

SUPERANDO LA CRISIS: COMUNICACIÓN DE MARKETING SOBRE LA SOSTENIBILIDAD UNIVERSITARIA

RESUMEN: las instituciones de educación superior (IES) se han visto ante el desafío de diseñar una estrategia sostenible para atraer y retener a sus estudiantes, particularmente durante la pandemia por covid-19. Teniendo en cuenta que la construcción de una marca sostenible requiere a su vez de la consolidación de la legitimidad de una organización, los mensajes de sostenibilidad deben presentarse de forma adecuada mediante canales de comunicación idóneos, como las redes sociales, que atraigan a las generaciones de estudiantes más jóvenes y se conviertan en el único canal para comunicarse con ellos durante el confinamiento. Por lo tanto, este artículo analiza si las IES colombianas utilizan efectivamente las herramientas de comunicación de marketing disponibles para informar sus estrategias de sostenibilidad. Para tal fin, inicialmente se llevó a cabo una revisión bibliográfica de los términos "sostenibilidad universitaria" y "marketing", aplicando un enfoque de métodos mixtos. Luego, se realizó un análisis exploratorio con la técnica *web scraping* que consideró los mensajes de Facebook® publicados por cinco IES privadas de la ciudad de Medellín (Colombia) durante un periodo de diez meses. Finalmente, se aplicó un enfoque de verificación para resumir datos, encontrar relaciones ocultas y hacer predicciones a través del lenguaje de programación Python. A pesar de las buenas intenciones y los esfuerzos desplegados, los hallazgos indican que las IES no cuentan con una estrategia sistemática para la comunicación de la sostenibilidad universitaria. En cambio, estas parecen gestionar esta temática principalmente desde un punto de vista económico. Como resultado, la comunicación de prácticas sostenibles que mejoran la reputación institucional y favorecen la retención de estudiantes resulta ser esporádica e insuficiente.

PALABRAS CLAVE: análisis exploratorio, comunicación de marketing, crisis pandémica, publicación en redes sociales, sostenibilidad universitaria.

SUPERAR A CRISE: COMUNICAÇÃO DE MARKETING DA SUSTENTABILIDADE UNIVERSITÁRIA

RESUMO: as instituições de ensino superior (IES), especialmente durante a crise pandêmica, enfrentaram o desafio de desenhar uma estratégia de vantagem competitiva sustentável para atrair e reter estudantes. No entanto, uma vez que a estruturação de uma marca sustentável requer a construção de sua legitimidade com sucesso, as mensagens de sustentabilidade devem ser apresentadas adequadamente nos canais de comunicação adequados, como redes sociais, que atraem gerações mais jovens de estudantes e se tornam a única forma de se comunicar com eles durante o confinamento. Assim, este artigo investiga se as IES colombianas efetivamente usam ferramentas de comunicação de marketing para informar suas estratégias de sustentabilidade. Para isso, foi realizada inicialmente uma revisão de literatura dos termos "sustentabilidade universitária" e "marketing", aplicando uma abordagem de métodos mistos. Em seguida, uma análise exploratória com a técnica de coleta de dados (*web scraping*) que considerou mensagens do Facebook® postadas por cinco IES privadas na cidade de Medellín (Colômbia) foi desenvolvida durante um período de dez meses. Finalmente, uma abordagem de exame foi aplicada para resumir dados, encontrar associações ocultas e fazer previsões por meio da linguagem de programação Python. Apesar das boas intenções e dos esforços razoáveis, os resultados indicam que as IES não parecem ter uma estratégia sistemática para comunicar questões de sustentabilidade. Em vez disso, dão a impressão de gerenciar questões de sustentabilidade principalmente do ponto de vista econômico. Como resultado, a comunicação das universidades sobre práticas sustentáveis que melhoram a reputação institucional e aumentam a retenção de alunos ainda parece ser esporádica e insuficiente.

PALAVRAS-CHAVE: análise exploratória, comunicações de marketing, crise pandêmica post de mídia social, sustentabilidade universitária.

DÉPASSER LA CRISE : LA COMMUNICATION MARKETING DE LA DURABILITÉ DES UNIVERSITÉS

RÉSUMÉ : Les établissements d'enseignement supérieur (EES), en particulier pendant la crise de la pandémie, ont été confrontés au défi de concevoir une stratégie d'avantage concurrentiel durable pour attirer et retenir les étudiants. Cependant, étant donné que la construction d'une marque durable doit réussir à construire sa légitimité, les messages de durabilité doivent être présentés de manière appropriée en utilisant des canaux de communication adaptés, tels que les réseaux sociaux, qui attirent les jeunes générations d'étudiants et de viennent la seule forme de communication avec eux pendant le confinement. Par conséquent, cet article cherche à savoir si les EES colombiens utilisent efficacement les outils de communication marketing pour informer leurs stratégies de durabilité. À cette fin, on a d'abord procédé à une analyse documentaire des termes "durabilité universitaire" et "marketing", en appliquant une approche à méthodes mixtes. Ensuite, on a mené une analyse exploratoire avec la technique du *web scraping* qui a pris en compte les messages Facebook® postés par cinq EES privés de la ville de Medellín (Colombie) pendant une période de dix mois. Enfin, on a appliqué une approche d'examen pour résumer les données, trouver les relations cachées et faire des prédictions à l'aide du langage de programmation Python. Malgré de bonnes intentions et des efforts raisonnables, les résultats indiquent que les EES ne semblent pas avoir de stratégie systématique pour communiquer sur les questions de durabilité. Au contraire, ils donnent l'impression de gérer les questions de durabilité principalement d'un point de vue économique. Par conséquent, la communication des universités sur les pratiques durables qui améliorent la réputation institutionnelle et augmentent la rétention des étudiants semble encore sporadique et insuffisante.

MOTS-CLÉ : Analyse exploratoire, communications marketing, crise pandémique, message sur les médias sociaux, durabilité de l'université.

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Getting Past the Crisis: Marketing Communication of University Sustainability*

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ABSTRACT: Higher education institutions (HEIs), especially during the pandemic crisis, have faced the challenge of designing a sustainable competitive advantage strategy to attract and retain students. However, since constructing a sustainable brand requires successfully building its legitimacy, sustainability messages must be presented appropriately by using suitable communication channels, such as social networks, that attract younger generations of students and become the only form to communicate with them during the confinement. Hence, this paper investigates if Colombian HEIs effectively use marketing communication tools to inform their sustainability strategies. For this purpose, a literature review of the terms "university sustainability" and "marketing" was initially conducted, applying a mixed-methods approach. Then, an exploratory analysis with the web scraping technique that considered Facebook® messages posted by five private HEIs in Medellín city (Colombia) was developed during a ten-month period. Finally, an examination approach was applied to summarize data, find hidden relationships, and make predictions through Python programming language. Despite good intentions and reasonable efforts, results indicate that HEIs do not seem to have a systematic strategy for communicating sustainability issues. Instead, they give the impression of managing sustainability issues mainly from an economic point of view. As a result, universities' communication of sustainable practices that enhance institutional reputation and increase student retention still appears to be sporadic and insufficient.

KEYWORDS: Exploratory analysis, marketing communications, pandemic crisis, social media post, university sustainability.

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Introduction

More and more higher education institutions (HEIs) face the challenge of continuously designing a sustainable competitive advantage strategy to attract and retain students (Manzuma-Ndaaba *et al.*, 2018), especially in times of pandemic crisis. Among the key differentiation points that support the construction of such competitive advantage is the availability of information regarding sustainability practices, as it helps Prospective and current students evaluate their higher education options to focus on issues beyond price and quality (Schieble, 2008). In order to sustain their operations and gain a competitive edge, universities need to focus on service innovation since it positively affects student satisfaction, perceived institutional image, and loyalty (Cheng *et al.*, 2019). HEIs need to better communicate their sustainability and social responsibility actions and improve students' education in these areas in order to achieve higher standards of satisfaction and credibility that set them apart from competitors (Vázquez *et al.*, 2014).

Since the construction of a sustainable brand demands the successful building of its legitimacy (Juusola & Rensimer, 2018), sustainability messages should be presented appropriately so they are most engaging to current and prospective students (Hodson *et al.*, 2020). At this point, the role of marketing becomes preponderant because, as stated by Baaken *et al.* (2016, p. 247), "HEIs are now operating in markets where they must use marketing instruments if they want to succeed and remain sustainable." Consequently, internal and external marketing strategies are key to achieving a sustainable competitive advantage (Mazzarol & Soutar, 1999), so HEIs should consider a relationship-marketing approach in their sustainability planning and decision-making (Currier & Wilhelm, 2017).

Marketing communications, a key element of the marketing mix and essential in the branding strategy (Lamb *et al.*, 2019), have a positive impact on a HEI perceived service quality, which further impacts trust, satisfaction, university-brand performance, and behavioral intentions (Sultan & Wong, 2014). Marketing communications support the university image, which, in turn, builds student fulfillment, enhances students' citizenship behavioral outcomes, and reinforces HEIs sustainability (Manzoor *et al.*, 2020).

Social media and social networking sites are the marketing communication channels often preferred by younger generations (Hodson *et al.*, 2020; Kuss & Griffiths, 2017). This means HEIs should aim to communicate their sustainability and social responsibility actions using such platforms in order to enhance effectiveness and loyalty (Zhuang *et al.*, 2013).

These organizations need to ensure the use of the most effective marketing communication tools to adequately inform current and potential students about their points of differentiation (Bachanová & Garbárova, 2017).

Grounded on the above, this paper examines if Colombian HEIs effectively use marketing communication tools to inform their sustainability strategies. Given the importance of marketing communications in HEIs branding and positioning strategy (Kocourek & Čočková, 2017), this research aims to explore the effectiveness of the efforts deployed by private universities when communicating their sustainability actions. Initially, a literature review of the terms "university sustainability" and "marketing" was conducted, using the software vosviewer® to run the bibliometric analysis. Content analysis was then completed. After the literature review, an exploratory analysis through the web scraping technique was conducted (Mitchell, 2018). For this phase, we considered the Facebook® posts shared by five private universities in the city of Medellín (Colombia) during a ten-month period. Discussion of the results and conclusions are presented in the final section of the paper.

Literature review about university sustainability and marketing

Search criteria

After the introduction of the research problem, a literature review of the terms "university sustainability" and "marketing" was conducted through a sequential mixed-methods approach (Mingers, 2001). First, a quantitative approach with bibliometric analysis was applied, considering mathematical and statistical methods to indexed publications (Durieux & Gevenois, 2010). Then, with the bibliometric results, we performed a qualitative content analysis, where each resulting cluster was in-depth reviewed. The citation pearl growing technique (Schlosser *et al.*, 2006) was applied to examine quantitative data, while qualitative data was screened applying the PRISMA technique (Moher *et al.*, 2009). Table 1 presents the research protocol (Escobar-Sierra *et al.*, 2021).

Literature review from a quantitative approach

In April 2021, after extracting the author, work title, and source, 626 publications were processed with vosviewer®, version 1.6.15. According to these works' occurrence and co-occurrence, the software stratified the most frequent terms into four clusters based on the vos mapping technique



proposed by van Eck and Waltman (2007, 2010), as shown in figure 1.

The first cluster, on marketing communications, is composed of terms such as consumer, relationship, perception,

attitude, behavior, consumption, influence, marketing strategy, higher education, and promotion. On the other hand, words such as technology, opportunity, production, course, college, collaboration, faculty, training,

Table 1.
Research protocol for the literature review.

| Criteria | Quantitative | Qualitative |
|--|---|---|
| Reasoning and role of the theory | Deductive | Inductive |
| Strategy of the research | Simulation | Discourse analysis |
| Unit of analysis | Co-occurrence of words | Content of concepts |
| Study sample | 626 documents from Scopus database. These documents resulted from the following search equation: TITLE-ABS-KEY ((sustainab*) AND (marketing) AND ("universit*" OR "colleg*" OR "higher education institution")) | 160 documents from Scopus database. These documents result from the following search equation applied only to the business context: TITLE-ABS-KEY ((sustainab*) AND (marketing) AND ("universit*" OR "colleg*" OR "higher education institution")) AND (LIMIT-TO (SUBJAREA, "BUSI")) |
| Variables | Dependent variable (relationship between words) and independent variables (occurrence, concurrence) | Concepts, topics and relations between them |
| Techniques for the analysis of results | Bibliometric analysis | Content analysis |

Source: authors.

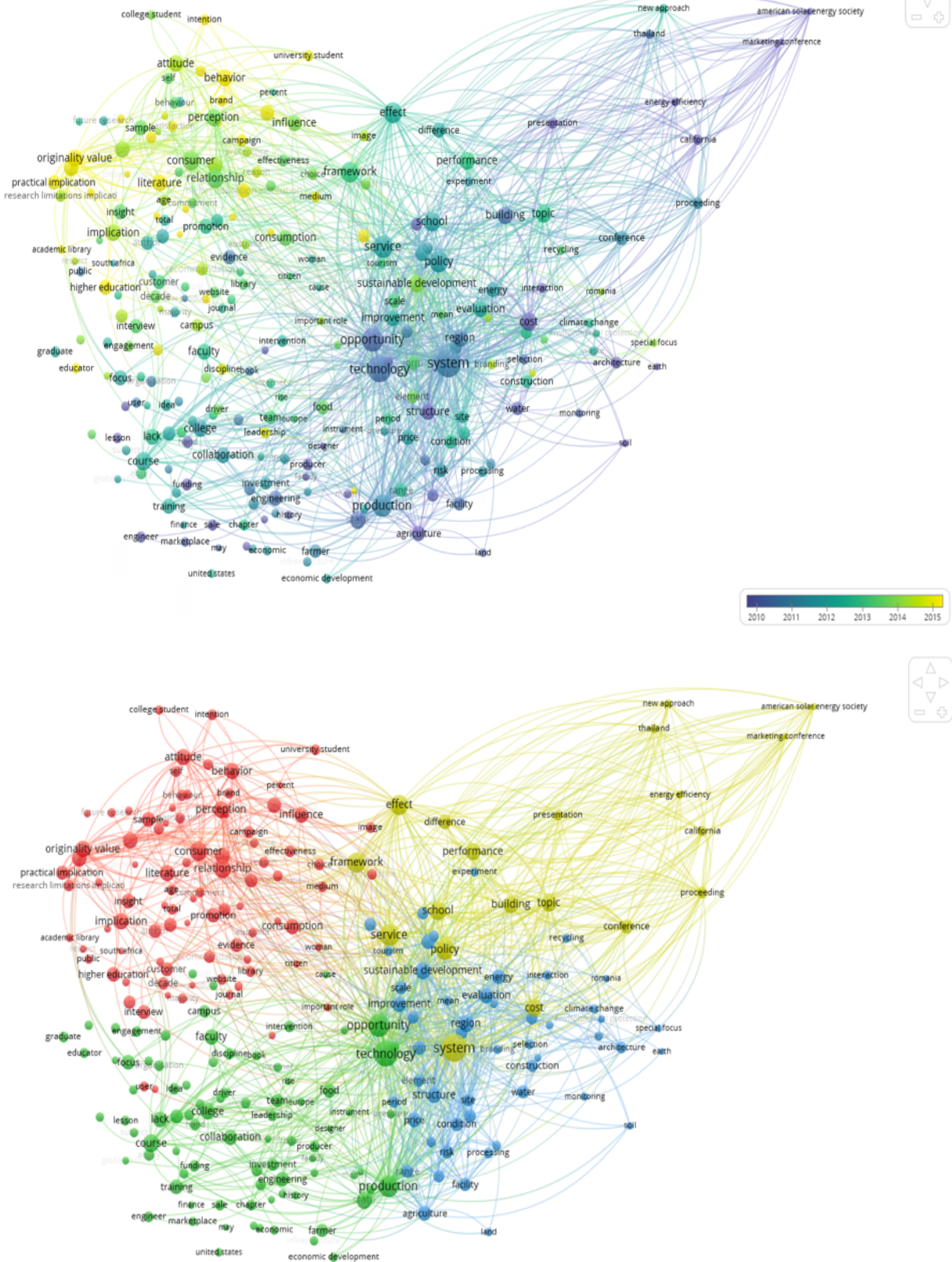


Figure 1. Knowledge map for the most common terms about "university sustainability" and "marketing" classified by year (above) and cluster (below). Source: authors.

engineering, and curriculum form the second cluster, associated with higher education institutions. Terms such as sustainable development, region, improvement, structure, evaluation, energy, agriculture, price, facility, and water correspond to the third cluster, which seems to be related to sustainability. Finally, the fourth cluster contains words such as system, service, policy, school, cost, building, and performance, associated with the implications of sustainability practices. Once the bibliometric analysis was completed, a content analysis was conducted based on the four clusters identified. Accordingly, these clusters were renamed in accordance with their content. For example, the first cluster was related to marketing communications, the second to higher education institutions, the third to sustainability, and the fourth to the implications of sustainability practices.

Literature review under a qualitative approach

Cluster 1: Marketing communications

For HEIs, marketing communications constitute a key element in the sustainability strategy, as they are a decisive driver of perceived service quality, which derives from satisfaction, trust, and behavioral intentions (Sultan & Wong, 2014). Marketing communications, as well as the other marketing mix elements, have a relevant impact on enrolment decisions to a university (Malarvizhi *et al.*, 2017). As a key feature of HEIs' branding strategies, marketing communications become important for creating reputation and prestige (Kocourek & Čočkova, 2017). Therefore, effective marketing communications must inform and enhance potential students' interests (Bachanová & Garbárova, 2017).

Marketing communications are not only important in attracting new students but are also key in establishing relationship marketing strategies, which has an impact on student retention (Currier & Wilhelm, 2017). In addition, marketing actions significantly affect student satisfaction, which positively relates to perceived institutional image and loyalty (Cheng *et al.*, 2019). In their communication efforts, HEIs should aim at building legitimacy (Juusola & Rensimer, 2018) and showing consistency (Shin & Ki, 2019) if they want maximize effectiveness.

Since Internet communications have become the most commonly used hypermedium among younger generations (Ptáčková, 2017), HEIs are relying on Internet-based marketing communications to promote their offer and increase the number of students (Alexa & Avasilcăi, 2017). Online communication technologies, such as social networking sites, must be carefully managed to attract and recruit

students (Ashmarina & Nikulina, 2017) and enhance their feelings and experiences (Zhuang *et al.*, 2013).

Cluster 2: HEIs

HEIs play a crucial role in society and need to remain economically sustainable (Abou-Warda, 2016). It is important to note that universities struggle to balance the proper execution of their traditional functions—education, research, and community engagement—while remaining economically sustainable (Miles *et al.*, 2017). For HEIs, the shortage of public resources leads to more business-oriented institutions, with marketing strategy playing an important role (Baaken *et al.*, 2016). In order to ensure their sustainability, HEIs are embracing the concept of science-to-business marketing, combining insights from different marketing disciplines (Baaken *et al.*, 2016).

HEIs need to better understand the importance of sustainable practices, so they can improve their viability through appropriate strategies and also shape a new generation of sustainable leaders (Gorski *et al.*, 2017). Implementing service innovation and a sustainable institutional image are key to students' satisfaction and loyalty (Cheng *et al.*, 2019).

Cluster 3: Sustainability

From an economic point of view, students constitute the most significant source of revenue to ensure HEIs financial sustainability (Malarvizhi *et al.*, 2017; Miles *et al.*, 2017). This brings the challenge for universities to constantly deliver high-quality customer service to this public (Vauterin *et al.*, 2011) and frequently develop new educational services (Abou-Warda, 2016).

Considering sustainability as a point of differentiation for HEIs, it is important to note that establishing universities' sustainable brands depends on the successful building of legitimacy, which can be self-promoted or borrowed (Juusola & Rensimer, 2018). As HEIs face challenges due to increased competition, delivering student satisfaction, defined as helping, feedback, advocacy, and tolerance, is decisive for the sustainability of these institutions (Manzoor *et al.*, 2020). Three pillars should be acknowledged about the role of universities regarding sustainability: research, within the curriculum, and institutional implementation (Brennan *et al.*, 2015). The successful application of these pillars provides the necessary moral authority universities require to play an active role in shaping students' attitudes towards sustainability (Pantelic *et al.*, 2016), as they perceive the institution they belong to act in a socially responsible manner (Vázquez *et al.*, 2014).

Cluster 4: Implications of sustainability practices

The focus on sustainability assists HEIs at becoming more competitive (Baaken *et al.*, 2016). Sustainability can become a key point of differentiation (Juusola & Rensimer, 2018), and differentiation might bring a notorious opportunity for HEIs, since the positive perceptions of being a socially responsible institution could be an essential supporter of the branding strategy (Gorski *et al.*, 2017; Vázquez *et al.*, 2014). This ultimately derives from strong student-university ties, which build a sustainable competitive advantage and loyalty (Cheng *et al.*, 2019; Manzuma-Ndaaba *et al.*, 2018). The focus on sustainability also shapes students' attitudes (Pantelic *et al.*, 2016) and the adequate communication of sustainability issues results in a more attentive and engaged audience (Hodson *et al.*, 2020).

The pursuit of financial sustainability drives HEIs to deliver high-quality customer service (Vauterin *et al.*, 2011) and innovative educational alternatives (Abou-Warda, 2016). In addition, for HEIs, adopting sustainable initiatives can play an important role in informing systemic transformation processes (Brennan *et al.*, 2015).

Materials and methods for the exploratory analysis

Table 2 shows the proposed research protocol for conducting fieldwork and provides an answer to the research question based on the method presented by Escobar-Sierra *et al.* (2021).

Table 2.
Protocol of the research to conduct fieldwork.

| Researcher decisions | Quantitative |
|----------------------------------|--|
| Reasoning and role of the theory | Deductive |
| Research problem or question | How do Colombian universities use marketing communication tools to inform their sustainability strategies? |
| Strategy of the research | Case study. One context and case (Medellín, Colombia) with several units of analysis (Yin, 2002) |
| Unit of Analysis | Communication of university sustainability |
| Sample | Social media posts by five private Colombian universities in ten months |
| Variables | Text strings |
| Data collection technique | Social media data from the Internet (Sullivan & Forrester, 2019) |
| Data analysis technique | Exploratory analysis techniques summarize data, find hidden relationships, and make predictions (Myatt, 2007) through Python programming |

Source: authors.

Given that participating universities post the same information on Facebook® and Instagram®, only data from Facebook® was collected. The webscraper.io® site was used for this purpose, employing an extension to scrap social media posts published since December 2020 and then reviewing them through exploratory analysis.

Results of the exploratory analysis

Myatt's (2007) proposal was followed to conduct the exploratory analysis. This proposal considers four stages: problem definition, data preparation, implementation of the analysis, and deployment of results. In addition, natural language processing and its toolkit in Python NLK—a suite of libraries and programs for symbolic and statistical natural language processing for English, and recently for other languages like Spanish, written in Python programming language—was applied in the analysis.

Problem definition

This work investigates how Colombian universities use marketing communication tools to inform their sustainability strategies, specifically, the case of five private universities in Medellín (Antioquia, Colombia) with high-quality accreditation.

Data preparation

As previously mentioned, the data of participating HEIs posts was scraped from their social networks using webscraper.io® extension for ten months. The number of scraped posts for each university is presented in table 3.

Table 3.
Number of posts scraped from the social networks of the participating universities.

| University | Number of collected post |
|-----------------------------------|--------------------------|
| University of Medellín | 1,221 |
| University EIA | 681 |
| University CES | 565 |
| Pontificia Bolivariana University | 2,053 |
| University EAFIT | 1,013 |

Source: authors.

The text strings of each post were stored in a .txt file encoded as ANSI and specified for each university. Then, text strings were uploaded into Jupyter notebook, a web-based environment to edit and run human-readable docs while describing the data analysis, where the following stages of exploratory analysis were programmed.

Once the data was uploaded to Jupyter notebook, a preliminary inspection was performed to understand features such as count, maximum, minimum, mean, and quartiles. Then, the data was analyzed to determine its typology –i.e., string, object, integer, or Boolean– and the amount of non-available values. Since text strings were in Spanish, we decided to form a compilation of text strings for each university to standardize upper- and lower-case letters, normalize accents, and remove URLs, special characters, and numbers. Furthermore, although lemmatization in Spanish does not work as well as in English, each string was lemmatized –i.e., remove inflectional endings to return to the base or dictionary form of a word– to improve the standardization of words. Finally, stop-words were removed, and text strings were tokenized into lists of substrings.

Implementation of the analysis

This is the central part of the exploratory analysis. The first step was to search for patterns, differences, and other characteristics that address the research question using graphs, tables, and statistics. Simultaneously, inconsistencies and limitations were identified to make general statements about the data and its relationships (Downey, 2014). The analysis of the obtained results will be presented in the following sub-sections.

Length of each post

The violin plot is similar to a box-and-whisker plot, but instead of all components corresponding to actual data points they rather estimate the kernel density of the underlying distribution. Figure 2 shows the violin plot for the length of each post scraped from participating universities' social networks.

As shown in figure 2, University EAFIT posted the longest messages, followed by University of Medellín. In contrast, University CES posted the shortest messages. Pontificia Bolivariana University and University EIA post shorter messages as well.

Word cloud

A word cloud represents the keywords that most frequently appear in text data. The size of the word in the cloud depicts the number of repetitions, so the most repeated terms appear bigger. Figure 3 shows the word cloud for each corpus of strings to identify the most frequent words in Facebook® posts shared by participating universities.

As shown in figure 3, HEIs frequently repeat their names in social media posts. Pontificia Bolivariana University and University EIA frequently repeat words like "here" or "course."

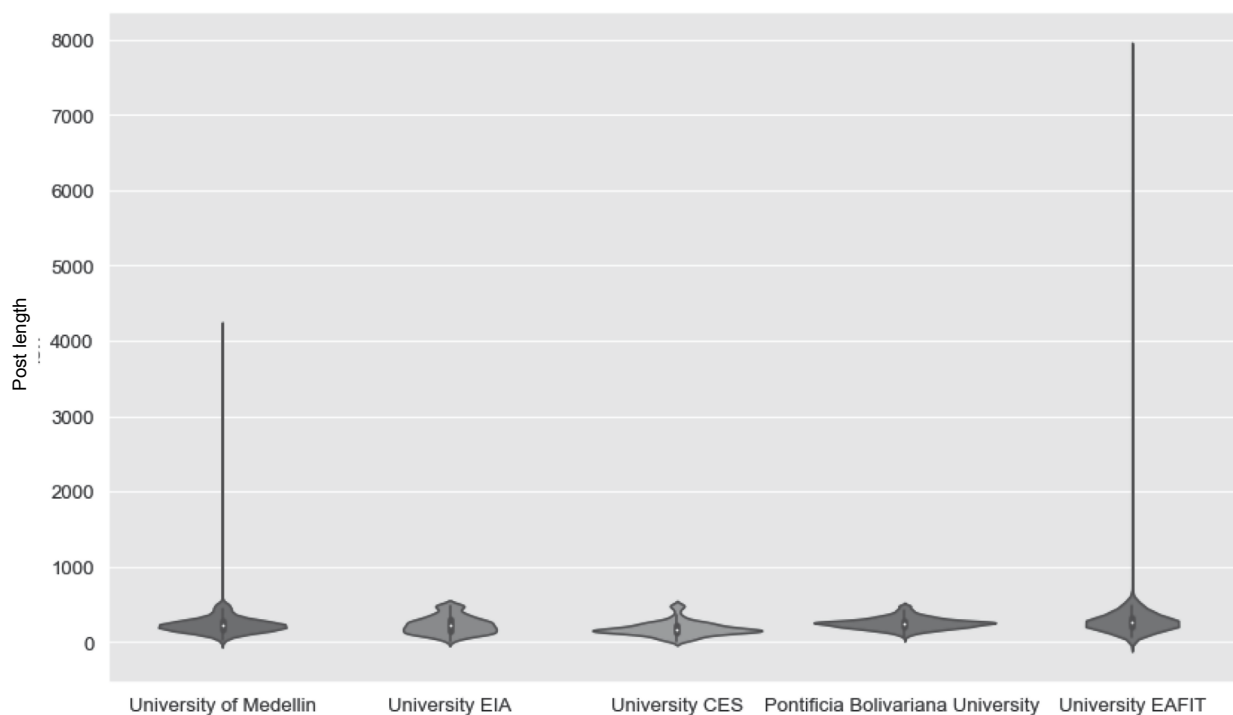


Figure 2. Violin plot for the length of each post scraped from the social networks of participating universities. Source: authors.

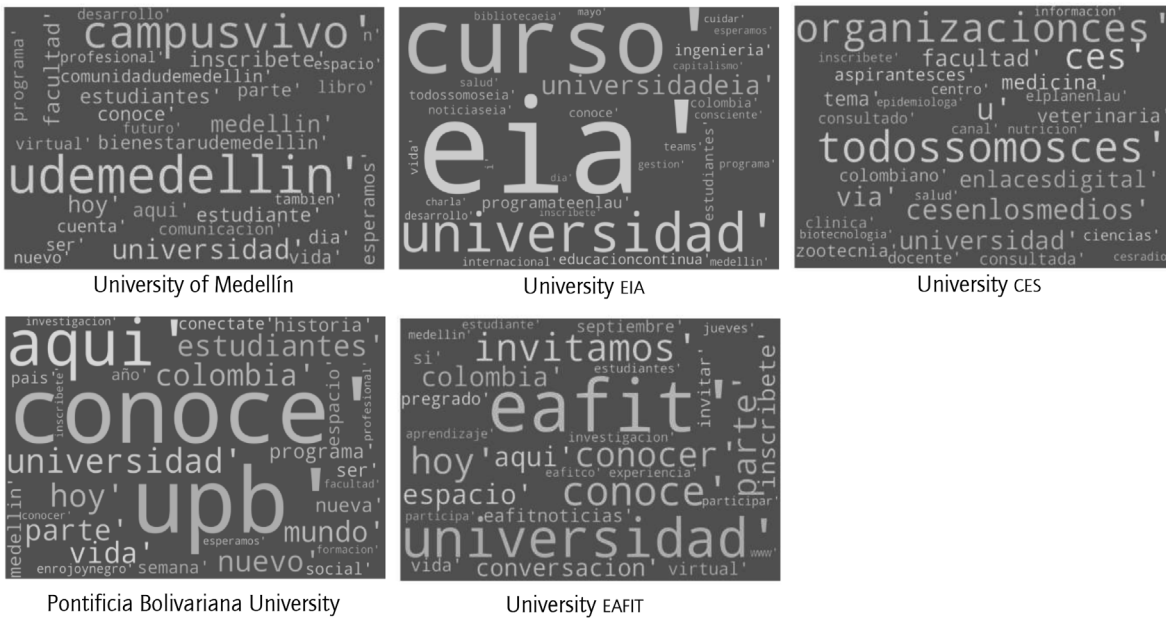


Figure 3. Word cloud for the most frequent words that universities post on their social networks. Source: authors.

Data reveals that University of Medellín often posts issues related to sustainability, like messages related to “campusvivo” (the name of its campus program) and well-being programs. The other universities post themes that refer indirectly to sustainability. For instance, University EIA posts messages about consciousness and health, University CES posts messages about health, Pontificia Bolivariana University posts messages about the country, the world, life, and society, and University EAFIT shares messages referring to experience, learning, life, and participation.

Recognition of named entity

Named entity extraction, or named entity recognition, is a keyword extraction technique that uses natural language processing algorithms to automatically identify named entities within the raw text and classify them into predetermined categories, e.g., categorizing important nouns and proper nouns in a text (Mohit, 2014). In this case, an effort was made to identify the most frequent nouns and adjectives in the universities' posts.

Once the most frequent nouns and adjectives included in the posts were identified, those related to sustainability issues were highlighted in grey. University EIA displays many posts that include nouns and adjectives related to sustainability, followed by Pontificia Bolivariana University, University of Medellín, University EAFIT, and University CES, as shown below.

- **Nouns and adjectives in the posts by University of Medellín:** campusvivo, udemedellin, udemedemedellincommunity, visit, wellnessudemedemedellin, information, part, account, communication, day, program, welookforwardto, future, research, also, plan, book, culture, restrepo, campus, be, great, exhibition, regresoalau, build, somosnoticia, years, moment, institution, postgraduate, udemedellin, university, register, udem.edu.co, virtual, national, new, new, degreesudemedellin, fomentoartístico, somosnoticia, social, nature, new, international, profesional, biodiversity, sustainability, get, registrationopen, udemedellin, all, period, salududememedellin, seal, so, we wait, tbt.
- **Nouns and adjectives in the posts by University EIA:** course, program, information, about, EIA, care, Colombia, aware, we look, forward to, management, programateenlau, engineering, library, university, chat, we care, quota, research, visit, day, a, link, process, life, conference, development, participate, challenges, environment, country, university, university, continuing education, programateenlau, everyoneisalready, noticiaseia, international, course, virtual, national, easostenible, laeiacontigo, register, sign up, bienestar, new, health, sustainable, digital develop, civil, taken, me, this, library, best, global, social, get vaccinated, covid.
- **Nouns and adjectives in the posts by University CES:** subject, Colombian, consulted, consulted, information,

nutrition, zootechnics, u, biotechnology, elplanenlau, cesradio, giraldo, dietetics, yessica, clinic, Castrillon, radio, program, podcast, teledemellin, link, visit, faculty, career, center, Telantioquia, attention, agreement, day, seedbed, university, enlacedigital, u, u., channel, register, news, elplanenlau, tropical, institute, covid-, future, weather, new, double, wide, next, health, tipdetic, you, enlacedtv, teacher, right, get, news, convince you, enter, animal, profesional, finance.

- **Nouns and adjectives in the posts by Pontificia Bolivariana University:** see, part, program, research, Colombia, training, information, upb, programming, world, country, connect, connectwithupb, account, meet, soyorgullosamenteupb, bolivarian, years, colegioupb, together, july, future, backinsuranceupb, education, become, life, medellin, history, all, week, upb, university, new, social, new, upbenlosmedios, general, sign up, virtual, upblive, profesional, upbsostenible, ecocampusupb, visit, special, new, international, national, do you, live, we wait for, you, upbaños, current, did you know, university, week, note, you, u, sustainable.
- **Nouns and adjectives in the posts by University EAFIT:** Eafit, conversation, meet, meet, part, Colombia, research, education, participate, undergraduate, program, information, country, search, restrepo, knowledge, day, innovation, community, eafitense, culture, campuseafit, years, space, opportunity, care, we want, edition, how, experience, university, eafit, virtual, register, eafitnoticias, new, space, social, international, new, national, speak, children, global, what, u, on-site, sign up, you, cultural, noticiaseafit, already, editorial, digital, so, new, which, do you, know you, integral.

Bigrams

Some words appear together more frequently, so, in a text string, it might be helpful to identify such words to conduct a further in-depth analysis (Brysbaert *et al.*, 2018; Moret-Tatay *et al.*, 2018). In this sense, the most frequently bigrams that appear in each university's posts are recognized, as described below.

- **Posts by UDEM:** [(‘#campusvivo’, ‘#udemedellín’), (‘...’, ‘see’), (‘#udemedellín’, ‘#campusvivo’), (university, ‘medellín’), (‘#udemedellín’, ‘#regresoalau’), (‘federico’, ‘restrepo’), (‘#bienestarestudemedellín’), (‘faculty’, ‘sciences’), (‘undergraduate’, ‘postgraduate’), (‘see’, ‘#udemedellín’), (‘plan’, ‘development’), (‘university’, ‘medellín.’), (‘university’, ‘medellín,’), (‘seal’, ‘editorial’),

(‘#bienestarestarudemedellín’, ‘#saludemedellín’), (‘view’, ‘yes’), (‘sciences’, ‘economics’), (‘#udemedellín’, ‘#inscripcionesabiertas’), (‘ago’, ‘part’), (‘scanning’, ‘code’)].

- **Posts by EIA:** [(‘...’, ‘see’), (‘#course’, ‘#continuouseducation’), (‘university’, ‘eia’), (‘#todossomoseia’, ‘#universidadeia’), (‘capitalism’, ‘conscious’), (‘#continuouseducation’, ‘#course’), (‘see’, ‘#programateenlau’), (‘care’, ‘care,’), (‘see’, ‘program: ’), (‘care’, ‘care!’), (‘see’, ‘#course’), (‘me’, ‘care,’), (‘#laeiacontigo’, ‘#todossomoseia’), (‘#universidadeia’, ‘#todossomoseia’), (run out, ‘space!’), (‘we care!’), (‘#laeiacontigo’), (‘i’, ‘congress’), (‘pontificia’, ‘bolivariana’), (‘congress’, ‘international’), (‘international’, ‘capitalism’)].
- **Posts by CES:** [(‘#todossomosces’, ‘#organizaciones’), (‘university’, ‘ces’), (‘#organizaciones’, ‘#cesenlosmedios’), (‘u.’, ‘via’), (‘veterinary’, ‘zootechnics’), (‘#cesenlosmedios’, ‘theme’), (‘#organizaciones’, ‘#enlacedigital’), (‘via’, ‘colombiano’), (‘faculty’, ‘medicine’), (‘colombiano’, ‘#todossomosces’), (‘faculty’, ‘sciences’), (‘theme’, ‘consulted’), (‘#organizationces’, ‘#aspirantsces’), (‘topic’, ‘consulted’), (‘path’, ‘channel’), (‘#organizationces’, ‘faculty’), (‘.’, ‘university’), (‘medicine’, ‘veterinary’), (‘ces’, ‘#cesenthemediia’), (‘center’, ‘veterinary’)].
- **Posts by UPB:** [(‘#upbenlosmedios’, ‘|’), (‘#conéctateconlaupb’, ‘|’), (‘...’, ‘see’), (‘julio’, ‘jairo’), (‘chancellor’, ‘general,’), (‘jairo’, ‘ceballos’), (‘university’, ‘pontificia’), (‘ceballos’, ‘sepúlveda,’), (‘#soyorgullosamenteupb’, ‘|’), (‘meet’, ‘here’), (‘be’, ‘part’), (‘editorial’, ‘bookstore’), (‘clinic’, ‘university’), (‘you’, ‘like’), (‘5:00’, ‘p. m.’), (‘new’, ‘broadcast’), (‘6:00’, ‘p.m.’), (‘sepulveda,’, ‘share’), (‘we give’, ‘welcome’), (‘#upbsostenible’, ‘|’)].
- **Posts by EAFIT:** [(‘...’, ‘view’), (‘university’, ‘eafit’), (‘#eafitnews’, ‘-’), (‘eafit’, ‘invite’), (‘#eafitnews’, ‘|’), (‘invite’, ‘meet’), (‘orchestra’, ‘symphony’), (‘see’, ‘#eafitnoticias’), (‘symphony’, ‘eafit’), (‘university’, ‘#eafit’), (‘5:00’, ‘p. m.’)W, (‘6:00’, ‘p.m.’), (‘#noticiaseafit’, ‘-’), (‘¿Do you’, ‘like’), (‘#trabajosíhay’, ‘universidad’), (‘see’, ‘how’), (‘university’, ‘child’), (‘invite’, ‘participate’), (‘languages’, ‘eafit’), (‘be’, ‘part’)].

Highlighted in grey are the bigrams related to sustainability issues in the posts of each university. For example, University of Medellín has many posts related to sustainability. For example, they frequently mention their *Campus Vivo* strategy and hashtags about well-being. Concurrently, University EIA repeatedly posted messages promoting a conference on conscious capitalism.

Trigrams

A similar analysis was conducted with the groups of three words that appear together more frequently (Brybaert *et al.*, 2018; Moret-Tatay *et al.*, 2018). Such groups are called trigrams. Afterwards, the most frequent posts of each university are presented.

- Post by UDEM:** [(‘federico’, ‘restrepo’, ‘posada,’), (‘imprint’, ‘editorial’, ‘university’), (‘faculty’, ‘sciences’, ‘economics’), (‘chancellor’, ‘federico’, ‘restrepo’), (‘federico’, ‘restrepo’, ‘posada’), (‘#campusvivo’, ‘#mesdelamujer’, ‘#mujeresquenosinspiran’), (‘talk’, ‘build’, ‘plan’), (‘build’, ‘plan’, ‘development’), (‘allies’, ‘institution’, ‘converse’), (‘institution’, ‘converse’, ‘build’), (‘#udemedellín’, ‘#campusvivo’, ‘#mesdelamujer’), (‘#udemedellín’, ‘meet’, ‘allies’), (‘space’, ‘cultivate’, ‘new’), (‘this’, ‘space’, ‘cultivate’), (‘we gather’, ‘allies’, ‘institution,’), (‘plan’, ‘development’, ‘2021-2025. this’), (‘#udemedellín’, ‘students’, ‘workshops’), (‘realized’, ‘#udemedellín’, ‘students’), (‘monday’, ‘22’, ‘march’), (‘ii’, ‘fair’, ‘virtual’)].
- Post by EIA:** [(‘I care,’), (‘I care,’), (‘I care,’), (‘I care,’), (‘I care,’), (‘I care,’), (‘we care!’), (‘#laeiacontigo’, ‘#todossomoseia’), (‘I care,’), (‘we care!’), (‘#laeiacontigo’), (‘#laeiacontigo’, ‘#todossomoseia’, ‘#universidadeia’), (‘...’, ‘see’, ‘#curso’), (‘cupo!’), (‘...’, ‘view’), (‘international’, ‘capitalism’, ‘conscious’), (‘register!’), (‘view’, ‘program:’), (‘i’, ‘congress’, ‘international’), (‘congress’, ‘international’, ‘capitalism’), (‘be’, ‘quota!’), (‘...’), (‘program:’, ‘...’, ‘see’), (‘habits’, ‘healthy’, ‘life!’), (‘welfare...’, ‘is’, ‘you!’), (‘see’, ‘#continuouseducation’, ‘#course’), (‘university’, ‘pontifical’, ‘bolivarian’), (‘#yosoyeia’, ‘#todossomoseia’, ‘#universidadeia’), (‘recommendations’, ‘follow them’, ‘me’), (‘misinformation’, ‘vaccinate’, ‘#covid19!#universidadeia’)].
- Post by CES:** [(‘#todossomosces’, ‘#organizaciones’, ‘#cesenlosmedios’), (‘#todossomosces’, ‘#organizaciones’, ‘#enlacesdigital’), (‘via’, ‘colombiano’, ‘#todossomosces’), (‘colombiano’, ‘#todossomosces’, ‘#organizaciones’), (‘#todossomosces’, ‘#organizaciones’, ‘#aspirantesces’), (‘#todossomosces’, ‘#organizaciones’, ‘faculty’), (‘veterinary’, ‘zootecnia’, ‘-’), (‘u.’), (‘via’, ‘colombiano’), (‘center’, ‘veterinary’, ‘zootecnia’), (‘zootecnia’, ‘-’, ‘university’), (‘-’, ‘university’, ‘ces’), (‘#cesenlosmedios’, ‘subject’, ‘consulted’), (‘medicine’, ‘veterinary’, ‘zootecnia’), (‘sciences’, ‘biotechnology’, ‘ces’), (‘#cesenlosmedios’, ‘topic’, ‘consulted’), (‘faculty’, ‘sciences’, ‘biotechnology’), (‘#organizaciones’, ‘#cesenlosmedios’, ‘topic’), (‘veterinary’, ‘zootecnia’, ‘ces’), (‘giraldo’, ‘castrillón’, ‘epidemiologist’), (‘yessica’, ‘giraldo’, ‘castrillón,’)].
- Post by UPB:** [(‘julio’, ‘jairo’, ‘ceballos’), (‘jairo’, ‘ceballos’, ‘sepúlveda,’), (‘ceballos’, ‘sepúlveda,’), (‘share’), (‘sepúlveda,’), (‘share’, ‘greeting’), (‘clinic’, ‘university’, ‘bolivariana’), (‘university’, ‘pontifical’, ‘bolivariana’), (‘see’, ‘#connectwithupb’, ‘|’), (‘pbro.’), (‘julio’, ‘jairo’), (‘chancellor’, ‘general,’), (‘julio’), (‘general,’), (‘julio’, ‘jairo’), (‘formation’, ‘continuous’, ‘-’), (‘continuous’, ‘-’, ‘university’), (‘-’, ‘university’, ‘pontifical’), (‘editorial’, ‘bookstore’, ‘upb’), (‘claudia’, ‘avendaño’, ‘ramón’), (‘mg.’), (‘pbro.’), (‘julio’), (‘ver’, ‘#upbenlosmedios’, ‘|’), (‘chancellor’, ‘general,’), (‘mg.’), (‘general,’), (‘mg.’), (‘pbro.’), (‘happy’, ‘week’, ‘everyone!’)].
- Post by EAFIT:** [(‘orchestra’, ‘symphony’, ‘eafit’), (‘view’, ‘#eafitnoticias’, ‘|’), (‘university’, ‘eafit’, ‘invite’), (‘#trabajosíhay’, ‘university’, ‘eafit’), (‘claudia’, ‘restrepo’, ‘chancellor’), (‘see’, ‘#noticiaseafit’, ‘-’), (‘officine’, ‘relations’, ‘international’), (‘university’, ‘child’, ‘eafit’), (‘invite’, ‘see’, ‘part’), (‘design’, ‘urban’, ‘management’), (‘see’, ‘#eafitnoticias’, ‘-’), (‘party’, ‘book’, ‘culture’), (‘see’, ‘already’, ‘you know’), (‘already’, ‘you know’, ‘magazine’), (‘event’, ‘open’, ‘public’), (‘undergraduate’, ‘design’, ‘urban’), (‘medellín’, ‘how’, ‘vamos’), (‘appropriation’, ‘social’, ‘knowledge’), (‘auditorium’, ‘founders’, ‘university’), (‘space’, ‘you can’, ‘learn’)].

Highlighted in grey are the trigrams related to sustainability issues in the posts of each participating university. Previous findings for bigrams are confirmed, which means that University of Medellín displays the most significant number of posted trigrams related to sustainability, followed by University EIA.

Sentiment analysis

Sentiment analysis—or sentiment classification—is a technique that identifies the underlying sentiment in a piece of text (Zulkifli & Lee, 2019). This kind of analysis falls into the broad category of text classification tasks where the researcher is supplied with a phrase or a list of words. The classifier is supposed to identify if the sentiment behind the text is positive, negative or neutral, through classification algorithms. Figure 4 presents the bar charts resulting from the sentiment analysis conducted to the entire database of universities’ posts.

In each of the graphs in figure 4, the first bar from left to right represents the number of “positive” posts, the second bar, the number of “neutral” posts, and the third bar, the number of “negative” posts. University of Medellín and Pontificia Bolivariana University mainly share positive

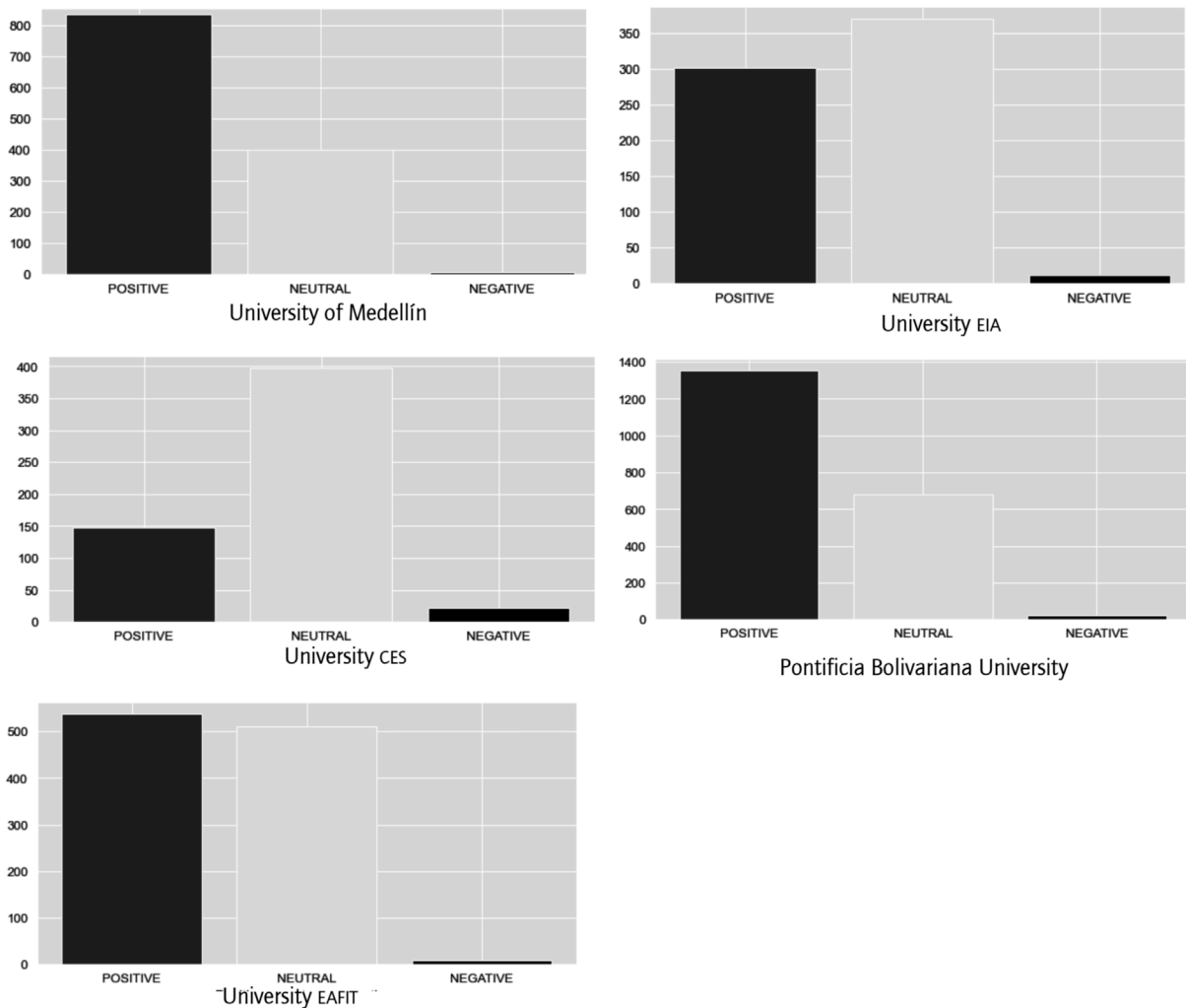


Figure 4. Sentiment analysis for each post scraped from the social networks of participating universities. Source: authors.

messages, closely followed by University EAFIT. In contrast, University EIA and University CES usually post neutral messages. Even further, University CES has a significant number of negative posts, which should be further reviewed.

Nouns before and after our subject of interest

Named entity extraction –or named entity recognition– was also applied to provide a more in-depth analysis (Mohit, 2014). The aim of this activity was to identify the nouns before and after the word “sustainab” in each post of the participating universities.

University of Medellín dataset has 24 occurrences:

- Nouns before: space, institution, urbanism, bio, bet, territory, development, projects, development, to, orchard, bet, based, based, fashion, planet, territory, marketing, production, participation, future, eco garden, social, passion.

- Nouns after: UdeMedellín, CampusVivo, Colombia, Faculty, AccreditationInstitutional, Environment, EcologicalFootprint, EcologicalFootprint, Empowerment, Empowerment, EcoGarden, Environment, Research.

University EIA dataset has 31 occurrences:

- Nouns before: construction, constructions, metropolitan, research, development, procurement, territories, vehicle, Competitiveness, proposal, relations, development, guarantee, proposal, aware, conscious, purpose, suggestion, proposal, conscious, development, metropolitan, development, urban development, development, operation, environment.
- Nouns after: urban, products, biodiversity, international, CongressCapitalismConsicente, Comfama, challenges, urban, challenges, mobility, mobility, management, EnvironmentalEngineeringEIA.

University CES dataset has 1 occurrence:

- Nouns before: Connect.
- Nouns after: OrganizationCES.

Pontificia Bolivariana University dataset has 66 occurrences:

- Nouns before: company, economy, SummerSchoolUPB, reflection, commitment, commitment, Retrofutures, enjoy, improve, around, chat, topics, reflections, now, practices, competitiveness, research, initiative, changes, habits, housing, future, spaces, alternative, development, territories, be, Week, economy, impact, Miradas, care, university, practices, which, meet, strategy, consumption, ZeroWaste, apply, culture, competitive, purchasing, companies, professionals, works, products.
- Nouns after: SummerSchoolUPB, SummerSchoolUPB, history, SummerSchoolUPB, register, here, improving, here, YouTube, reportedesostenibilidadesostenibilidadupb, reportedesostenibilidadupb, EcoDay, week.

University EAFIT dataset has 19 occurrences:

- Nouns before: development, competitiveness, cities, road, mobility, rental, We will speak, determinants, secure, exact, urban, alternative, technology, competitive, universities.
- Nouns after: time.

Several post by Pontificia Bolivariana University include the term "sustainability," a trend followed by University EIA, University of Medellín, University EAFIT, and University CES. They relate the string "sustainab" with different elements inside and outside of the universities.

Deployment of results and discussion with other authors

The communication of HEIs sustainability practices and its implications constitute a domain of appealing exploration potential. Findings suggest that HEIs are extensively using Internet-based marketing communications to contact their different publics, in line with what is advised in the literature, as these type of communications help promote universities' offer and increase the number of students enrolled (Alexa & Avasilcăi, 2017).

Nonetheless, as observed from the collected data, HEIs should deliver their sustainability messages in a more precise, accurate, and persistent manner if they want sustainability to become a key differentiation factor that helps them grow into more competitive institutions (Baaken *et al.*, 2016; Juusola & Rensimer, 2018). This, by all means,

is closely associated with the sustainability and communications objectives of each particular HEI, and if they are clearly defined and understood.

Data show that the communication strategy of sustainability practices in participating HEIs seems to be mainly inconsistent and short-term oriented. Other than the long-term transmission of University of Medellín's *Campus Vivo* system (Universidad de Medellín, 2022), HEIs tend to communicate particular events and activities related to sustainability (e.g., Women's month or Conscious Capitalism Congress). HEIs should consistently call for the design, implementation, and communication of sustainability actions to obtain the necessary moral authority to impact the attitudes of students and other stakeholders towards the subject (Pantelic *et al.*, 2016).

Furthermore, having clarity on the process and the staff responsible for the communication of sustainability issues could be helpful for HEIs to convey a more accurate and understandable message, resulting in a more attentive and engaged audience (Hodson *et al.*, 2020) and loyalty (Cheng *et al.*, 2019). Marketing communications are an important tool for building brand equity and interactive marketing communications are useful for establishing brand personality by its tone and creative content (Keller, 2009). However, in their communication efforts regarding sustainability, HEIs need to closely observe the tone they are employing since most of the analyzed posts evoke a neutral instead of positive sentiment.

Conclusions, limitations, and future research

Our results indicate that, despite good intentions and plausible efforts, HEIs do not seem to have a systematic strategy for communicating sustainability issues. HEIs give the impression to be managing sustainability issues mainly from an economic point of view, as they are communicating their advantages to students considering that they represent an essential source of revenue and one of the pillars of financial sustainability (Malarvizhi *et al.*, 2017). However, the communication of sustainable practices that enhance an institutions' reputation and increase student retention still appears to be sporadic and insufficient. This was evidenced in the analysis of the collected data, where, except for the communication of University of Medellín's *Campus Vivo* system (Universidad de Medellín, 2022), sustainability messages presented by HEIs focused on short-term, specific matters.

Positive perceptions of being sustainable and socially responsible constitute tremendous support in HEIs branding strategy (Gorski *et al.*, 2017). Nevertheless, sustainability

seems to be still far from being considered a point of differentiation for HEIs in their brand positioning scheme. This situation is aggravated considering that younger generations recognize sustainability actions as insufficient, and they think such actions should be accompanied by regenerative initiatives (Wahl, 2019), leaving HEIs one step behind.

Regarding tone, HEIs need to place close attention to the sentiments their sustainability messages provoke. However, results show that instead of relying on messages that cause positive feelings, most of the messages posted by these organizations have a neutral tone.

It is time then to view sustainability as a long-term strategy. Therefore, HEIs should focus their communication efforts on sustainable practices, considering that they must be consistent and that elements such as the message, the tone, and the channel are important for effectively reaching the different public.

Several limitations by this study need to be acknowledged. First, data was collected from a quite homogeneous sample, as the five participating universities are private organizations and belong to the same geographical region. Second, since collected data was analyzed following exploratory techniques, results cannot be generalized. Finally, the study focused on the messages posted on one social media platform (Facebook®), excluding other marketing communication channels.

Future research could take a confirmatory approach, where results can be generalized and hypotheses validated. Also, a more diverse sample might be considered, including public and private HEIs and from various regions or countries. Finally, a wider spectrum of marketing communication channels should be included in forthcoming investigations, as well as the relationship between sustainability messages and users' reactions.

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