



Longitudinal analysis of Instagram use in Spanish universities

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ABSTRACT

Introduction: Universities need to strengthen their brand image by initiating a transformation that incorporates new means of communication. Digital social media, as fast and effective channels for communication and dissemination, have become ideal for identifying and addressing the needs of current and potential students, as well as other stakeholders. The aim of this study is to analyze and evaluate how Spanish universities use Instagram for their strategic communication and to offer the scientific community a solid and replicable methodology to study other contexts. **Methodology:** This is an eminently quantitative, longitudinal and comprehensive study, as it analyzes 165,497 posts from 89 Spanish university accounts posted from 2012 to 2024 using tools related to the Big Data paradigm: Social Network Analysis, Machine Learning and Artificial Neural Networks. **Results and Discussion:** The results show that the digital activity of the accounts is consolidating, but not all of them achieve the same acceptance by the digital audience. Therefore, the marketing strategies of those accounts with a low Engagement Rate should be adjusted. The hashtags used allude to a sectorial and collegiate register, mainly educational and/or scientific. However, there is one main topic that generates social consensus in the university community: equality between men and women. Likewise, the conversation takes place in neutral or positive terms, with an absence of polemics and polarization. **Conclusions:** The study contributes a replicable analytical model for assessing the strategic use of social media by universities or similar institutions.

Keywords: Instagram; Social Media Intelligence; Data Mining; Big Data; Corporate Communication; University; Spain.

1. INTRODUCTION

Society has undergone profound transformations in the technological field, which has modified, among other things, the channels used to exchange information. In this regard, in the current context, digital social networks are immersed and fully normalized in different contexts, such as personal, social, and professional environments. Their use is increasingly common among individuals, institutions, and organizations of various kinds to disseminate information, keep in touch with friends and family, promote business, acquire knowledge, or simply as a source of entertainment (Kaplan & Haenlein, 2010; Orbegozo-Terradillos, 2023).

Digital social networks, from a professional and strategic point of view, are current communication channels that enable any type of organization to achieve greater dissemination, obtain information, and be closer to society (Harrison et al., 2017). This evolution of corporate communication is referred to as the phenomenon of 'symmetrical dialogic communication', which allows issuing entities to improve their visibility and relationships with audiences, disseminate information, participating in and listening to online conversations with different stakeholders (Capriotti et al., 2020). However, this type of communication has also given rise to the phenomenon of clicktivism (Biraghi et al., 2019; Karpf, 2010), where audience participation is reduced to quick and superficial actions, such as liking, sharing, or commenting. While these interactions increase the visibility and reach of messages, they do not always reflect a genuine commitment to their institution's values or objectives. This phenomenon presents a challenge for universities, which must balance engagement metrics with the real quality of the relationships they establish with their audiences on platforms such as Instagram.

Organizations dedicated to teaching and research at the higher education level have also joined this dialogic communication or digital strategic communication, because capturing the attention of their potential students (digital natives immersed in Web 2.0 applications) is essential (Capriotti & Zeler, 2023; Pérez-Bonaventura & Rodríguez-Llorente, 2023). Among other functions, digital social networks are indispensable platforms for connecting communities, promoting brand identity, and building a meaningful and distinct reputation among competitors (Mai To et al., 2022; Sataøen & Wæraas, 2016). In this context, universities have begun adopting strategic approaches to manage their online presence to strengthen their brand image and attract their target

audiences. Often viewed as academic institutions, they are now seen as brands competing in a global market where social media plays a crucial role in shaping their institutional identity. This approach aligns them with business marketing dynamics, where not only academic programs are promoted, but also quick and visible interactions are sought through low-cost actions (Perera et al., 2022).

The educational field, in general, and the university, in particular, are no stranger to the aforementioned phenomenon of digital strategic communication in the Web 2.0 era, and the impact that social networks can have on the dissemination of information by higher education institutions is significant (Alcolea Parra et al., 2020; Simancas-González & García-López, 2017). The way in which the university's communication with society is no longer limited only to traditional media. With the emergence of social networks, communication is much more direct and personalized with different audiences, often without intermediaries, allowing for a bidirectional exchange of information (Simón-Onieva, 2014; Thelwall, 2018). In addition, it should not be forgotten that university students, the main target group of universities, are 'digital natives' (Prensky, 2001), so communication strategies must align with this reality.

In this regard, the growing importance of social media in education has been extensively documented, highlighting its role in enhancing knowledge sharing, interaction, and collaborative learning in higher education institutions. Recent studies have emphasized how social media facilitates a more dynamic and accessible learning environment (Luong et al., 2023; Nasution, 2024). Furthermore, bibliometric analyses have confirmed the rapid growth of research in this field, underlining the need for robust methodologies to evaluate their impact on institutional communication and student engagement (Fauzi et al., 2023).

In the context of Spanish universities' strategic communication on social media, much of the academic output was concentrated in the 2010s, driven by the emergence and expansion of Web 2.0 and digital platforms (Alonso-García & Alonso-García, 2014). Accordingly, most studies have focused on Facebook, Twitter, YouTube, or LinkedIn, often adopting descriptive approaches and traditional methodologies (Oliveira et al., 2022; Paniagua Rojano & Gómez Calderón, 2012; Rodríguez Ruibal & Santamaría Cristino, 2012) or primarily quantitative methods (Pérez-Bonaventura & Vilajosana, 2023). More recent studies, such as that by (Matosas-López & Cuevas-Molano, 2021), although employing big data methodologies, concentrate exclusively on Twitter (now X) and use a limited sample of universities. On the other hand, the comparative perspective on social media use across different countries is enriched by the contributions of Pérez-Bonaventura et al. (2023) and (Cancelo Sanmartín & Almansa Martínez, 2013). Finally, Pérez-Bonaventura's (2022) doctoral dissertation provides an in-depth and pioneering comparative analysis of four social media platforms (Facebook, Twitter, YouTube, and Instagram) across all 82 Spanish universities. The author, beyond identifying Instagram's clear potential as a future communication tool, concludes that universities "should review their communication strategies" (Pérez-Bonaventura, 2022, p. 302), especially among public institutions.

In this context, this research has two objectives: on the one hand, with a complete and comparative vision, to analyze and evaluate how Spanish universities use Instagram for their digital strategic communication and, on the other hand, to offer the scientific community a solid and replicable methodology to study other contexts or phenomena. It is also done from a longitudinal, comprehensive, and exhaustive perspective, which greatly enriches the study: 12 years of activity are analyzed (the initial year is taken as the year that the first corporate accounts were created), and a complete view of the university landscape is offered (all the accounts of Spanish public and private universities are included in the corpus analyzed). For this purpose, different Social Media Intelligence (SMI) techniques or tools are used, such as Social Network Analysis (SNA), Machine Learning (ML), or Artificial Neural Networks (ANN). Thus, characterizing, through the design of an inductive and structured methodology replicable in other scenarios, the social narrative constructed by Spanish universities.

Considering universities as brands that require essential strategic communication to compete effectively (Whisman, 2011), it is necessary to study the use of social networks by universities. Moreover, there is no doubt that social networks are an immense and valuable source of information and extracting intelligence from information provided by social networks has become increasingly popular (Desai & Han, 2019). This article focuses on addressing this need and exploring these dynamics in the context of Spanish universities.

In this regard, brand image emerges as a critical intangible asset for universities in highly competitive and globalized educational environments. Social media platforms play a central role in shaping and communicating that brand images, enabling institutions to project values, personalities, and identities through visual and interactive content (Capriotti, Martínez-Gras et al., 2023; Capriotti, Oliveira et al., 2023; Sataøen, 2019). The strategic use of Instagram allows universities to construct a coherent narrative aligned with their institutional identity, enhance public perception, and foster emotional connections with prospective and current students. Therefore, studying how universities manage their digital presence is essential to understanding the broader mechanisms of brand positioning and reputation-building in the higher education sector and potentially reformulating them toward more participatory and socially committed communication models (Simancas-González & García-López, 2019).

1.1. Social Media Intelligence and corporate use of Instagram in Universities

Instagram is one of the most popular and frequently used social networks in Spain (along with WhatsApp and BeReal), being the one that has generated the most interaction in recent years (+10% growth in 2023) (IABSpain, 2024). Moreover, apart from being the fourth social network with the most users worldwide (behind Facebook, YouTube and WhatsApp), in the specific case of Spain, Instagram is the platform with the second largest number of users (74.9% of the population aged 16 to 64 uses it), behind WhatsApp (89.7% of the population in the same age group). Likewise, Instagram has a predominantly young audience; approximately 70% of its users, globally, are under 35 years old (We Are Social, 2023).

In this scenario, as far as scientific studies on Social Network Intelligence are concerned, despite the large number of Instagram users, its academic attention is clearly underrepresented compared to other social networks such as Twitter (Matamoros-Fernández & Farkas, 2021). This statement is corroborated by the comparison of certain data, such as the number of users of one and the other social network: Instagram had 23.8 million active users in Spain in 2022, while Twitter (currently X), obtained a record of 4.39 million (Statista, 2024a, 2024b) and monopolizes a large part of scientific research (Ahmed, 2019). However, the relatively open policy of Twitter, until February 2023, which gave access to data through its official academic API, contrasts with the hermeticism and opacity of networks such as Facebook or Instagram. Thus, the limited academic attention to Instagram is largely explained by the difficulty of systematically acquiring data, making it one of the social networks with the most active users and one of the least studied by the scientific community (Morales-i-Gras & Sánchez-i-Vallès, 2022).

In the specific case of institutions dedicated to higher education, Instagram ranks fifth among the most used social networks by international universities listed in the QS World University ranking and 86.1% of Western European universities in the ranking have an official account on Instagram (Valerio-Ureña et al., 2020). Additionally, the results of a recent study for Swiss universities show that, in recent years, university communication has increased on Instagram, but not on Facebook or Twitter (Sörensen et al., 2023).

Instagram stands out for its high level of engagement, generating up to 58 times more interactions per follower than the social network Facebook and 150 times more interactions than Twitter (Escobar, 2018). Currently, Instagram is already an effective tool for universities: it contributes to strengthening their institutional identities, helping them to position themselves in a truly competitive environment, and broadening the

spectrum of the public they address (Alcolea Parra et al., 2020). In this way, university profiles on Instagram aim to act as showcases with their own voice for offline campuses aiming to transition online (Blanco-Sánchez & Moreno-Albarracín, 2023).

In the specific case of Instagram, several studies analyze this platform as a university teaching tool (Ávila, 2021; Gómez-Ortiz et al., 2023; Alonso López & Terol Bolinches, 2020). Additionally, research has explored university students' consumption of this platform and its effects (Foroughi et al., 2022; Pekpazar et al., 2021; Romero-Rodríguez et al., 2020). However, published research on Instagram as a university corporate tool for digital strategic communication is scarce.

Among the few references found, most of them are focused on analyzing the content of posts published by universities during specific periods (Alcolea Parra et al., 2020; Blanco-Sánchez & Moreno-Albarracín, 2023; Moreno-Albarracín & Blanco-Sánchez, 2022; Stuart et al., 2017), using small datasets and without advanced Big Data techniques. Another characteristic of existing studies is that, apart from focusing on small datasets, they analyze posts over short time periods (Ramadanty & Syafganti, 2021). Likewise, user engagement on Instagram is often studied using traditional methods, such as surveys, to measure the opinions of the student community about institutional communication on Instagram (Kurniawan et al., 2021). In that sense, despite the large amount of data generated by university Instagram accounts, the only works found that process these data through Natural Language Processing (NLP) techniques do so with lexicon-based models for sentiment analysis of the obtained texts (Desai & Han, 2019; Thejas et al., 2019).

Thus, in this scenario, it is considered necessary to define the steps of a competitive intelligence methodology to analyze and identify communication trends, to gain insights into digital activity, generate knowledge, and improve communication strategies based on specific objectives. In this sense, universities increasingly resemble businesses, applying marketing strategies to manage their digital presence, attract prospective students, and strengthen their institutional brand in a competitive environment.

2. METHODOLOGY

For the analysis of digital activity on Instagram by Spanish universities, this research adopts an eminently quantitative approach, using techniques and tools related to SNA, ML and ANN in the context of Big Data. Advanced data gathering and processing tools are employed to carry out a detailed analysis, including, among others, language detection, calculation of engagement metrics, content analysis and sentiment analysis, providing a comprehensive and data-driven view of the digital activity of Spanish universities on Instagram.

The study sample comprises the corpus of posts published by the 89 universities with corporate accounts on Instagram out of the 91 universities, public and private, that make up, as of April 2024, the Spanish University System (<https://www.educacion.gob.es/ruct/consultauniversidades?actual=universidades>). These Instagram accounts have been identified on the official websites of each university and their activity on Instagram over a period of 12 years (from the first post published by a Spanish university on March 6, 2012 to April 13, 2024) has been downloaded (see Supplementary_material_appendix 1).

Two tools provided by the University of Amsterdam are used to obtain and first processing of the data. The first tool, for data retrieval, is Zeeschuimer (Peeters, 2024). The second tool, for downloading data in 'ndjson' format is 4CAT (Digital Methods Initiative, 2024). Subsequently, the data is then prepared using data cleansing, transformation, and processing tools: OpenRefine (<https://openrefine.org/>); VantagePoint (<https://www.thevantagepoint.com/>)

The data analysis is carried out in four main sections that answer the following research questions:

- RQ1. What is the digital presence on Instagram of Spanish universities?
- RQ2. What is the behavior of the engagement metrics and the Engagement Rate of the Instagram accounts of Spanish universities?
- RQ3. What patterns are observed in the use of hashtags and in the co-occurrence network of these hashtags?
- RQ4. What is the predominant sentiment in Instagram posts from Spanish universities?

To answer the first research question, the language used in the post, the temporal distribution of number of posts and number of likes and comments and, the ranking of universities according to digital audience activity is analyzed. For the specific case of identifying the language of the posts, an open-source Artificial Neural Network model for language detection was used: the xlm-roberta-base-language-detection model (Papariello, 2022), pre-trained for language detection using the transformer model, which is based on XLM-RoBERTa and adds a classification head to the model. XLM-RoBERTa is a multilingual variant of the RoBERTa model (Conneau et al., 2020). Moreover, by making use of the unsupervised k-means clustering algorithm, the universities are grouped according to the activity of their digital audience.

In the case of the second research question, to understand the engagement metrics, variables correlated with the likes and comments variables are analyzed. Additionally, the Engagement Rate (ER) for the first four months of 2024 of the Instagram accounts of Spanish universities is calculated. To ensure comparability, engagement rates were calculated based solely on posts from the most recent months of activity. This approach normalizes the data across accounts and reflects current audience interaction levels. Formula 1 shows one of the ways to measure ER for a given period.

Formula 1: Formula used to obtain the Engagement Rate (Orbegozo-Terradillos et al., 2025)

$$\text{Engagement Rate} = [((\text{Likes} + \text{Comments}) / \text{Posts}) \text{ Followers}] * 100$$

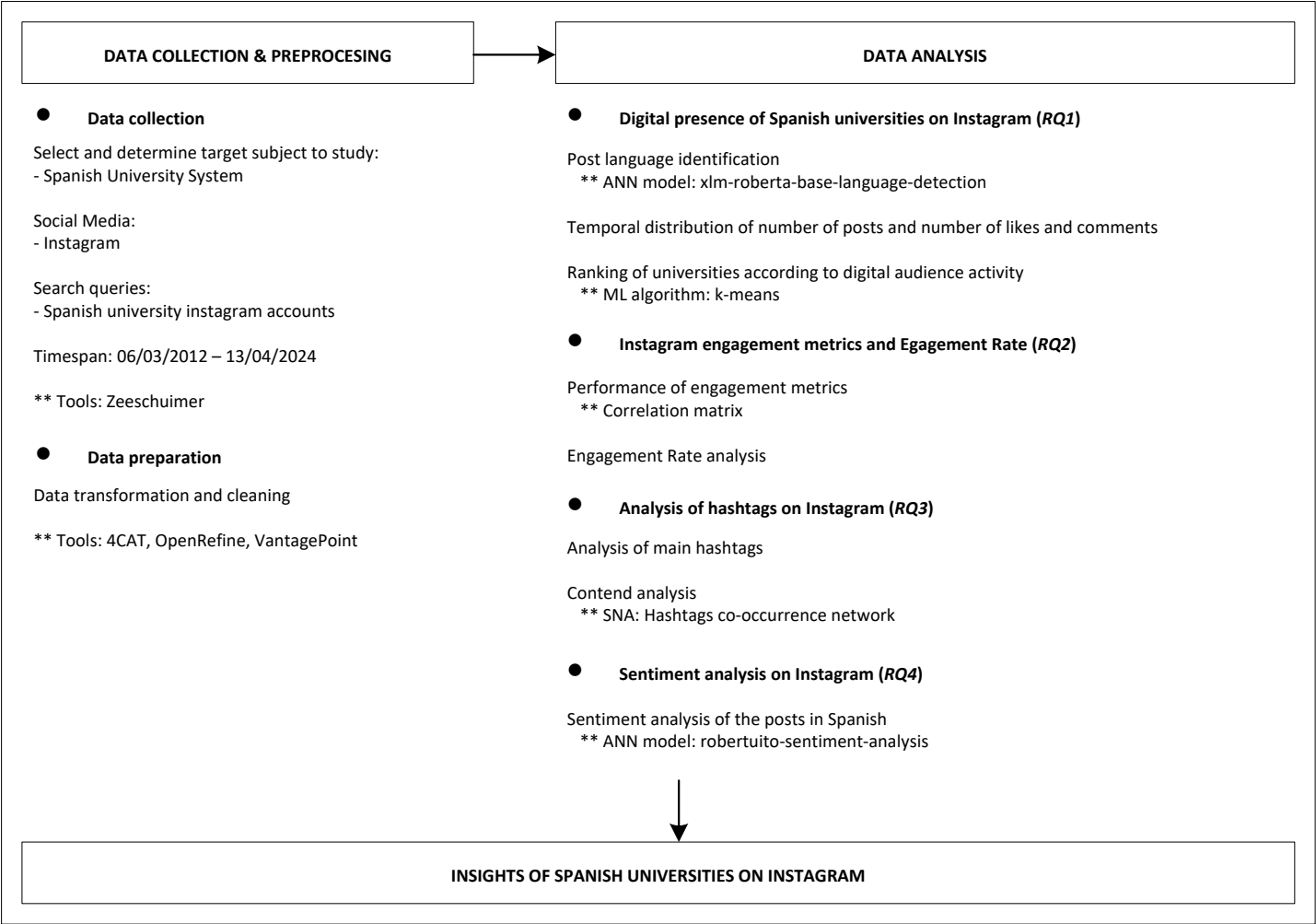
As for the third research question, the main hashtags used (those that appear most frequently in the posts) are analyzed to provide a first approach to content analysis. Likewise, to explore the thematic configuration of hashtags, a co-occurrence network was constructed, where nodes represent hashtags and edges represent their joint appearance in the same post. The initial network was generated using Pajek (Mrvar & Batagelj, 2025), and subsequently visualized and analyzed in Gephi (Bastian et al., 2009). The *Modularity Class* algorithm was applied to detect clusters (communities) based on structural modularity rather than predefined themes. Thus, different communities or clusters emerge that serve to observe the thematic preferences of the longitudinal digital conversation analyzed.

Regarding the sentiment analysis of the posts shared by Spanish universities (fourth research question), a multi-class sentiment classification was carried out: positive, neutral or negative. For this purpose, an open-source Artificial Neural Network model for sentiment detection was used: robertuito-sentiment-analysis (<https://huggingface.co/pysentimiento/robertuito-sentiment-analysis>), a pre-trained model for accurately detecting and classifying sentiments. In this case, the base model is RoBERTuito, a RoBERTa model trained with social media text in Spanish (García-Vega et al., 2020; Pérez et al., 2021).

Finally, it is important to note that the data analyzed in this study were collected exclusively from public institutional Instagram accounts of Spanish universities. Data collection was carried out using academic tools. The analysis focused only on aggregate metrics and institutional content.

Figure 1 shows a summary of the research methodology used.

Figure 1. Methodology applied in the study.



Source: Elaborated by the authors.

3. RESULTS AND DISCUSSION

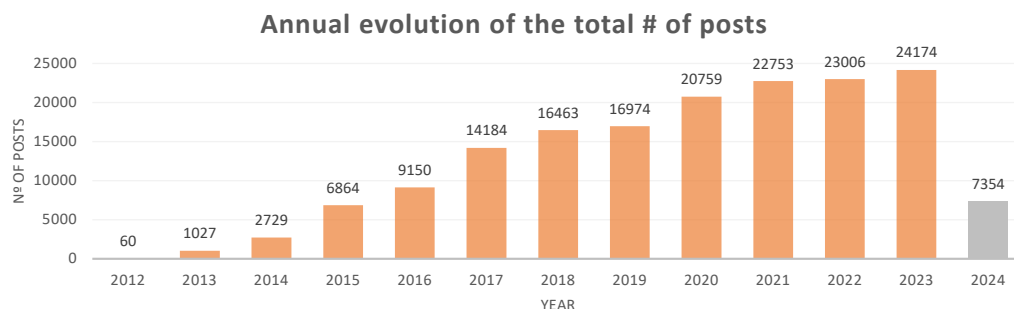
3.1. Digital Presence of Spanish Universities on Instagram

Of the 91 universities that make up the Spanish University System, it can be seen that 89 have an active Instagram account (representing 97.8% of Spanish universities as of April 2024).

The dataset for this study consists of 165,497 posts published by universities during the period between March 6, 2012, and April 13, 2024. In this dataset, according to the xlm-roberta-base-language-detection model, 92.76% of the posts are in Spanish (153,517 posts); hence, more than 9 out of 10 pieces of content are in Spanish. These data show a relative monolingualism of the digital strategy of the university system as a whole, which focuses its communication efforts mainly on Spanish-speaking community.

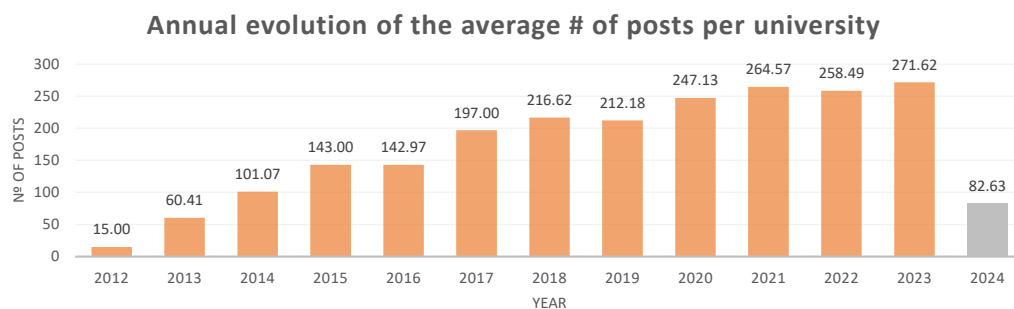
From a chronological point of view, another significant fact is worth noting: the frequency of content publication increases over the years. While in 2012 there were only 60 pieces of content published throughout the year (from four official accounts), this figure increases to 24,474 pieces of content in 2023 (the large decrease observed in 2024 is due to the fact that the data collection period only runs until mid-March 2024) (see the top part of Figure 2 and 3). This growth reflects both the increased use of the platform itself and the emergence of new universities with their own communication channels on Instagram. In 2023, with all the analyzed accounts already officially activated, the average number of pieces of content per university was 271.62, slightly less than one post per day (see the bottom part of Figure 2 and 3).

Figure 2. Annual evolution of the total # of posts



Source: Elaborated by the authors.

Figure 3. Annual evolution of the average # of post per university.



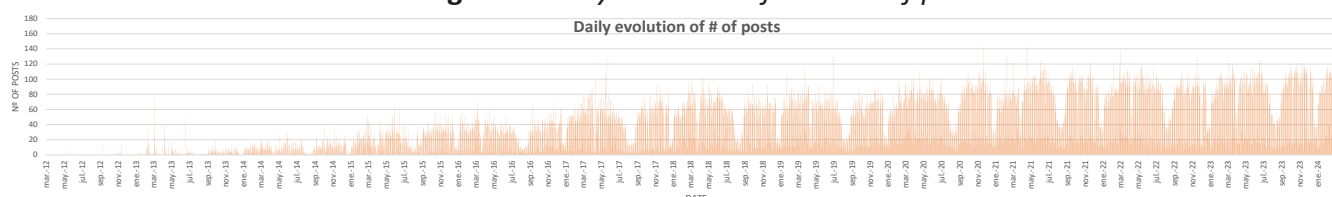
Source: Elaborated by the authors.

The increase in posting frequency was progressive, reflecting the popularity of the platform and the activation of new accounts. However, the peaks of greater intensification in terms of growth occurred in the years 2015 and 2017, with 60% and 55% more posts per year, respectively (annual evolution of posts as a whole). The period spanning these years can, in fact, be considered as Instagram's exponential growth cycle in terms of the number of posts by active users. This fact, together with the introduction of new functionalities (Instagram Stories, in August 2016; and Instagram Live, during 2017), the sophistication of algorithms that improved the use of the platform and the growing competition among universities, explains Instagram's expansion, probably also in terms of digital marketing investments.

As for the average annual number of posts per university, the growth follows a similar pattern. The figure almost doubles between 2014 and 2017, and this significant increase slows from that year onwards. It is worth noting that, despite the digitalization and virtualization accelerated by the Covid-19 pandemic in 2020, which led many institutions to intensify their presence on social networks and digital platforms, the increase in posting frequency did not maintain the growth rate observed in previous years.

Figure 4 shows the daily evolution of content. A general increase is observed over the years, especially notable from 2015 onwards, all consistent with the previous figures. Internally, within each annual period, there are peaks of activity and decreases or ‘valleys’, which, from an overall perspective, correspond to the Christmas and summer holiday periods: the intensity decreases significantly in the months of January and August. Therefore, a plausible interpretation of the data is that the logic of activity does not correspond so much to important periods or events in the academic calendar (beginning of the academic year, exam periods, etc.), but to the existence of clearly marked holiday periods in the social calendar, reflecting a decrease in interaction and content production during these times of rest. As for the Covid-19 pandemic, the data show that the global crisis did not produce a clear intensification of activity on Instagram.

Figure 4. Daily evolution of number of posts.

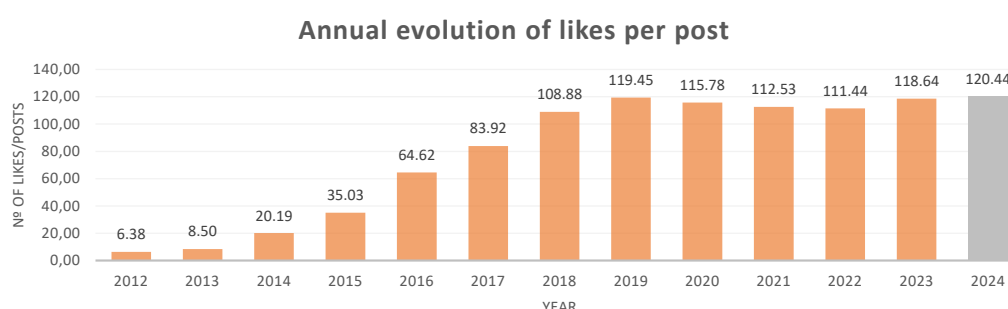


Source: Elaborated by the authors.

In terms of daily variability, another significant detail is that there are certain days in the calendar that produce a notable increase in activity. For instance, observing the microdata, two of the most significant dates on the international agenda for equal rights between men and women —March 8 (International Women's Day) and November 25 (International Day for the Eradication of Violence against Women)— coincide with periods of high interaction. This fact indicates, among other issues, that this topic can be considered to have a high degree of social consensus, showing broad acceptance and support by the university community.

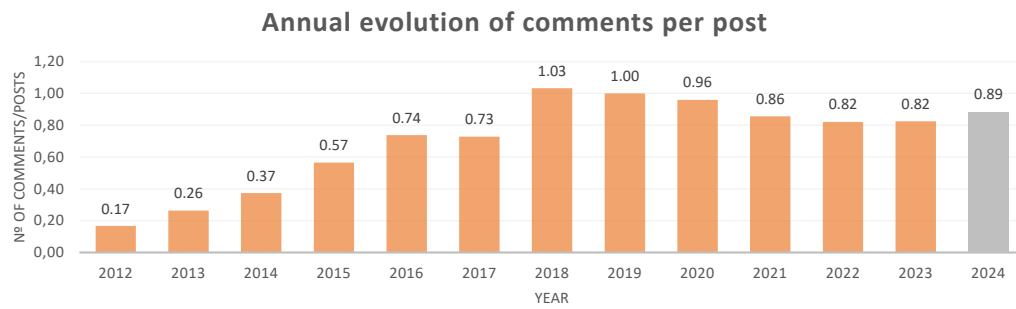
However, it should be noted that the number of posts is an indicator that brings us closer to the concept of intensity in the digital activity of Spanish universities, but it does not provide information on the acceptance of these posts by the Instagram audience. In contrast, indicators such as the number of likes or the number of comments better approximate aspects related to audience reactions to the content published by the universities. Therefore, after having eliminated the posts with extreme outliers of likes or comments (Interquartile Range, IQR factor = 3¹) to ensure the integrity of the analysis, of the 153,916 posts used for the study, it is observed that as of 2018, the rate of reactions (per post) by Instagram users has managed to remain constant (see Figure 5 and 6).

Figure 5. Annual evolution of likes per post



Source: Elaborated by the authors.

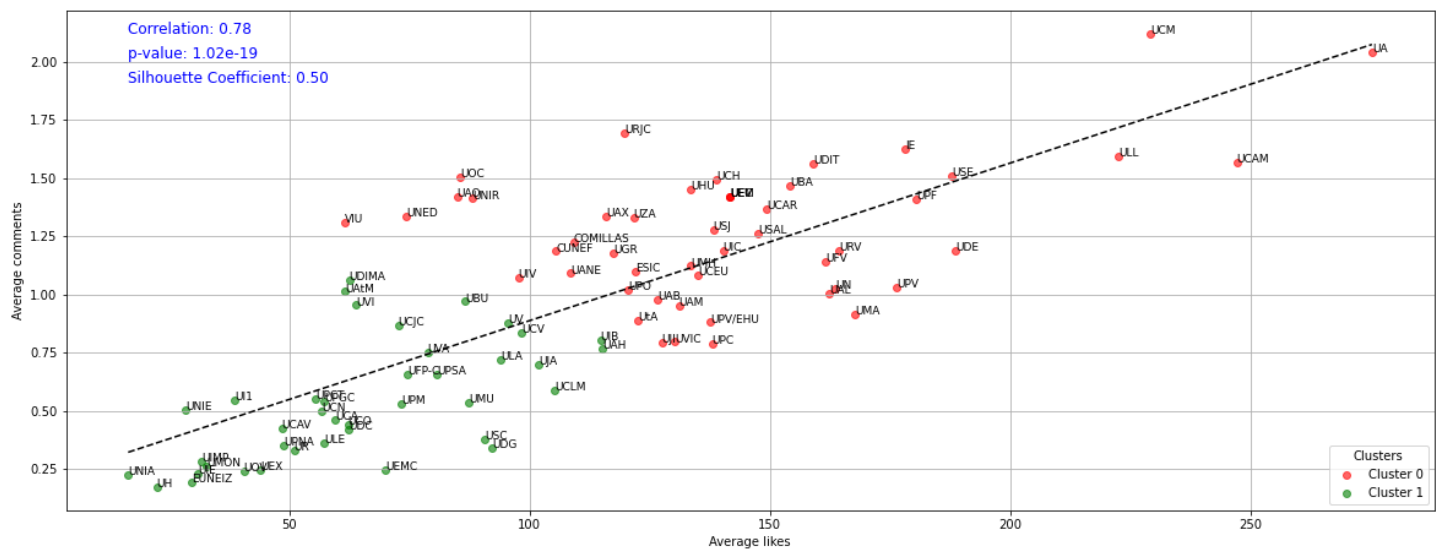
¹ Although the conventional IQR factor for identifying outliers is 1.5, a more conservative threshold (IQR = 3) was applied in this study to exclude only the most extreme values. This approach was intended to preserve the integrity of the dataset and to reduce the risk of introducing bias into the analysis.

Figure 6. Annual evolution of comments per post

Source: Elaborated by the authors.

One way to put all the above data into context is to compare the average number of likes and comments that each university has achieved on its posts. The relationship between the average of these two variables per post for each university (see Figure 7), shows that both are strongly correlated ($r = 0.78$), i.e., the more likes per post a university account collects, the more comments per post it will get. This suggests a coherent pattern of audience engagement, where liking and commenting behaviors are closely aligned.

Furthermore, the unsupervised k-means algorithm, selecting the clustering with the highest Silhouette value (0.5), classifies universities into two different segments, nearly equal in terms of the number of universities: universities that make up the group with the least active audiences (cluster 1, in green) and universities with the most active audiences on Instagram, with many likes and many comments per post (cluster 0, in red) (see Supplementary_material_appendix 1 for acronyms).

Figure 7. Relationship between the average number of likes and the average number of comments per content of Spanish universities

Source: Elaborated by the authors.

The clusters are distributed along the trend line, but important nuances can be observed. For instance, some universities in Cluster 0 are significantly above the regression line, indicating that their posts generate more comments than would be expected given the number of likes, suggesting a deeper or more conversational engagement. Conversely, some universities below the line receive relatively fewer comments compared to likes, indicating a more superficial interaction.

Since interaction with the digital community is one of the most prominent aspirations of digital communication strategies, the aspiration of those institutions located in cluster 1 (more passive audiences) will be to move to the area of the graph occupied by cluster 0 (publish content that encourages interaction with their audience). In fact, only a small portion of the Spanish university system (the red cluster, toward the upper right of the graph) has managed to build an active digital community with high levels of engagement.

To better illustrate the distribution shown in Figure 7, we identified the four universities with the highest and several universities with the lowest levels of audience engagement, measured by the combined average number of likes and comments per post. At the top of the list are Universidad de Alicante (UA), Universidad Católica San Antonio (UCAM), Universidad Complutense de Madrid (UCM) and Universidad de La Laguna (ULL), which stand out for achieving high levels of interaction and positioning themselves in the upper-right quadrant of the graph. These institutions, all of them medium-to-large in size (with more than 15,000 students) can serve as benchmarks for successful digital communication strategies, as their posts generate both visibility and audience participation.

In contrast, institutions such as Universidad Internacional de Andalucía (UNIA), Universidad de las Hespérides (UH), Universidad Euneiz, Universidad Internacional de la Empresa (UNIE), i.e., whose main characteristic is their private management (with the exception of UNIA) and lower student enrollment, appear in the lower-left region of the graph, indicating weaker performance in terms of user engagement. These universities face the challenge of rethinking their content strategies to better connect with their audience and foster more active digital communities. This segmentation highlights the diverse levels of maturity and effectiveness in the use of Instagram as a strategic communication tool within the Spanish university system.

3.2. Engagement Metrics and Engagement Rate on Instagram

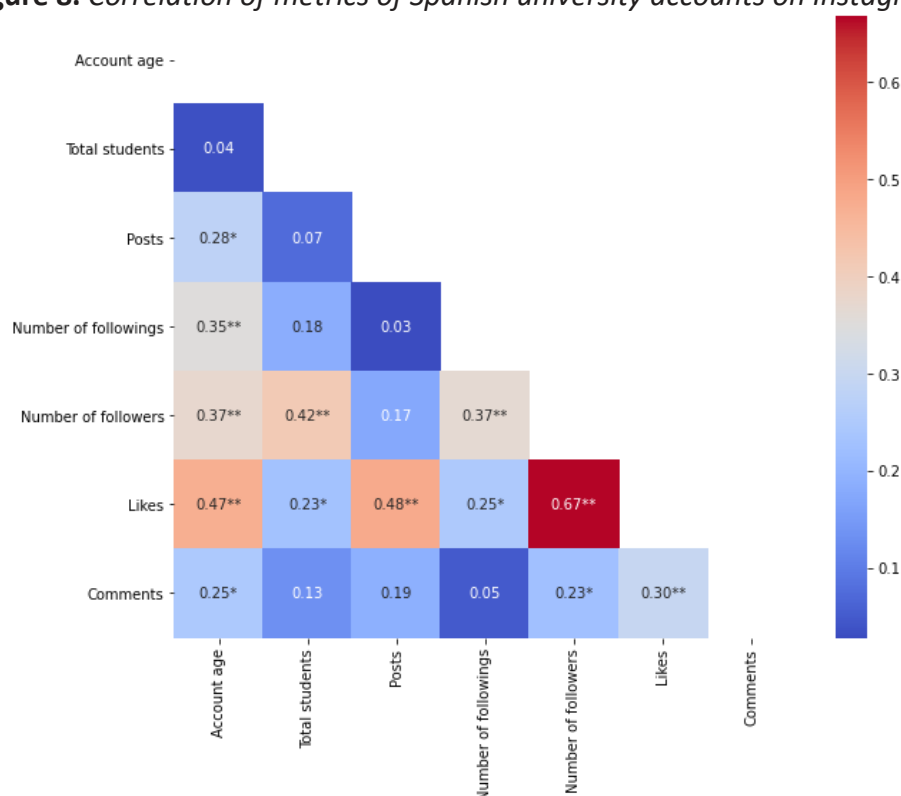
As mentioned in the previous section, in addition to the communicative intensity of the social network (active network in number of posts), the engagement of the digital community (through likes and comments, among others), must also be taken into account.

A particularly relevant point is identifying which parameters are positively associated with the phenomenon of “likes” (see Figure 8). In this regard, there is a substantial relationship between the number of likes a post receives and the account’s age, the number of posts published, and the number of followers the university has on Instagram. This correlation is weaker when considering the institution’s total number of students or the number of accounts the university itself follows.

Another relevant indicator for assessing digital dialogue or engagement with the university community is the number of comments. In this case, there is no evidence that universities with a larger student body receive more comments, nor does a higher posting frequency necessarily lead to more community engagement through comments. Regarding positive and statistically significant correlations, older accounts tend to accumulate slightly more comments. Moreover, accounts with more followers receive more comments, and posts with higher numbers of likes also tend to receive more comments. However, this link remains moderate, suggesting that not all quantitative interaction (likes) translates into qualitative interaction (comments).

However, this does not necessarily mean that their content is better. In this context, the Engagement Rate (ER) provides an assessment of the quality of content, regardless of the number of posts or followers of an account. Thus, the ER (Keyhole, s.f.; Lauron, 2024) provides a unified metric that reflects the performance of each Instagram account, facilitating comparisons between profiles with different levels of activity and followers.

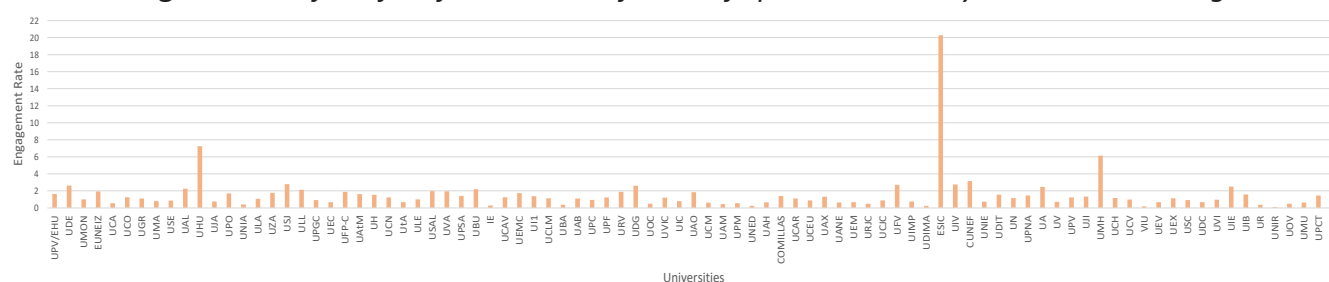
Figure 8. *Correlation of metrics of Spanish university accounts on Instagram*



Source: Elaborated by the authors.

From the analysis of the ER for the first four months (from January 1 to April 13, 2024) of the 89 Instagram accounts of Spanish universities, it can be seen that this value differs from one account to another (see Figure 9) (see Supplementary_material_appendix 1 for acronyms).

Figure 9. ER of the first four months of 2024 of Spanish university accounts on Instagram




Source: Elaborated by the authors.

Although the average ER is 1.56, in the case of ESIC (Business School, Madrid) an unusually high ER is observed. This is due to the fact that, despite having a small number of followers (4,201 followers) and publishing very few posts during the first four months of 2024 (30 posts), one of its posts achieved a high level of interaction (20,862 likes and 602 comments):

Original: ✨ ¡Hola a todos los que estais en Generación ESIC!

Deja un comentario aquí para participar en los sorteos de hoy  ¡Suerte a tod@s!   

In English: ✨ Hello to all of you in ESIC Generation!

Leave a comment here to participate in today's sweepstakes  Good luck to all!   

The fact that viewers were specifically asked to comment to enter a sweepstakes is the obvious driving force behind the high interaction.

3.3. Analysis of Hashtags on Instagram

Hashtags are a fundamental tool in social networks for organizing and categorizing content; they also help to increase the visibility of posts, facilitate the search for information on specific topics, serve to create communities and increase participation. In particular, in this context, hashtags promote the corporate brand of universities. In that regard, this research captures 72,562 unique hashtags employed², in various languages, on Instagram posts. As can be seen, there is a large number of words or terms converted into hashtags, indicating the wide variety of topics addressed with the content posted, as well as their strategic use in communicative terms.

However, for a more specific analysis, the list of the 100 most-used hashtags by Spanish universities is used as a reference. Of that ranking, all hashtags appear more than 900 times in the entire sample. The word cloud in Figure 10 provides an overview of the most frequent topics, illustrating the use of hashtags and their importance in the analyzed digital conversation. Specifically, in the Top-10, the following hashtags emerge: #universidad (26,382), #unileon (8,272), #university (7,484), #leonesp (6,206), #repost (6,029), #estudiantes (4,311), #ulpgc (4,206), #master (3,928), #sevilla (3,530), #madrid (3,433) (see Supplementary material appendix 2 for information on the hashtags in Spanish used throughout the text).

² In the case of hashtags, diacritical marks (accents) were removed, all characters were converted to lowercase, and empty or null hashtags were excluded from the dataset.

In general terms, although the hashtag has been used in other social networks and in other digital conversations eminently for activist purposes (Orbegozo-Terradillos, 2023), in this case, their use is far from that purpose. It is a conversation of a corporate nature, focused on sector-specific topics (education and research), where universities are constantly self-citing or self-referencing and place the conversation in the context of a relatively neutral dialogue between the educational institution and current and potential clients/consumers of the institution itself. There are clear attempts to create a community with hashtags such as #somosupm, #somuji or #somosuned, but most of them are terms related to the institutional name of the University (#unileon, #ulpgc, #universidaddesevilla, #uclm, #ucavila, etc.), the geographical location of the entity (#leonesp, #sevilla, #madrid, #malaga, #barcelona, etc.) or generic terms related to higher education and research (#master, #investigacion, #grado, #ciencia, #tecnologia, etc.).

Figure 10. *The 100 most used hashtags*

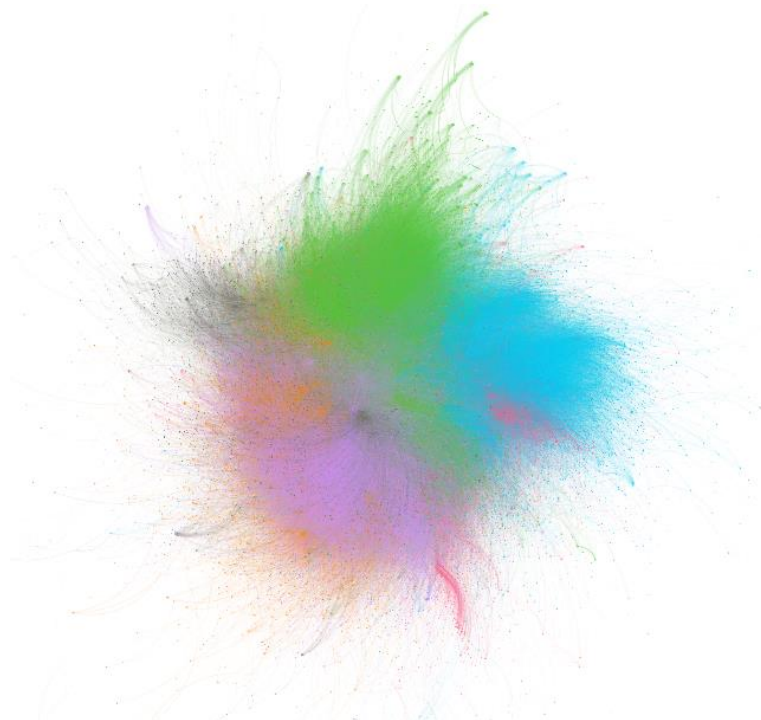


Source: Elaborated by the authors.

On the other hand, although with less presence in the Top-100, there is an attempt to reinforce brand identity through the creation of custom hashtags, as in the case of #deusto360 or #nosoloingenieria (UPM, Polytechnic University of Madrid). These hashtags are of a propagandistic or marketing nature and summarize certain ideas and fundamental concepts to characterize the institution itself or certain campaigns. In addition, it is worth noting that certain hashtags related to the dynamics of the platform itself emerge (#repost, #instapv, #pickoftheday, etc.), indicating a relative knowledge of the functioning and logics operating on Instagram.

Finally, with regard to languages, it is clear that English (the only language other than Spanish and Catalan present in the top positions) is used for advertising purposes and is aimed at future foreign students who must choose a destination for their university studies. Hashtags such as #university, #uviclife, #studyabroad, #bachelor, #students, etc. correspond to this section.

On the other hand, regarding the hashtags co-occurrence network, 2,330 different communities have been identified from the interaction network of 72,562 hashtags (nodes), with a modularity figure of 0.468, which gives the community structure considerable mathematical significance. Of these communities, only six account for more than 5% of the hashtags in the network, making them the top six communities (see Figure 11).

Figure 11. Hashtag co-occurrence network after filtering the six main communities

Community (% of presence)		# (grade)	Community (% of presence)		# (grade)
1	University, Research and Culture (35.22%)	#universidad (21,905)	4	Madrid (9,23%)	#madrid (4,988)
		#estudiantes (6,149)			#estudiar (2,483)
		#investigacion (4,754)			#nebrija (2,035)
		#sevilla (4,412)			#lacomplutense (1,485)
		#educacion (4,301)			#universidadnebrija (1,306)
		#ulpgc (4,115)			#ucjc (1,292)
		#formacion (3,809)			#venalacomplutense (1,290)
		#ciencia (3,495)			#yosoycomplutense (1,015)
		#cultura (3,223)			#ucm (868)
		#unir (3,191)			#uni (866)
2	International (21.29%)	#repost (10,005)	5	Technology (8%)	#ingenieria (2,895)
		#university (9,371)			#upct (2,796)
		#unileon (4,863)			#tecnologia (2,731)
		#campus (4,723)			#alumnos (2,585)
		#leonesp (4,242)			#arquitectura (2,418)
		#students (3,206)			#cartagena (1,895)
		#uchceu (2,822)			#architecture (1,840)
		#valencia (2,776)			#diseño (1,353)
		#umh (2,689)			#estudiante (1,344)
		#spain (2,602)			#engineering (1,130)
3	Catalonia and Covid-19 (19.07%)	#universitat (4,504)	6	Equality activism (7.19%)	#somuji (1,214)
		#barcelona (3,348)			#igualdad (1,080)
		#uab (2,515)			#uniovi (971)
		#uvic (2,466)			#campusuji (924)
		#uvice (2,345)			#8m (696)
		#campuslife (1,944)			#somosuned (688)
		#covid19 (1,891)			#huelva (583)
		#unibarcelona (1,492)			#stem (535)
		#cerdanyola (1,455)			#diainternacionaldelamujer (531)
		#campusuab (1,193)			#diadellibro

Source: Elaborated by the authors.

Therefore, the algorithm generates six communities representative of the content posted during the years analyzed. For this work, the meaning of the hashtags is analyzed by contextualizing them, and a nomenclature is obtained for each cluster (see Figure 9) as detailed below:

- The first, ‘University, Research and Culture’, is by far the most voluminous community and contains the most generic terms. The combination of these terms (#universidad, #investigacion, #educacion, #formacion, #ciencia, #cultura, in the top ten), logically falls within the context of higher education.
- The second, ‘International’, has a clear focus on appealing to foreign students and includes hashtags in English (#university, #students, #spain).
- The third, ‘Catalonia and Covid-19’, brings together a combination of hashtags promoted by several university institutions in Catalonia and, as an exception, a reference to the Covid-19 pandemic (#covid19).
- In territorial terms, something similar happens with the fourth community, ‘Madrid’, as it groups hashtags related to universities in Madrid. It is one of the clusters that shows the competition between universities seeking to attract students and create a sense of belonging among their community (#venalacomplutense, #yosoycomplutense).
- The fifth cluster, ‘Technology’, involves an amalgam of terms related to a more technical and technological side of higher education. Moreover, this cluster includes a combination of hashtags in two languages: Spanish (#ingenieria, #tecnologia, #arquitectura, #diseño) and English (#architecture, #engineering).
- In last place, ‘Activism for equality’, is the topic that, a priori, deserves the greatest social consensus within the inter-university social community. Terms such as #igualdad, #8m, #diainternacionaldelamujer or even #stem (due to the low presence of women in science, mathematics and engineering classrooms), refer to activism for equality between men and women.

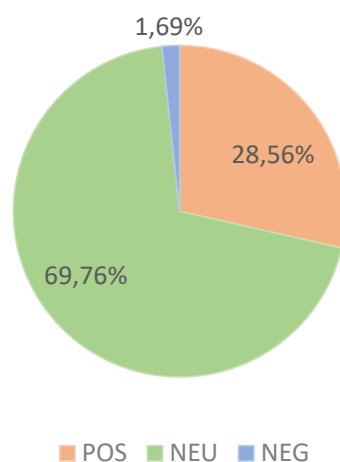
3.4. Sentiment Analysis on Instagram

Sentiment analysis of Spanish universities’ posts aims to describe universities’ attitudes toward the messages posted (in Spanish). Figure 12 shows the ratio of positive, neutral and negative posts for the analyzed time span. It appears that communicates when different universities spread their messages through Instagram, they tend to do so in neutral or positive terms. In this regard, the robertuito-sentiment-analysis model detects that fewer than two posts out of a hundred (1.69%) could be placed in the group of negative messages. This figure is extremely low in comparison with other digital conversations that allude to more controversial topics (Amiri et al., 2023), indicating that the communicative exchange is characterized by the absence of controversy and polarization. In general, therefore, it reflects a sectorial communicative register characteristic of corporate social network accounts, where institutions communicate or disseminate content in neutral or positive terms to their followers.

Regarding the trend of sentiment of the posts over the years, Figure 13 shows how the proportion of positive, neutral and negative posts remains practically constant since 2014. However, it is worth noting that the upward trend in positive messages from 2015 to 2019 was interrupted in 2020, at the time of the Covid-19 pandemic. During 2020, the series records the lowest number of messages in positive terms (22.49%), while the number of negative messages rises (2.15%). These data are relatively logical and consistent with scientific studies that have analyzed the phenomenon of the pandemic and its translation into digital rhetoric (Qi & Shabrina, 2023). Society, especially during the first months of the pandemic (early 2020), experienced a stage characterized by shock and fear (health concerns, lack of knowledge about the virus and its effects, etc.) and all of this is reflected in digital conversations.

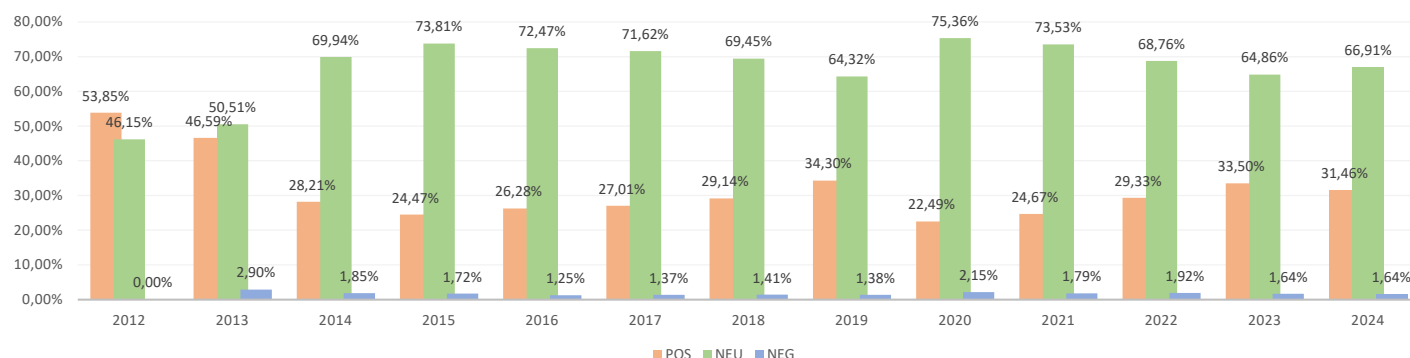
In this regard, it is important to note that during the pandemic years, universities did not publish content exclusively about the global health crisis. However, part of their posts revolved around the global epidemic and its consequences in the sector to which their activity is circumscribed. Another fact corroborating the effect of the pandemic is that the number of negative messages begins to decline after 2020, while the number of positive messages rises progressively during the second pandemic phase (years 2021, 2022 and even 2023). The collective mood or social climate during those years was characterized by other emotions such as hope, resilience, optimism, etc.

Figure 12. *Positive, neutral and negative posts in the period analyzed*



Source: Elaborated by the authors.

Figure 13. *Positive, neutral and negative posts by year*



Source: Elaborated by the authors.

4. CONCLUSIONS, LIMITATIONS AND FUTURE LINES OF WORK

This study offers valuable insights into the use of Instagram as a strategic communication tool by Spanish universities during 12 years of digital activity. It is a work with an eminently quantitative approach and stands out for its longitudinal and comprehensive approach. It uses tools related to the paradigm of Big Data (Social Network Analysis, Machine Learning, and Artificial Neural Networks) to analyze more than 165,000 posts from 89 active accounts of higher education institutions. There is scarce literature with which to compare the results obtained in this study, mainly because the difficult access to data corresponding to interactions in social networks, such as Instagram, results in limited scientific production focused on this platform. In this sense, university institutions have never before been the subject of study with the approach, methodology, and tools used in this study.

This research provides a model for assessing the digital presence of universities by analyzing audience interactivity, thematic trends, and the overall tone of the content shared over time. These findings offer a clear map of digital performance that can help institutions benchmark their communication efforts and identify areas for strategic improvement. In particular, the segmentation of universities based on engagement levels serves as a valuable tool for communication managers, enabling them to understand their positioning and develop more effective strategies.

Beyond content quality, the results also suggest that strategic communication should be more consistent over time, not limited to periods of academic activity. A more sustained presence throughout the year could help build a stronger and more engaged digital community. Moreover, the relatively low posting frequency observed in many institutions, often below one post per day on average, indicates that there is room for increasing content output to maintain audience attention and relevance. These practical insights are intended to support university communication teams in making informed decisions to enhance their visibility, engagement, and overall brand positioning in an increasingly competitive digital landscape.

The main and daily language is Spanish, while English is used mainly to attract foreign students. The activity as a whole is progressively consolidating, without yet reaching one post published per day. Spanish universities use Instagram unevenly, and not all of them get the same reception from the digital audience. Thus, those university accounts that have an audience characterized by their passivity towards the published content should improve the interaction with their audiences, making them digitally active by offering attractive content in terms of interactivity. However, these interactions may be influenced by the phenomenon of clicktivism, where superficial actions, such as likes or comments, can inflate engagement metrics without reflecting genuine commitment to the universities' messages. While clicktivism can increase the visibility and reach of posts, it may lead to misleading interpretations of engagement; as such, interactions do not necessarily translate into deeper relationships or authentic interest in the university's values or initiatives. This phenomenon highlights the need to go beyond quantitative metrics and focuses on evaluating the quality of engagement and the real impact of social media strategies.

In the specific case of those university accounts with a low Engagement Rate, it is possible, among other things, that they have a significant number of followers who are not their target customers or that their content is not attractive enough to interact with them. Therefore, marketing strategies should be adjusted accordingly.

The hashtags used in the posts alluded to a sector-specific and collegial register, mainly educational and/or scientific. However, the study detects a main theme that generates social consensus in the university community: equality between men and women. Likewise, the digital conversation develops in neutral or positive terms, with an absence of polemics and polarization.

Despite the robustness of the dataset and methodology applied, this study is not without limitations. Chief among them is the exclusion of Instagram Stories and Reels from the analysis. These formats have become increasingly important on the platform in recent years, but their ephemeral nature (particularly in the case of Stories, which disappear after 24 hours along with their interactions) poses significant challenges for data collection and long-term analysis. Consequently, the engagement metrics presented here may not fully reflect the actual performance or communicative success of some university accounts. Nevertheless, this study provides a solid and innovative foundation for understanding institutional communication on Instagram over an extended period.

Finally, this study opens the way for further research that could focus on the individual analysis of specific university accounts, as well as the study of content that generates the highest levels of interactivity or engagement. Moreover, the methodological model proposed, based on longitudinal data analysis and the use

of Big Data and machine learning techniques, is highly adaptable and can be replicated not only in other universities, but also in a wide range of institutions, public organizations, or private entities interested in evaluating and improving their digital communication strategies. By integrating a critical perspective on issues such as engagement inequality and superficial interaction, this study encourages new lines of research that explore the ethical, qualitative, and strategic dimensions of digital presence across different sectors.

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Appendix 1 (Information about downloaded data)

University (acronym)	Instagram account	# post download ed	Account creation date
Universidad del País Vasco/Euskal Herriko Unibertsitatea (UPV/EHU)	https://www.instagram.com/upvehu_gara/	904	01/12/2017
Universidad de Deusto (UDE)	https://www.instagram.com/udeusto/	1602	01/01/2014
Mondragón Unibertsitatea (UMON)	https://www.instagram.com/munibertsitatea/	1276	01/12/2014
Universidad Euneiz (EUNEIZ)	https://www.instagram.com/euneiz_universidad/	353	01/03/2022
Universidad de Cádiz (UCA)	https://www.instagram.com/univcadiz/	4649	01/02/2015
Universidad de Córdoba (UCO)	https://www.instagram.com/universidaddecordoba/	2029	01/07/2015
Universidad de Granada (UGR)	https://www.instagram.com/canalugr/	1072	01/10/2015
Universidad de Málaga (UMA)	https://www.instagram.com/infouma	2716	01/03/2014
Universidad de Sevilla (USE)	https://www.instagram.com/unisevilla/	4629	01/07/2013
Universidad de Almería (UAL)	https://www.instagram.com/unialmeria	1141	01/01/2020
Universidad de Huelva (UHU)	https://www.instagram.com/unihuelva/	279	01/05/2017
Universidad de Jaén (UJA)	https://www.instagram.com/universidadjaen/	2444	01/10/2015
Universidad Pablo de Olavide (UPO)	https://www.instagram.com/pablodeolavide/	2461	01/01/201

			5
Universidad Internacional de Andalucía (UNIA)	https://www.instagram.com/uniauniversidad/?hl=es	721	01/07/2019
Universidad Loyola Andalucía (ULA)	https://www.instagram.com/loyolaand/	1998	01/06/2015
Universidad de Zaragoza (UZA)	https://www.instagram.com/universidaddezaragoza	847	01/11/2018
Universidad San Jorge (USJ)	https://www.instagram.com/universidadsanjorge/	857	01/12/2015
Universidad de La Laguna (ULL)	https://www.instagram.com/universidaddelalaguna/?hl=es	814	01/03/2017
Universidad de Las Palmas de Gran Canaria (UPGC)	https://www.instagram.com/ulpgc_para_ti	4525	01/06/2016
Universidad Europea de Canarias (UEC)	https://www.instagram.com/ueuropea/	2011	01/07/2013
Universidad Fernando Pessoa-Canarias (UFP-C)	https://www.instagram.com/ufpcanarias/	1139	01/04/2017
Universidad del Atlántico Medio (UAtM)	https://www.instagram.com/atlanticomedio/	1219	01/04/2016
Universidad de las Hespérides (UH)	https://www.instagram.com/univ.hesperides/	236	01/03/2021
Universidad de Cantabria (UCN)	https://www.instagram.com/universidaddecantabria	1081	01/08/2016
Universidad Europea del Atlántico (Uta)	https://www.instagram.com/uneatlantico	2287	01/01/2016
Universidad de León (ULE)	https://www.instagram.com/unileon_es/	8736	01/12/2013
Universidad de Salamanca (USAL)	https://www.instagram.com/usal/?hl=es	1548	01/04/2015
Universidad de Valladolid (UVA)	https://www.instagram.com/universidaddevalladolid/	1052	01/03/2016
Universidad Pontificia de Salamanca (UPSA)	https://www.instagram.com/upsa_salamanca/	1264	01/05/2018
Universidad de Burgos (UBU)	https://www.instagram.com/universidadburgos/	504	01/05/2015
IE Universidad (IE)	https://www.instagram.com/ieuniversity/	1363	01/07/2013
Universidad Católica Santa Teresa de Jesús de Ávila (UCAV)	https://www.instagram.com/ucavila/	3546	01/10/2014
Universidad Europea Miguel de Cervantes (UEMC)	https://www.instagram.com/uemc	1020	01/05/2015
Universidad Internacional Isabel I de Castilla (UI1)	https://www.instagram.com/ui1universidad/	1674	01/10/2016
Universidad de Castilla-La Mancha (UCLM)	https://www.instagram.com/uclm_es/	3648	01/02/2015
Universidad de Barcelona (UBA)	https://www.instagram.com/UniBarcelona/	3090	01/03/2014
Universidad Autónoma de Barcelona (UAB)	https://www.instagram.com/uabbarcelona/	2527	01/03/2014
Universidad Politécnica de Catalunya (UPC)	https://www.instagram.com/la_upc/	1311	01/05/2016
Universidad Pompeu Fabra (UPF)	https://www.instagram.com/upfbarcelona	1912	01/01/2013
Universidad Ramón Llull (URLL)	Does not have Instagram (does have other social networks)		
Universidad Rovira i Virgili (URV)	https://www.instagram.com/universitatURV/	659	01/12/2014
Universidad de Girona (UDG)	https://www.instagram.com/univgirona	923	01/03/2012
Universidad de Lleida (UDL)	Does not have Instagram (does have other social networks)		
Universitat Oberta de Catalunya (UOC)	https://www.instagram.com/uocuniversitat	1123	01/11/2012
Universidad de Vic-Universidad Central de Catalunya (UVIC)	https://www.instagram.com/uvic_ucc/	2348	01/03/2013

Universitat Internacional de Catalunya (UIC)	https://www.instagram.com/uicbarcelona/	908	01/04/2012
Universitat Abat Oliba CEU (UAO)	https://www.instagram.com/uaocceu_universitat/	958	01/03/2016
Universidad Complutense de Madrid (UCM)	https://www.instagram.com/uni.complutense/	2472	01/09/2016
Universidad Autónoma de Madrid (UAM)	https://www.instagram.com/uammadrid/?hl=es	2121	01/02/2015
Universidad Politécnica de Madrid (UPM)	https://www.instagram.com/somosupm/	2698	01/05/2016
Universidad Nacional de Educación a Distancia (UNED)	https://www.instagram.com/uneduniv/?hl=es	1242	01/01/2018
Universidad de Alcalá (UAH)	https://www.instagram.com/uahes/	2984	01/12/2014
Universidad Pontificia Comillas (COMILLAS)	https://www.instagram.com/ucomillas	796	01/12/2014
Universidad Carlos III de Madrid (UCAR)	https://www.instagram.com/universidadcarlosiiidemadrid	859	01/07/2014
Universidad San Pablo-CEU (UCEU)	https://www.instagram.com/universidad_ceu_sanpablo/	950	01/12/2016
Universidad Alfonso X El Sabio (UAX)	https://www.instagram.com/uaxuniversidad/	1657	01/05/2015
Universidad Antonio de Nebrija (UANE)	https://www.instagram.com/universidad_nebrija/	3188	01/10/2012
Universidad Europea de Madrid (UEM)	https://www.instagram.com/ueuropea/	2011	01/07/2013
Universidad Rey Juan Carlos (URJC)	https://www.instagram.com/urjc_uni/?hl=es	375	01/10/2015
Universidad Camilo José Cela (UCJC)	https://www.instagram.com/ucjc_universidad/?hl=es	1319	01/02/2016
Universidad Francisco de Vitoria (UFV)	https://www.instagram.com/ufvmadrid/	2418	01/03/2013
Universidad Internacional Menéndez Pelayo (UIMP)	https://www.instagram.com/uimp1/	2533	01/06/2016
Universidad a Distancia de Madrid (UDIMA)	https://www.instagram.com/universidad_udima	622	01/10/2014
ESIC Universidad (ESIC)	https://www.instagram.com/esicuniversity?igsh=MW00YXlnbDY2M2lrag%3D%3D	350	01/03/2021
Universidad Internacional Villanueva (UV)	https://www.instagram.com/UniversidadVillanueva/	1009	01/05/2016
CUNEF Universidad (CUNEF)	https://www.instagram.com/cunef/	1542	01/03/2014
Universidad Internacional de la Empresa (UNIE)	https://www.instagram.com/UNIEUniversidad/	383	01/02/2022
Universidad de Diseño, Innovación y Tecnología (UDIT)	https://www.instagram.com/udit.es/	2117	01/03/2012
Universidad de Navarra (UN)	https://www.instagram.com/universidaddenavarra	1834	01/09/2012
Universidad Pública de Navarra (UPNA)	https://www.instagram.com/upna.nup/	850	01/05/2016
Universidad de Alicante (UA)	https://www.instagram.com/ua_universidad	859	01/06/2014
Universitat de València (Estudi General) (UV)	https://www.instagram.com/universitatvalencia/	1022	01/11/2017
Universitat Politècnica de València (UPV)	https://www.instagram.com/instaUPV	1896	01/04/2013
Universidad Jaume I de Castellón (UJI)	https://www.instagram.com/ujiuniversitat/	4121	01/02/2017
Universidad Miguel Hernández de Elche (UMH)	https://www.instagram.com/universidadmh	2893	01/09/2013
Universidad Cardenal Herrera-CEU (UCH)	https://www.instagram.com/uchceu_universidad	1688	01/06/2014

Universidad Católica de Valencia San Vicente Mártir (UCV)	https://www.instagram.com/UniversidadCatolicaValencia/	1289	01/04/2013
Universitat Internacional Valenciana (VIU)	https://www.instagram.com/universidadviu/	1363	01/01/2017
Universidad Europea de Valencia (UEV)	https://www.instagram.com/ueuropea/	2011	01/07/2013
Universidad de Extremadura (UEX)	https://www.instagram.com/uni.extremadura/	978	01/09/2020
Universidad de Santiago de Compostela (USC)	https://www.instagram.com/universidade usc	1488	01/04/2018
Universidad de A Coruña (UDC)	https://www.instagram.com/udc_oficial/	2819	01/03/2019
Universidad de Vigo (UVI)	https://www.instagram.com/universidaddevigo/	264	01/06/2016
Universidad Intercontinental de la Empresa (UIE)	https://www.instagram.com/uieuniversidad/	302	01/03/2022
Universitat de les Illes Balears (UIB)	https://www.instagram.com/uibuniversitat/	1622	01/08/2013
Universidad de La Rioja (UR)	https://www.instagram.com/unirioja/	5082	01/04/2015
Universidad Internacional de La Rioja (UNIR)	https://www.instagram.com/uniruniversidad/	2569	01/01/2016
Universidad de Oviedo (UOV)	https://www.instagram.com/universidad_de_oviedo/	5058	01/02/2020
Universidad de Murcia (UMU)	https://www.instagram.com/umu/	3385	01/06/2016
Universidad Politécnica de Cartagena (UPCT)	https://www.instagram.com/upctoficial/	2306	01/08/2015
Universidad Católica San Antonio (UCAM)	https://www.instagram.com/ucam_universidad	2748	01/02/2014

Appendix 2 (Information on the hashtags in Spanish used throughout the text)

Hashtag	Meaning
#universidad	University
#unileon	University of Leon
#leonesp	Leon Spain
#estudiantes	Students
#ulpgc	University of Las Palmas de Gran Canaria
#master	Master's degree
#sevilla	Seville (capital of Andalusia)
#madrid	Madrid (capital of Spain)
#somosupm	We are UPM (Polytechnic University of Madrid)
#somuji	We are (UJI) (Jaume I University)
#somosuned	We are UNED (National University of Distance Education)
#universidaddesevilla	University of Seville
#uclm	University of Castilla-La Mancha
#ucavila	Catholic University of Ávila
#malaga	Malaga (province of Andalusia or capital of the province)
#barcelona	Barcelona (capital of Catalonia)
#investigacion	Research
#grado	Undergraduate studies
#ciencia	Science
#tecnologia	Technology
#deusto360	University of Deusto (360º)
#nosoloingenieria	Not only engineering
#instaupv	Insta UPV (Polytechnic University of Valencia)
#educacion	Education
#formacion	Training
#cultura	Culture

#venalacomplutense	Come to the Complutense (Complutense University of Madrid)
#yosoycomplutense	I am Complutense (Complutense University of Madrid)
#ingenieria	Engineering
#arquitectura	Architecture
#diseño	Design
#igualdad	Equality
#8m	March 8
#diainternacionaldelamujer	International women's day
#unir	International University of La Rioja
#universitat	University (in Catalan)
#uab	Autonomous University of Barcelona
#uvic	University of Vic (Central University of Catalonia)
#unibarcelona	University Barcelona
#cerdanyola	Cerdanyola (a city in Catalonia)
#campusuab	Campus UAB (Autonomous University of Barcelona)
#estudiar	Study
#nebrija	Nebrija University
#lacomplutense	The Complutense (Complutense University of Madrid)
#universidadnebrija	University Nebrija
#ucjc	Camilo Jose Cela University
#ucom	Complutense University of Madrid
#uni	Uni (short for university)
#upct	Polytechnic University of Cartagena
#alumnos	Students
#cartagena	Cartagena (a city in the Region of Murcia)
#estudiante	Student
#diadellibro	Book day
#uniovi	University of Oviedo
#campusuji	Campus UJI (Jaume I University)
#huelva	Huelva (province of Andalusia or capital of the province)

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