.2. Correlation between university ranking and their performance on social networks

Table 3. Pearson correlations between university position in the rankings and their results on social networks

	<i>Facebook</i>	<i>Instagram</i>	<i>Twitter</i>	<i>YouTube</i>
Number of followers	0.397**	0.415**	0.700**	0.177
Number of posts	0.016	0.101	0.117	0.115
Number of likes per post	0.466**	0.168	0.504**	0.101
Number of comments per post	0.507**	-0.065	-	-0.043
Number of shares per post	0.370**	-	0.558**	-

Note: ** $p < 0.01$; * $p < 0.05$

In studying the Pearson correlation between the position in the university rankings and the university’s number of followers on social networks, Table 3 reveals that there was a moderate correlation between the first variable and the number of followers on *Facebook* ($r = 0.397$) and *Instagram* ($r = 0.415$). The correlation was strong with *Twitter* followers ($r = 0.700$). However, in the case of *YouTube* subscribers, the correlation was not significant.

When analyzing the relationship between the position in university rankings and the weekly number of posts, no significant correlation was observed on any of the social networks studied.

Finally, when user interaction was taken as the dependent variable, the following results were found: A moderate correlation was found between ranking position and the number of likes on *Facebook* ($r = 0.466$) and *Twitter* ($r = 0.504$), whereas for *Instagram* and *YouTube*, no significant correlation was found between this independent variable and the number of likes received.

Upon analyzing the interactions on networks through comments and shares, the results showed a moderate correlation between the position in the university rankings and the number of comments on *Facebook* ($r = 0.507$) but not *Instagram* or *YouTube*. Finally, looking at the number of shares per post, there was a positive correlation for *Facebook* ($r = 0.370$) and a somewhat stronger correlation with the number of retweets on *Twitter* ($r = 0.558$).

5.3. Correlation between number of followers and university performance on social networks

Table 4. Pearson correlations between the number of followers and a university’s results on social networks

	<i>Facebook</i>	<i>Instagram</i>	<i>Twitter</i>	<i>YouTube</i>
Number of likes per post	0.490**	0.598**	0.585**	0.283*
Number of comments per post	0.573**	0.026	-	0.289*
Number of shares per post	0.318**	-	0.618**	-

Note: ** $p < 0.01$; * $p < 0.05$

The relationship between the number of followers that universities had on social networks and the number of user reactions to their posts was also studied, revealing positive results (Table 4). Regarding the number of likes, the relationship between the number of followers on social networks and the reactions per post presented a strong positive correlation in the case of *Instagram* ($r = 0.598$) and *Twitter* ($r = 0.585$). For *Facebook*, this correlation was moderate ($r = 0.490$), whereas for *YouTube*, it was weak ($r = 0.283$).

When reactions were measured through comments and shares per post, it was found that there was a moderate positive correlation between the number of followers and the number of comments for *Facebook* ($r = 0.573$), whereas this correlation was tenuous for *YouTube* ($r = 0.289$). A strong correlation with the number of shares per post for *Twitter* ($r = 0.618$) as well as a weak correlation for *Facebook* ($r = 0.318$) were also observed.

5.4. Correlation between number of posts and university performance on social networks

In this section, we analyze the correlations between the variables that indicate Spanish universities’ results on the social networks studied. First, there seems to be no significant correlation between university institutions’ weekly number of posts on the networks and their number of followers on *Facebook* and *Instagram* (Table 5). In the case of *Twitter*, there was a significant but weak positive correlation ($r = 0.237$) between these two variables. However, for *YouTube*, a moderate positive correlation ($r = 0.528$) was found between the number of followers universities had on the social network and the weekly number of video posts.

Table 5. Pearson correlations between number of posts and number of followers

	Facebook	Instagram	Twitter	YouTube
Number of followers	0.067	-0.021	0.237*	0.528**

Note: ** $p < 0.01$; * $p < 0.05$

In terms of interactions with posts, a distinction was made between weekly or per-post reactions. Correlations between the number of posts made by universities and weekly reactions measured in likes were moderate and positive for *Twitter* ($r = 0.464$) and significant, albeit somewhat weaker, for *Facebook* ($r = 0.382$), *Instagram* ($r = 0.354$), and *YouTube* ($r = 0.275$) (Table 6).

With respect to reactions in the form of comments and shares, the relationship was also significant, but the results were tenuous when it came to comments for *Facebook* ($r = 0.227$) and *YouTube* ($r = 0.282$). However, regarding the number of times posts were shared each week, a moderate positive correlation was demonstrated for *Facebook* ($r = 0.508$) as well as for *Twitter* with retweets ($r = 0.498$).

Table 6. Pearson correlations between the number of posts and reactions per week

	Facebook	Instagram	Twitter	YouTube
Number of likes	0.382**	0.354**	0.464**	0.275*
Number of comments	0.227*	0.009	-	0.282*
Number of shares	0.508**	-	0.498**	-

Note: ** $p < 0.01$; * $p < 0.05$

In the analysis of interactions per post (Table 7), in terms of reactions through likes, a trend at odds with that found per week was observed. It appears that, while weekly likes showed a positive correlation with respect to posts, correlations are negative for likes per post, albeit very weakly. Thus, the relationship between the number of posts and the number of reactions per post is negative but does not reach statistical significance for any of the four social networks.

Regarding reactions measured in comments and shares per post, a pattern similar to that described above was observed, with negative albeit not significant correlations observed for all the studied networks.

Table 7. Pearson correlations between number of posts and reactions per post

	Facebook	Instagram	Twitter	YouTube
Number of likes per post	-0.132	-0.232	-0.195	-0.115
Number of comments per post	-0.121	-0.045	-	-0.162
Number of shares per post	-0.047	-	-0.184	-

Note: ** $p < 0.01$; * $p < 0.05$

6. Discussion and conclusions

This work focused on studying the correlations of university variables related to their use of and results on social networks. Specifically, the relationships established between the number of students at a Spanish university and the university's position in the ranking with the number of followers, posts, and reactions on four social networks (*Facebook*, *Instagram*, *Twitter*, and *YouTube*) were explored. The correlations between the number of followers and posts with the interactions obtained by higher-education institutions on each of these social networks (weekly and per post) were also analyzed.

First, a positive and significant relationship was found between the number of students at the institution and their followers on all social networks. That is, the greater the number of students, the larger the community of followers of those universities are on the different networks. A positive correlation was also found between the size of the institution's student body and the interactions (likes, comments, and shares) they received on these social networks, with the exception of *Instagram*. Thus, it can be confirmed that the size of the university would influence its results on social networks (Zarco; Del-Barrio-García; Cordón, 2016), while corroborating the findings of Amaral and Santos (2020) regarding the correlation between the size of higher-education institutions and the activity and interactions they obtain on their social networks. It is worth highlighting that not finding a significant correlation between the number of students and reactions for *Instagram* could be due to private universities' intensive use of this social network (Alcolea-Parra; Rodríguez-Barba; Núñez-Fernández, 2020) and the smaller number of students they have in comparison with public universities. However, there seemed to be no relationship between the number of students and the number of posts on any of the social networks studied. Therefore, the number of posts depends more on the characteristics and composition of the university's communication office than on the number of students it has.

Second, when the institution's position in the rankings was taken as an independent variable, a positive correlation with the number of followers was observed for all of the social networks analyzed, except *YouTube*. Thus, already observed in other research, the better the university's position in the rankings, the greater its number of followers on the networks (Brech et al., 2017). Possibly, the status of certain institutions allows them to obtain a large number of followers more

easily than others that are less well known (Zhu, 2019). In addition, the university's position in the rankings correlated positively with the interactions obtained by posts in terms of likes, comments, and shares on *Facebook* and *Twitter*, but this was not the case on *Instagram* and *YouTube*. For these two networks, there were other

factors that had a closer relationship with the reactions obtained. Regarding *Instagram*, one explanation could be the distortion of correlations caused by the extreme values of some universities in terms of likes and comments. For *YouTube*, this could be influenced by the higher cost of creating content on this network, as well as the amount of resources allocated to their management (Martínez-González; Santamaría-Llanera, 2017).

Third, the relationship between a university's number of followers and its results on social networks was studied. A positive correlation was found between this variable and the number of user reactions to a university's posts for all of the social networks studied, with the exception of comments in the case of *Instagram*. On the basis of these results, it is corroborated that universities that have more followers on social networks generate more interactions with the content they post (Alonso-García; Alonso-García, 2014). In addition, the positive relationship between followers and shares on *Twitter* (retweets) already observed by Palmer (2013) as well as the relationship between the number of *Facebook* followers and the interactions obtained by universities (Brech *et al.*, 2017) are also confirmed. Paniagua-Rojano, Gómez-Calderón and Fernández-Sande (2012) concluded that those universities with more followers on networks were not necessarily those that obtained more user reactions. However, the results presented here differ by finding a considerable correlation between followers and reactions on networks.

Finally, we analyzed whether there was a positive correlation between the number of posts and the universities' results on social networks. On the one hand, posting more content on networks such as *Twitter* or *YouTube* was related to the number of followers that universities had on these social networks, but such a relationship was not found for *Facebook* or *Instagram*. Consequently, the relationship between these variables did not hold true for some social networks (Simón-Onieva, 2014). On the other hand, relationships were found between the number of posts and the interactions received on the networks. Focusing on weekly reactions, a positive correlation could be observed when it came to user interactions via likes, comments, and shares on *Facebook*, *Instagram*, *Twitter*, and *YouTube*, the exception being comments on *Instagram*. In contrast, when reactions per post were considered, no significant correlations were observed and, moreover, they showed negative values. In other words, if universities post more, it appears that they obtain more overall weekly interactions, but the interaction for each post decreased or was not affected. Therefore, it is possible that increasing posting frequency does not affect user interaction (Simón-Onieva, 2014) when interaction per post is analyzed. These results could support the argument that qualitative aspects of a post play an important role in user interaction and engagement (Lund, 2019), and therefore, this is what universities should focus on.

This study has sought to overcome the limitations of previous research in this field by carrying out an exhaustive analysis of Spanish universities' use of social networks, covering all national higher-education institutions. In addition, the study covered four social networks and was carried out over 14 weeks, differentiating it from research conducted to date and promoting a better understanding of the phenomenon studied.

In terms of limitations, this study has a quantitative approach, and it would be useful to supplement it with a qualitative approach. In this sense, the analysis of the interactions that universities' posts receive could be expanded by studying the content of their posts using a qualitative approach. It would also be of interest to add the variable of the number of new student enrollments that universities obtain to study possible causal relationships. In addition, it would be relevant to study the origin of the differences in the results obtained for *Instagram* compared with the other social networks. Finally, a complementary and comparative analysis of the differences in user interactions according to the type of content that universities post on social networks (e.g., outreach, audiovisual elements, etc.) could be carried out.

This study has provided evidence regarding the relationship between indicators of Spanish universities, such as the number of students and a university's position in the rankings, and their performance on the social networks they use, confirming the relationship between some of the variables connected to their results on social networks, albeit with some variation among them. However, in the future, the impact of other factors, such as the number of years an institution has existed and the leadership or the characteristics of the communication office, on this relationship could be studied.

In conclusion, it was confirmed that the number of students at a university is an influential variable when it comes to the university's results on social networks, showing a positive relationship with the number of followers on all social networks and with the interactions they obtain on *Facebook*, *Twitter*, and *YouTube*. It was also observed that position in the university rankings was related to the number of followers for all of the social networks studied, except *YouTube*. Likewise, the correlation between this variable and interactions held true for *Facebook* and *Twitter*, but not *Instagram* and *YouTube*. The other important variable related to the results on social networks was the number of followers that universities had on these networks. Those universities with

There was a positive correlation between position in the university rankings and the interactions received on *Facebook* and *Twitter*

The relationship between the number of followers on social networks and the reactions per post presented a positive correlation

a larger community of followers were observed to achieve more interactions on all the studied social networks. Posts demonstrated a positive relationship when studied by weekly interaction achieved for all the networks, but not when studied per post. Therefore, posting more generates more overall weekly interaction, but reactions per post do not increase. Finally, the number of posts was not related to the number of followers that universities had on *Facebook* and *Instagram*, even though it was related for *YouTube* and, to a lesser extent, for *Twitter*.

There was no significant correlation between university institutions' weekly number of posts on the networks and their number of followers

The current trend shows that social media use continues to grow in the context of higher-education institutions throughout Spain and is becoming an increasingly important resource for university communication and marketing. Accordingly, it is vital to identify the relationships presented here to improve universities' communication strategies, as well as their impact on social networks. The research presented herein describes a methodology that could be used to monitor and analyze educational institutions' social networks now or in future studies, making a contribution to study design in this field that could even be applied to the business world.

7. References

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