An approach for analysing and segmenting messages about the SDGs on Twitter from the perspective of social marketing

Araceli Galiano-Coronil[1] · Manuela Ortega Gil[1] · Belén Macías Varela[1] ·
Rafael Ravina Ripoll[1]

Abstract

This descriptive study aims to identify the most published SDGs by @GlobalGoalsUN, the United Nations' official account for sustainable development goals, and elaborate the segmentation profiles of these messages that promote a more significant impact from the perspective of social marketing and happiness. With more than 345 million active users in 2022, Twitter is a relevant social media tool for researching and knowing public reactions. In order to identify the most relevant SDGs, we have downloaded tweets from January 1, 2021, to September 30, 2022. The segmentation profiles have been elaborated with the classification tree using the division method called CHAID (Chi-square automatic interaction detector), which allows the automatic detection of interactions through Chi-square. This technique has made it possible to identify four homogeneous sub-samples corresponding to the segmentation profiles of messages based on impact, social marketing and happiness. The results of these profiles show the categories of the variables that best distinguish the messages. In addition, it has been verified that the most published SDGs do not coincide with those that have achieved the greatest impact. The climate has been the most published SDG (SDG 13 Climate action), but the one that has obtained the most significant reaction from the public has been the SDG related to well-being (SDG 3 Health and well-being). The most popular format has been video, the most recurrent emotional tone has been neutral, and, about social marketing, a category of action messages stands out, unlike behavioural ones, which do not specify the indications to carry out a specific initiative.

Keywords Social marketing · Happiness · Well-being · Gender · Climate · SDGs

✉ Araceli Galiano-Coronil
  araceli.galiano@gm.uca.es

Extended author information available on the last page of the article

1 Introduction

In 1968 a group of scientists, educators, economists, humanists, industrialists, and national and international civil servants gathered in Rome to discuss humankind's present and future predicament. They stressed the need to tackle the world's significant problems together, be they economic, environmental, political or social. They gave one of their first performances was the commissioning of a report by the Massachusetts Institute of Technology (MIT) called "The Limits to Growth", published in 1972. It examined five fundamental factors and their interactions that determine growth on this planet – population, agricultural production, non-renewable resource depletion, industrial output and pollution (Meadows et al., 1972; Turner, 2008; Purvis et al., 2019). Many authors, including Fukuda-Parr and Muchhala (2020), place this moment as the origin of the term "sustainable development".

Since then, the issue of the sustainability of the planet has become the leading global problem. Climate change and human activity in other areas, such as the economic and social spheres and their consequences are changing the world. Faced with this situation, in the year 2000, leaders from 189 countries met in New York at the United Nations headquarters. They signed the Millennium Declaration, subsequently beginning a process that began in 2012 and ended in September 2015 with the approval by the 193 member countries of the United Nations of the 2030 Agenda for Sustainable Development. This document contains the 17 Sustainable Development Goals for people's welfare and cares for the planet (United Nations, 2022). Among them are the three (SDG 3, Ensuring healthy lives and promoting well-being for all ages; SDG 5, Achieve gender equality and empower all women and girls; SDG 13) urgent action to combat climate change and its impacts) that will be analysed in this article.

Environmental issues have a growing presence in the media. The survey that was carried out jointly by the European Parliament and the Commission corroborates this, by the Eurobarometer on the future of Europe, 91% of young people between 15 and 24 years of age, and 87% of those surveyed over 55 years of age, consider that climate change is the biggest challenge for the EU (Special Eurobarometer on the future of Europe published on January 25, 2022). Coming to generate environmental awareness in citizens, this can be understood as the set of images and representations that have the environment as the object of attention or particular aspects of it, such as the decline of species, the scarcity of natural resources, the quality environment as a whole, among many other aspects (Corraliza et al, 2006).

In this environment, social marketing is configured as an ideal discipline since, as Kotler and Roberto (1992) and Kotler et al. (2002) postulate, its purpose is to stimulate changes in the conduct or behaviour of citizens, benefiting both the individual as well as society in general. In this way, social marketing has been used to stimulate appropriate behaviour about the SDGs mentioned above. Concerning the environment, various investigations are related to the intention to purchase sustainable products or the importance for companies to focus on this type

of product (Ali, 2021; Giantari et al., 2021; Elsaman & Sergio, 2021). research evidence shows the importance of message framing and its effectiveness in persuading consumers to adopt environmentally sustainable behaviour (Florence et al., 2022). Concerning gender, gender roles from the perspective of social marketing have been a recurring theme (Friedmann, 2018; Robertson & Davidson, 2013). It is noteworthy that much research on gender also deals with environmental issues, especially in underdeveloped countries where these factors significantly affect women's lives (Amine & Staub, 2009). It also highlights that gender is treated from the point of view of well-being (Aya Pastrana et al., 2020) or violence (Martam, 2016). Regarding well-being, this is another SDG studied from the perspective of social marketing (Van Hierden et al., 2022; Johns, 2020; 2019). Recently, other investigations are emerging that take social networks as protagonists since they allow direct communication with their audiences without the need to make expensive investments in advertising space and time (Abuhussein & Magatef, 2022). About social platforms, Twitter has been configured as one of the most investigated due to its public and informative nature from the perspective of social marketing (Guidry et al., 2014; Guijarro et al., 2021), especially for topics related to health, such as those related to how to increase engagement with health programs to improve well-being and happiness (Ravina-Ripoll et al., 2022; Keim-Malpass et al., 2017; Mehmet et al., 2020; Downey et al., 2019). Environment and gender have also been addressed using Twitter as a social marketing tool, with some addressing both SDGs to study gender differences in climate change communication on Twitter (Holmberg & Hellsten, 2015; Sanford et al., 2021).

In this proliferation of studies on social networks, the authors of this work observe that recent literature offers the opportunity to stimulate research that deepens that social marketing and happiness constitute two very valid instruments to raise awareness among citizens about the importance of the SDGs. In this sense, both elements show that institutional tweets that convey positive emotions and significant joy change people's behavior toward the SDGs in the online environment (Jiménez-Marín et al., 2021; Keim-Malpass et al., 2017; Ravina-Ripoll et al., 2021a, 2021b, 2022a, 2022b). However, not enough evidence has been found in this regard that reflects an adequate segmentation of messages in microblogging, which reflects the main characteristics of tweets from a perspective of both social marketing and happiness. That is why this work it is intended the following objectives:

Identify the most published SDGs by @GlobalGoalsUN.

Elaborate on the segmentation profiles of the messages published by @GlobalGoalsUN to identify the most relevant characteristics that promote a more significant impact from the perspective of social marketing and happiness.

Analyze the impact of the selected messages from the perspective of social marketing and happiness.

2 Theoretical framework

2.1 Health and wellness, gender equality and climate change. Consequences in happiness

Since the beginning of the twenty-first century, public administrations have been carrying out, little by little, actions or practices aimed at seeking happiness for citizens (Esaiasson et al., 2020). This policy is being developed in a globalized ecosystem whose prevailing economic models are based on principles far removed from well-being, gender equality and ecology. It is eroding the Welfare State, the biodiversity, and the collective happiness of the inhabitants of the global village (Arias & Costas, 2016).

Faced with this reality, the UN promoted the 2030 Agenda to promote sustainable and environmentally friendly landscapes. That is an inclusive, prosperous and democratic capitalism that is open to fulfilling all the SDGs (Galiano-Coronil, et al., 2021). In this way, human beings will be able to enjoy a society that gravitates toward the dimensions of health, gender perspective, happiness and energy efficiency. Undoubtedly, this path will allow us to enjoy a planet where individuals do not turn their backs on nature, gender equality, and social well-being (Ravina-Ripoll et al., 2022).

SDG 3, "Ensure healthy lives and promote well-being for all at all ages". This objective focuses on the well-being of citizens in the broadest sense of the concept, which includes the physical, material and emotional domains. Currently, the well-being represented by the quality of life (QoL) introduces the dimension of health with two variables "Self-perceived health" and "Life expectancy". The former expresses the respondent's subjective assessment of his or her health. The latter is the average additional number of years a person of that age can expect to live according to current mortality conditions (Eurostat, 2022a). In addition, QoL has a specific subjective well-being variable, "overall life satisfaction", which aims to integrate the diversity of experiences, choices, priorities and values of an individual, which is the ultimate goal of any European policy (Eurostat, 2022b). "Life satisfaction is considered to reflect peoples' subjective evaluations of the risk that various economic, social, political and environmental conditions might exert upon their well-being" (Daskalopoulou et al., 2022).

Human health and well-being are broadly related to climate change (SDG 13) from different dimensions (Whitmee et al., 2015) "affect the quality and quantity of food produced in a range of ways" it will also affect water and lead to an increase in emerging and re-emerging diseases. Some effects will be direct such as the effect of increased heat on the ability to work outdoors; the effects of severe weather events, especially floods and droughts, and the increased frequency of intense storms; and some indirect, such as the spread of diseases (dengue fever, malaria, Etc.), food insecurity and malnutrition. Other authors focus on the relationship between well-being and climate change and show a negative relationship, going as far as to state that climate change will affect physical and mental health and well-being. Extreme storms and droughts will cause anxiety,

depression, post-traumatic stress disorder, substance abuse and even suicide in the world's population (Manning & Clayton, 2018). SDG 3 is also related to gender equality (SDG 5) with immediate benefits such as improved resources and female health or long-term benefits through childcare (Howden-Chapman et al., 2017). Furthermore, it has been shown that greater gender equality appears to increase aggregate happiness, including that of men (Audette et al., 2019); thus equality measures help the well-being of citizens.

SDG 5 "Achieve gender equality and empower all women and girls". According to the United Nations report (2022) on inequality, the world is not on track to achieve gender equality by 2030. Not much progress has been made in recent years, and the pandemic has aggravated this situation. According to their data, it would take another 40 years to equalise the number of women and men in national parliaments; from 2015 to 2020, it has only increased by 3.8 percentage points, reaching 26.2%. Furthermore, one in four women over the age of 15 has been subjected to intimate partner violence in her lifetime, and the number of employed women in 2019 accounted for only 39% of the total. To this must be added, among other things, that in 2021, almost one in five young women will be married before 18. Against this backdrop, United Nations argues that there is a need to accelerate the implementation of measures and create gender-responsive budgeting with monitoring and evaluation.

In addition to this, there is a gender bias in the majority of jobs:

Women are paid less than men, even if they perform similar activities.
The number of women in high-level business and political positions is relatively low.
Women business owners are relatively rare compared to men, accounting for almost 50% of the world's population.

Studies have shown that eradicating gender inequality would add 11–26% to global GDP by 2025 (Roy & Xiaoling, 2022).

It should also be noted that this goal interacts with other SDGs, including the health and well-being SDG 3 and the climate change SDG 13. According to some researchers, climate disasters strongly and negatively affect gender equality. The effects of climate change, such as temperature deviations, and climatological disasters, are associated with a decrease in women's economic and social rights that is accentuated in less developed countries (Eastin, 2018). Moreover, they are underutilised in climate change action as they play a crucial role in its struggle as food producers (in agriculture in some regions of Africa, Southeast Asia and East Asia), household food managers and consumers (Agarwal, 2018). On the other hand, Lau et al. (2021) argue that gender inequality in environmental policies presents a systemic problem made up of complex and dynamic relationships, norms and processes that make it difficult to introduce into these policies.

SDG 13 "Take urgent action to combat climate change and its impacts". Climate change will affect all systems on earth and humankind in all its dimensions. "Demand-side solutions for mitigating climate change include strategies targeting technology choices, consumption, behaviour, lifestyles, coupled

production–consumption infrastructures and systems, service provision and associated sociotechnical transitions. Disciplines vary in their approaches and in the research questions that they ask on demand-side issues" (Creutzig et al., 2018: 260). Concerning soil and food security, there will be both direct and indirect effects. The former include changes in temperature, precipitation and moisture regime and the latter are induced by adaptations such as irrigation, changes in crop rotation and tillage practices. They also affect soil biodiversity (Hamidov et al., 2018). Given this, climate change is expected to hinder poverty reduction. Changes are expected to affect people's incomes, such as droughts, floods, water quantity and quality, and ecosystem degradation. These changes with policy failures in the face of climate change will lead to increased economic and social vulnerability of households and communities, especially among the poorest (Szabo et al., 2016). In the face of climate change, two actions can be carried out: adaptation and mitigation. The first encompasses a set of activities aimed at reducing the risks and taking advantage of the benefits of climate extremes or changes; in contrast, the second involves activities to prevent pollution (Kelman, 2017).

2.2 Twitter as a social marketing tool for the SDGs

Social marketing is configured as an ideal discipline in the environment of sustainable development objectives since its purpose is to achieve a change in behaviour regarding a social issue that benefits both the individual and society. Commercial marketing techniques adapted to the particularities of this discipline are used (Andreasen, 1994). Social marketing was initially defined as: "The design, implementation, and control of programs calculated to influence the acceptability of socialideas and involving considerations of product planning, pricing, communication, distribution and market research" (Kotler & Zaltman, 1971, p. 5).

Concerning behaviour, there are a set of theories and models based on sociology, social psychology and other related areas used in the social marketing field. Theories often posit that behaviours take place in conjunction with affective-cognitive processes. However, the focus is on how people behave in specific settings, not how they feel or think. It is not to say that thought and feeling are not factors in these models; rather, people's behaviours (past and present) are conceived as more indicative of future behaviours than attitudes or emotions (Gerdes & Stromwall, 2008). In social marketing, these models are related to the behavioural school of thought, which argues that people perform acts about their previous experiences and within the social and physical environment in which they live (Ajzen, 1991; Foxall, 2004; Kiriakidis, 2015; Parveen & Ahmad, 2020). Behavioural models imply that people behave in a certain way and that they can be encouraged to behave in other ways, for example, by "nudges" (Spotswood et al., 2012) or changing the environment of choice (Audet & Lefebvre, 2017).

One of the behavioural models most used in the application of social marketing is that of Prochaska and DiClemente (2005). This model initially emerged in psychology to treat addictions (alcohol, drugs, Etc.), although Andreasen (2002) adapted it for application in Social Marketing. Stages: Pre-contemplation, when

the person has no intention of undertaking the attitude change action; contemplation, which refers to the intention to take action in a reasonable time; preparation for action, which means acting shortly; action, behaviour change recently; and confirmation, which would be the maintenance of the behaviour change. Later, social marketing campaigns use this information to predict behaviour change. However, the main reason for the popularity of this model is that it provides a convenient way to segment people based on their changing behaviour and associated needs (Logie-MacIver et al., 2012).

In the online environment Twitter is one of the leading platforms where social movements are most potent. Many authors consider it an essential tool in contemporary communication (Rodríguez & Ureña, 2011; Manfredi-Sánchez et al., 2021) due to the brevity of its messages, the use of hashtags to classify topics and the efficiency in sending and receiving tweets. Social networks, especially Twitter, connect people, especially young people, with other users with whom they share experiences and support (Patton et al., 2017; Wilson & Perkin, 2021). Therefore, international events such as climate summits cannot be understood without analyzing the content published on this microblogging network (Hopke & Hestres, 2018). Likewise, Twitter is essential to pressure public opinion on climate change (Cody et al., 2015; Fownes et al., 2018; Kirilenko & Stepchenkova, 2014). It is a social network with the tendency to comment and discuss social issues, unlike Facebook and Instagram, which are based on entertainment and personal life. This social network is considered a virtual agorathat promotes interaction and the exchange of thoughts, opinions and beliefs in real-time, which makes them an adequate source of research data (Burna & Williams, 2016).

3 Methodology

3.1 The content analysis

The methodology used in this article combines data mining techniques and content analysis, both from a quantitative and qualitative point of view. Content analysis is a method that consists of classifying or coding the various elements of a message into categories in order to find patterns that give a specific meaning to the communication that occurs in them (Krippendorff, 1990). According to the author above, content analysis is considered one of the most important methodologies in communication research since its objective is to rigorously and systematically study the nature of the messages exchanged. In the case under study, the Twitter platform has been selected for two reasons: the first because it is used by 468.22 million users (Statista, 2022), and the second, because it is a social medium that can be followed unilaterally and according to the interest of each person. This feature differentiates it from Facebook, which focuses on mutual relationships and the exchange of personal information (Orminski et al., 2021). The following phases have been followed in the research design:

- Selection of the analysis unit and and the user profile on Twitter to be analyzed. The message or tweet has been taken as the unit of analysis, specifically the messages published by the user @GlobalGoalsUN, the UN's official account for the sustainable development goals, between January 1, 2021, and September 30, 2022. In total, 2,433 tweets have been collected with Twitonomy (Rodríguez-Peral et al., 2022). We have considered it relevant to know which are the most published sustainable development goals (the most recurring ones) in the tweets issued by @GlobalGoalsUN for two reasons:

  – First, the user @GlobalGoalsUN is the Official United Nations (UN) account for the global goals for sustainable development. Bearing in mind that the UN is the organization that approved the 2030 Agenda for Sustainable Development, we consider relevant the information that it could provide to citizens on the SDGs.
  – Secondly, it has been verified that Twitter is configured as an ideal tool by creating an online public space where organizations can inform and receive feedback on their contributions since it is an interactive platform in which users and organizations can share information (Fownes et al., 2018).

- Examination and cleaning. The Grounded Theory (Miller et al., 2019), which emphasizes the creation of personal and subjective meaning or the construction of reality has been considered. The logic on which it is based is that the theory must be based on empirical evidence, that is, evolve from data instead of developing it a priori and then testing it. Constructivist Grounded Theory emphasizes the creation of personal and subjective meaning or the construction of reality (Charmaz, 2006). Under this premise, we have selected the three SDGs under study: Climate change (13), gender equality (5), and health and well-being (3) because after an exploration of the data, these three objectives have been the most mentioned in the messages published. With this classification, the selected messages were 772.

- Identification of the variables and codification. The following variables have been selected:

  – Impact: This variable has been created by adding the likes and retweets indicators since likes and retweets can be seen as distinctly different types of reaction, compared to replies, concerning user engagement Salgado & Bobba, 2019).
  – Format: Given the importance of the multimedia format in social media communication, the categories of this variable are text, video, image and link to an information page (Zhang, 2010).
  – Social marketing. This variable is related to the purpose of the tweet and can be informative, dialogic and behavioural (Guidry et al., 2014; Guo & Saxton, 2014). Behavioral messages encourage some behavior or action by offering all the information necessary to carry out said behavior. In addition, another category has been identified, called action. Unlike the behaviour category, it supposes a stimulus to change behaviour but does not provide all the information necessary to carry out the same.

– Sentiment. The sentiment variable has been selected to examine happiness in the messages, which has three categories referring to the emotional connotation of the message, positive, negative and neutral (Saif et al., 2016).
– Well-being. (corresponding to SDG 3). Dichotomic variable.
– Gender (corresponding to SDG 5). Dichotomic variable.
– Climate (corresponding to SDG 13). Dichotomic variable.

- Analysis and interpretation of the results.

3.2 The classification tree

Classification trees are a data mining technique that prepares, probes and explores the data to reveal hidden information. The solution to prediction, classification and segmentation problems is addressed. The Classification tress technique allows the creation of a classification model based on flow charts. They classify cases in groups or predict values of a dependent variable (criterion) based on independent variables (predictors) values. In this case, the division method called CHAID (Chi-square automatic interaction detector) will be used, which allows the automatic detection of interactions through Chi-square (Pérez & Santín, 2007). The process stops when no more statistically significant predictors can be found. CHAID requires a categorical dependent variable and several independent or predictive variables that are combined, allowing segments to be identified. It is limited to nominal and ordinal variables and makes no normality assumption (Fitri et al., 2019; Fuentes-Lara & Arcila-Calderón, 2023). In the model presented in our research, the dependent variable is the impact (or interactions), formed by the sum of the most shared likes, to which node 0 corresponds. The impact variable is nominal and has the following categories: (1 if impact $< =50$; 2 if the impact is between 50 and 200 interactions; 3 if the impact is between 201 and 1000 interactions, and 4 if impact $> =1000$). The independent variables introduced in the analysis were: Format, social marketing, and sentiment, being statistically significant. Each division of the nodes in the CHAID method has a 95% confidence, that is, chi-square, $p < 0.05$ (Escobar, 1998). Specifically, it is a technique that can be useful for detecting tweets segmentation profiles for several reasons (Do Valle et al., 2012; Struhl, 2015):

Allows automatic detection of interactions using Chi-square. CHAID chooses the independent (predictor) variable with the most substantial interaction with the dependent variable at each step.

The CHAID analysis can only be performed if the variables produce a statistically significant split in the sample under study. Since the sample is split repeatedly, the technique works best if large sample sizes are used, making it ideal for analyzing social media data involving a large volume of unstructured information.

CHAID offers marketers advantages over other predictive techniques, such as neural networks and logistic regression, because it is a rule-induction approach that a marketer can follow to improve the chances that their Tweets will have

more impact. It is not the case with neural networks, which use a network of hidden connections to get their results and do not provide information on how they are obtained or logistic regression, which produces an equation to predict results, but which it cannot be easily translated into a set of business rules for practical application.

Decision trees are less affected by extreme values. It makes CHAID specifically suitable for analyzing Twitter data, as many Twitter-related variables tend to have highly skewed long-tailed Poisson distributions with many extreme values (for example, the number of retweets per tweet).

The tree model obtained is a graphical representation. In the case under study, all variables are treated as nominal, and each node contains a frequency table that shows the number of cases (frequency and percentage) for each category of the dependent variable. It also includes the frequency graph. The "predicted" category, which is the category with the highest frequency value at each node, is highlighted with a grey stripe (Berlanga Silvente et al., 2013).
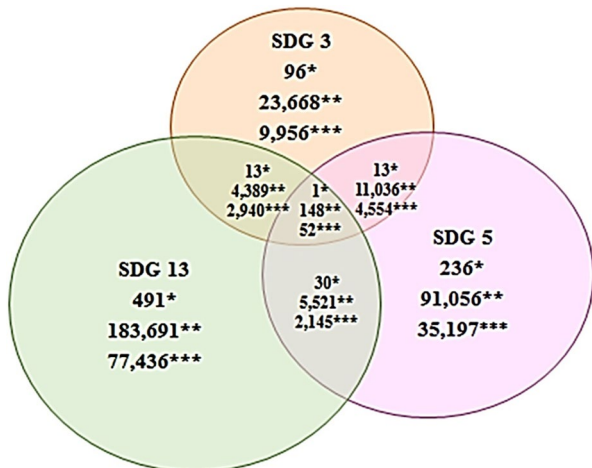
4 Results

4.1 Descriptive analysis results

Firstly, a descriptive analysis of the messages has been conducted to verify which SDGs are the most published in the conversations and which have achieved the most significant impact. Figure 1 shows both the number of messages and the impact of the messages that speak about various SDGs.

Figure 1 shows that SDG 13 (climate change) has had the most significant impact of the three analyzed, with 491 messages, 183,691 likes, and 77,436 retweets. It shows the importance of climate change for the United Nations. It is followed by SDG 5

Fig. 1 Number of messages published with SDGs 3, 5 and 13, likes and retweets. Note: *Messages **Likes *** Retweets. Source. Own elaboration from https://twitter.com/GlobalGoalsUN?ref_src=twsrc%5Egoogle%7Ctwcamp%5Eserp%7Ctwgr%5Eauthor

SDG 3
96*
23,668**
9,956***

13*
4,389**
2,940***

1*
148**
52***

13*
11,036**
4,554***

SDG 5
236*
91,056**
35,197***

SDG 13
491*
183,691**
77,436***

30*
5,521**
2,145***

(gender equality) with 236 messages, 91,056 likes, and 35,197 retweets, and, finally, SDG 3 (health and well-being) with 96 messages, 23,668 likes, and 9,956 retweets.

For the most part, the messages about SDG 13 seek to make the population aware of the consequences of climate change and the urgency of "acting now." An example of this is the following message, with 3810 retweets and 9930 likes:

"RT @UNDP: We can't ignore #ClimateChange any longer. Unless we end the excuses, we'll be another species facing extinction. Join us and @…"

Regarding SDG 5 (gender equality), the themes of his messages focus on the abuse of women and girls, as it appears in the following message, with 2,413 retweets and 6,246 likes:

"RT @antonioguterres: I am appalled by the abduction of more than 300 girls during an attack on a secondary school in Nigeria today."

Concerning SDG 3 (health and well-being), its message with the most significant impact (2,475 retweets and 3,281 likes) is a message that relates well-being to climate change:

"RT @IPCC_CH: PRESS RELEASE | 28 Feb 2022 #Climatechange: a threat to human well-being and health of the planet. Taking action now can sec…".

Figure 1 also shows the number of messages that include more than one objective. In this sense, it is observed that SDG 13 (climate change) and SDG 5 (gender equality) are the ones that appear the most together (30 messages). However, together they have only gotten 5,521 likes and 2,145 retweets. Of these messages, the one that has achieved the greatest impact (803 retweets and 2,251 likes) is the following:

"@antonioguterres: The impacts of climate change & environmental degradation fall most heavily on women. They are 80% of those displaced…".

Continuing with the messages that include two SDGs together, it should be noted that those on SDGs 5 (gender equality) and 3 (health and well-being) present a smaller number of messages (13) but a greater number of likes and retweets, 11,036 and 4,554, respectively. Of these 13 messages, the following stand out, with 1,356 retweets and 3,595 likes:

"RT @antonioguterres: Gender equality is a question of power. But equal power will not happen by itself in a male-dominated world. We must…"

The messages in which SDGs 13 and 3 interact are only 13, with 4,389 likes and 2,940 retweets. Of them, the message mentioned above stands out.

Finally, only one message in which the three SDGs under study interact. It should be noted that it is an original message from @ONU and with a low impact, 148 retweets, and 52 likes:

"Women everywhere can power up to drive the #ClimateAction agenda! From inclusive communities to climate justice to renewable energy to choices in daily life – women's leadership matters. Happy #IWD2021 from climate leaders: https://t.co/fYpfJgAPB4 https://t.co/RlwtuQbEjk"

4.2 The classification tree model

A classification tree model was made that allowed carrying out a segmentation of the tweets to analyze in more depth the messages that contain the three selected SDGs. Figure 1 shows the classification tree, obtained using the Chi-squared Automatic Interaction Detection (CHAID) algorithm (Ghoson, 2011) which allows four homogeneous sub-samples to be distinguished. This classification identifies the segmentation profiles of each of the four groups of differentiated messages. It is a classification tree with two levels of depth and four terminal nodes. Below we explain the process of identifying profiles in the classification tree:

In the first place, node 0 describes the dependent variable: The impact of the messages divided by sections according to the number of interactions.

Next, we observe that the dependent variable branches into two nodes: Node 1 and 2, belonging to the format variable, indicating that this is the primary predictor variable. In this sense, node 1 refers to messages containing an image or a link to an information page, and node 2 refers to group messages with a video or text. In node 2, it can be seen that 41.5% of the messages containing video or text have achieved an impact (more shared likes) that exceeds 200.

Continuing with the explanation of the segmentation obtained and concerning node 1, the variable associated with this is the feeling or emotional connotation of the message. Nodes 3 and 4 are distinguished, which groups positive messages on the one hand and negative and neutral messages on the other. In this sense, 19% of messages with a positive emotional connotation have achieved an impact of more than 1,000 interactions, compared to 1.3% of messages with a negative or neutral emotional connotation.

Finally, about node 2, the following variable related to this is social marketing, giving rise to nodes 5 and 6 that distinguish between messages of behaviour and dialogue on the one hand and those of information and action on the other. In this sense, it should be noted that 49.1% of the informative and action messages (which are those that encourage people to carry out a specific action but without specifying the information necessary to carry it out) have achieved between 200 and 1,000 interactions and that 23.7% have exceeded 1000 interactions.

Based on the information provided by the classification tree (Fig. 2), we can distinguish the following segmentation profiles:

Profile 1 (node 3). Messages containing an image or a link to a page of information of interest have a neutral or negative connotation.

Profile 2 (node 4). Messages containing an image or a link to a page of information of interest have a positive connotation.

Profile 3 (node 5). Messages containing video or text and dialogue or behaviour purpose.

Profile 4 (node 6). Messages containing video or text and informational or action purposes.
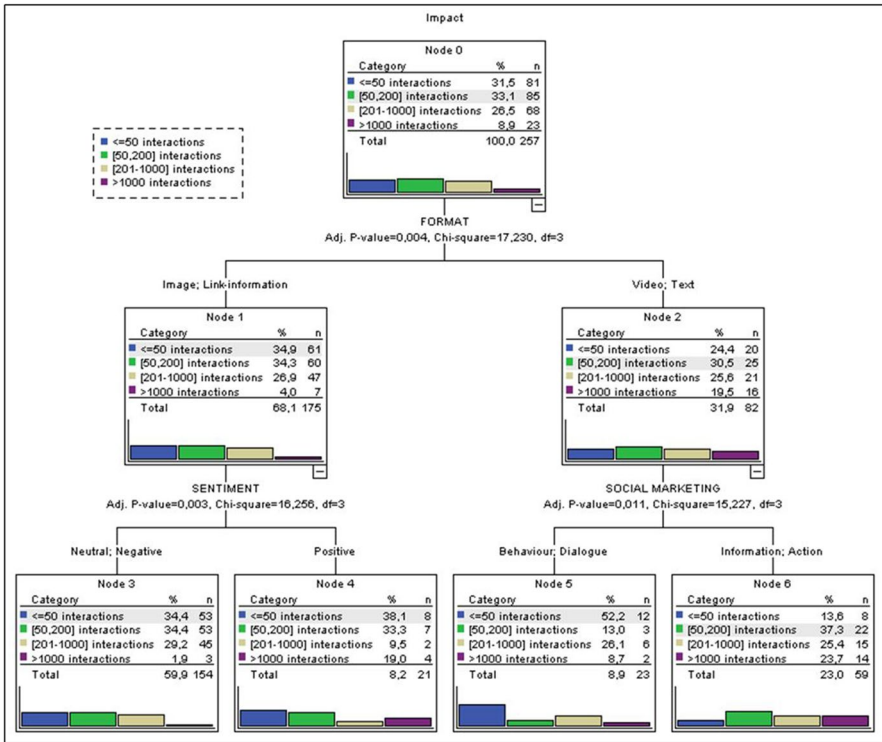
Fig. 2 Classification Tree Analysis (CHAID) Algorithm. Source. Own elaboration

The Chi-Square test (Table 1) has been calculated to confirm the relation between the messages' impact (measured by the sum of likes and retweets) and the segmentation profile. The p-value $(0.000) < 0.05$ indicates that there is a relationship between the two variables indicated.

Table 2 and Fig. 3 have been prepared to know the impact obtained in the messages corresponding to each profile. Table 3 shows that profile 4 (messages that contain video or text with an informative or action purpose) is the one that has obtained more interactions or impact (43.53% of the total interactions). The second profile with the most impact was 3 (messages containing video or text for dialogue or behaviour). These results show the importance of both the format in the first place and the social marketing variable in second place in the public's reaction.

Figure 3 shows that a more significant number of messages have been published, impacting between 50 and 200 interactions. In this sense, checking the SDGs that treat the messages according to the profiles obtained is interesting.

Figure 4 highlights that the SDGs published the most are not the ones that have received the most significant reaction from the public. In this sense, if we consider the messages of profile 4 (with the most impact), SDG 3 (health and well-being) has

Table 1 Chi-Squre test for the impact variable

Test Statistics		
	Profiles	Impact
Chi-Square	13,410[a]	11,769[a]
df	3	3
Asymp. Sig	,004	,008

a 0 cells (0.0%) have expected frequencies less than 5. The minimum expected cell frequency is 9,8.

Source. Own elaboration

been the most popular. However, the message with the most significant impact has been about the environment. Below is the message conversation:

> "We can't ignore #ClimateChange any longer. Unless we end the excuses, we'll be another species facing extinction.
> Join us and @FrankieTheDino, and let's take #ClimateAction before it's too late: http://dontchooseextinction.com
> #DontChooseExtinction #COP26".

The tweet shows the campaign under the slogan #DontChooseExtinction and contains a revealing video in which a dinosaur appears at the UN headquarters to encourage governments to make the right decisions to protect species. In a serious and firm tone, this message encourages action, although it does not detail the steps to follow. However, it is a call to urgent action for the rulers. From a social marketing perspective, the messages that have achieved the most significant impact have been those of action (without specifying the steps to follow), followed by informative messages, those of dialogue, and lastly, those of behaviour, which are the ones that do indicate the instructions to follow to do something in particular.

The message on well-being that has achieved the most significant impact is the following:

> "Happy International Day of Rural Women!

Let's thank #RuralWomen around the world and show our support for the unsung heroes of resilient communities and custodians of natural resources."

It is a message with a dialogue purpose and a positive tone that includes the word happy. The most frequent words in wellness messages are happy first, followed by "globalgoals", "people", "planet", and "action". Messages about wellness often

Table 2 Impact percentage by profile

Profiles	Impact percentage
Profile 1	18,46%
Profile 2	5,17%
Profile 3	32,84%
Profile 4	43,53%

Source. Own elaboration

Fig. 3 Impact by profile. Source. Own elaboration

include references to happiness as well. However, the positive messages are not the ones that have achieved a more significant reaction from the public. It is also interesting to note that the sentiment depends on the format and most of these positive messages contain an image. The following results related to environmental messages should also be noted: The tweets with the most significant impact have a neutral emotional connotation; the most popular ones about gender are usually positive; those with the most significant impact on well-being have an emotional connotation, and none have a negative emotional connotation. It is interesting to note that this well-being message also speaks to gender. In fact, more than 28% of messages about well-being also talk about gender and the environment.
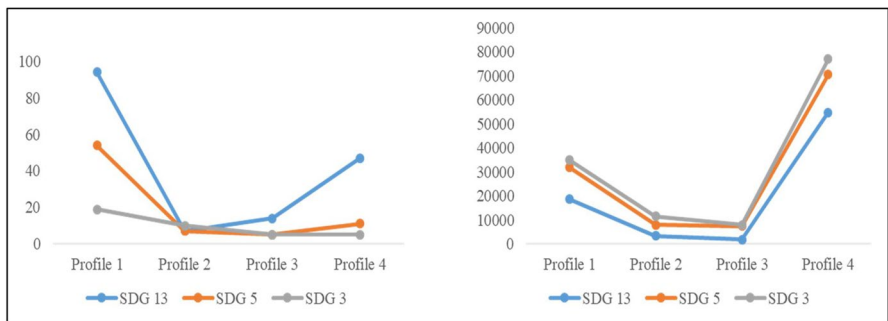

Fig. 4 Messages published (%) and impacto by profile and SDG. Source. Own elaboration

5 Discussion and practical implications

Based on artificial intelligence, the methodology used has made it possible to identify the Message segmentation profiles that have been prepared based on the impact achieved in the analyzed sample. The importance of the social marketing variable stands out since the relationship between this variable and the impact has been demonstrated in the message profiles.. This contribution complements research results such as those of Guidry et al. (2014); Lovejoy and Saxton (2012). Those studies carried out in social networks and social marketing analyze a similar variable called "purpose", in which they differentiate three categories, information, dialogue and action. These studies identify action messages as those that encourage a certain attitude.

Related to format, it is known that multimedia format encourage the public reaction. In this case this variable is relevant to design the segmentation profile. It is interesting to note that, although video is a relevant category in this study, links to a page with information of interest are, according to the literature, an influential factor in public participation and reaction (Surucu-Balci et al., 2020).

Concerning the SDGs, it has been verified that the most published have not achieved the most significant impact. The most published SDG has been climate action (SDG 13), which coincides with a large majority of research (De Luca et al., 2022; Oliveira et al., 2021; Roldan-Alvarez et al., 2021). It has also been found that messages talk about several objectives in the same message, for example, SDG 13 and SDG 5. This issue has been observed in other studies where women's empowerment is highlighted in several sub-development areas (Holmberg & Hellsten, 2015; Chakraborty & Biswal, 2022). Concerning SDG 3 (well-being and health), it is necessary to highlight that it has been the least published but the one that has achieved the most significant impact. These refer to various SDGs of a different nature, technology, human rights, youth, Etc. But the studies tend to focus more on health issues (Pavlova & Berkers, 2020; Coll-Seck et al., 2019). Of the three objectives the one that has the greatest impact is climate change this is in line with the Eurobarometer survey which shows that European citizens believe that climate change is the most serious problem facing the world. In it, nine out of ten respondents consider climate change to be a serious problem (93%), and almost eight out of ten (78%) consider it to be very serious (European Union, 2021). This is followed by gender equality and finally health and well-being. It would be interesting to analyze the relationship between health and wellbeing and gender equality since few messages have a very high impact (likes and retweets) while in the set of climate change and gender equality with many messages few likes and retweets.

Regarding feelings, most of the messages have a neutral connotation, although, in those related to the environment, there is also an interesting volume of tweets with a negative connotation (Reyes-Menendez et al., 2018). Although some studies indeed relate happiness more with other SDGs, such as 4 (education) (Marujo & Casais, 2021). Subjective well-being has been shown to help predict prosocial behaviours that others value. For example, happier individuals volunteer more, so under this premise, it would be interesting to encourage happiness in messages in order to encourage active helping behaviour (Thoits & Hewitt, 2001).

The results' importance is based on the relevance of the public analysis on Twitter about the SDGs for two reasons. Firstly, the contributions of this research are based on models and techniques that analyze a social medium in which millions of users participate. Therefore, using these techniques and the results of studies of these characteristics can help compare studies already carried out or identify new problems related to the SDGs. Second, considering initiatives on the United Nations SDGs, this technique to outline groups of messages with more significant impact is relevant to the scientific community and can substantiate the findings using other methodologies. Our findings can also be used by the United Nations and other institutions seeking to develop or improve communication on the SDGs.

6 Conclusions

This research uses artificial intelligence techniques such as the classification tree (Fuentes-Lara & Arcila-Calderón, 2023) to predict which are the characteristics of the messages related to the impact. In this case, it has been verified that there is an association between the variables format and happiness (based on the emotional connotation) with the impact, on the one hand, and on the other hand, social marketing and format with the impact. It has made it possible to identify the four profiles mentioned above.

The importance of the social marketing variable stands out since the relationship between this variable and the impact has been demonstrated in the message profiles. Profile 4, made up of video or text messages and for informational or behavioral purposes, is the one that has achieved the most significant impact concerning each of the three SDGs considered. The format is relevant variable to design the segmentation profile. It is interesting to note that, although video is a relevant category in this study, links to a page with information of interest are an influential factor in public participation and reaction. Concerning the SDGs, the most published SDG has been climate action (SDG 13) and also the one that has the greatest impact, followed by gender equality (SDG 5) and finally health and well-being (SDG 3). Concerning SDG 3 (well-being and health), it is necessary to highlight that it has been the least published but the one that has achieved the most significant impact in each profile, valuing the importance that the public has for their well-being and health. It has also been found that messages talk about several objectives in the same message, for example, SDG 13 and SDG 5.

The study makes a methodological contribution by showing how the CHAID predictive model can be used for Twitter data analysis and a theoretical contribution by providing insights into what leads to higher impact (retweets plus likes) in the context of social marketing and SDGs. Previous studies have been limited to the content of tweets as an antecedent to retweets or likes. In parallel, other researchers uses content analysis of tweets to determine what topics people tweet about in different contexts. This study bridges the gap between these two types of studies by using CHAID (chi-square interaction automatic detection) analysis to build predictive models for message impact using three types of predictors combining message characteristics: content about SDG on the tweets, sentiment, format, and purpose of the tweets (social marketing variable).

7 Limitations

This academic work, like any other, is not exempt from its corresponding theoretical and methodological limitations. First, not being able to guarantee the quality of the secondary data used for this research, due not only to the narratives of the messages and their format but also because most of these messages are opinions of people. Second, the data was collected in a specific interval of time. This fact makes it challenging to consolidate the empirical results of this article. Longitudinal studies would be very valid to solve the possible bias in this scientific study. Third, the data for this work was collected from a single secondary source. It could hinder the detection of opportunities and threats linked to the implementation of the SDGs. Fourth, the choice of the variables analyzed for this research makes it difficult to draw a clearer picture of the behavior of citizens regarding the SDGs. The last one is the need for solid academic literature that shows solid evidence to demonstrate that social marketing and happiness constitute two critical pieces in the sustainable development of the territories per the SDGs of the 2030 agenda. Despite the limitations mentioned above, this article decisively addresses the objectives of this research.

8 Future lines of research

Acknowledging that there is still much to understand about the relevance that the SDGs will have on the economic and social growth of citizens in the post-Covid-19 era, this scientific study is part of the academic corpus that empirically analyzes the content of the profile in Twitter of the UN directly linked to the promotion and development of the SDGs at a global level. It is a hot topic that has attracted the interest of many researchers in recent years (Galiano Coronil & Ortega Gil, 2019). Although, it is not accompanied by a great scientific enthusiasm to explore this topic from the perspective of social marketing and happiness (Ravina-Ripoll et al., 2021a, b). In light of what has been argued, it is interesting for future research to focus on advancing the design of holistic and multidisciplinary studies to understand that the behavior patterns of the inhabitants of the global village can be changed related to the SDGs through the academic disciplines of social marketing and happiness management (Jiménez-Marín et al., 2021). On the other hand, in conceiving the role that social marketing and happiness can play in the landscape of the SDGs. In this way, citizens' more prosocial, ecological, and altruistic behavior can be achieved in the search for a more sustainable, habitable, and supportive planet (Ravina-Ripoll et al., 2021a, b).

Likewise, new scientific papers that explore the results achieved in this research on other digital platforms (for example, Facebook or Instagram) are interesting. It will allow, among other things, to enjoy the opinions of the main leaders in SDGs on the construction of a planet oriented to the integral development of human beings and, therefore, their happiness and social well-being.

References

Abuhussein, T., & Magatef, S. (2022). Social marketing, social media and eudaimonic well-being: A qualitative exploration. *Asia-Pacific Journal of Business Administration*. https://doi.org/10.1108/APJBA-08-2021-0393

Agarwal, B. (2018). Gender equality, food security and the sustainable development goals. *Current Opinion in Environmental Sustainability*, *34*, 26–32. https://doi.org/10.1016/j.cosust.2018.07.002.

Ajzen, I. (1991). The Theory of Planned Behaviour. Organizational Behaviour and Human. *Decision Processes, 50*(179), 211.

Ali, M. (2021). A social practice theory perspective on green marketing initiatives and green purchase behavior. *Cross Cultural Management, 28*(4), 815–838. https://doi.org/10.1108/CCSM-12-2020-0241

Amine, L. S., & Staub, K. M. (2009). Women entrepreneurs in sub-saharan africa: An institutional theory analysis from a social marketing point of view. *Entrepreneurship and Regional Development, 21*(2), 183–211. https://doi.org/10.1080/08985620802182144

Andreasen, A. R. (1994). Social marketing: Its definition and domain. *Journal of Public Policy & Marketing, 13*(1), 108–114.

Andreasen, A. R. (2002). Marketing Social marketing in the social change marketplace. *Journal of Public Policy & Marketing, 21*(1), 3–13.

Arias, X., & Costas, A. (2016). *La nueva piel del capitalismo*. Galaxia Gutenberg.

Audette, A. P., Lam, S., O'Connor, H., et al. (2019). Quality of Life: A Cross-National Analysis of the Effect of Gender Equality on Life Satisfaction. *Journal of Happiness Studies, 20*(7), 2173–2188. https://doi.org/10.1007/s10902-018-0042-8

Audet, J. N., & Lefebvre, L. (2017). What's flexible in behavioral flexibility? *Behavioral Ecology, 28*(4), 943–947.

Aya Pastrana, N., Somerville, C., & Suggs, L. S. (2020). The gender responsiveness of social marketing interventions focused on neglected tropical diseases. *Global Health Action, 13*(1), 1711335–1711335. https://doi.org/10.1080/16549716.2019.1711335

Berlanga Silvente, V., Rubio Hurtado, M. J., & Vilà Baños, R. (2013). Cómo aplicar árboles dedecisión en SPSS. [Online] REIRE, *Revista d'Innovació i Recerca en Educació, 6*(1), 65–79. https://www.ub.edu/ice/reire.htm

Burna, P., & Williams, M. (2016). Us and them: Identifying cyber hate on Twitter across multiple protected characteristics. *EPJournal Data Science, 5*, 11. https://doi.org/10.1140/epjds/s13688-016-0072-6

Chakraborty, U., & Biswal, S. K. (2022). Psychological empowerment of women entrepreneurs: A netnographic study on twitter. *Management Research Review, 45*(6), 717–734. https://doi.org/10.1108/MRR-01-2021-0046

Charmaz, K. (2006). *Constructing grounded theory: A practical guide through qualitative analysis*. Sage Publications.

Cody, E. M., Reagan, A. J., Mitchell, L., Dodds, P. S., & Danforth, C. M. (2015). Climate Change Sentiment on Twitter: An Unsolicited Public Opinion Poll. *PLoS ONE*, *10*(8), e0136092. https://doi.org/10.1371/journal.pone.0136092.

Coll-Seck, A., Clark, H., Bahl, R., Peterson, S., Costello, A., & Lucas, T. (2019). Framing an agenda for children thriving in the SDG era: A WHO–UNICEF–Lancet commission on child health and wellbeing. *The Lancet* (British Edition), *393*(10167), 109–112. https://doi.org/10.1016/S0140-6736(18)32821-6.

Corraliza, J., Castro, R., Mar, A., Berenguer, J., García, E., Hernández, B., Jiménez, M., Lafuente, R., Martín, R., Moreno, M., Pardo, M., Santiago, P., Suárez, E. & Tábara, J. (2006). *Persona, Sociedad y Medio Ambiente: Perspectiva de la investigación social de la sostenibilidad*. Egondi Artes Gráficas S.A.

Creutzig, F., Roy, J., Lamb, W. F., et al. (2018). Towards demand-side solutions for mitigating climate change. *Nature Clim Change, 8*, 260–263. https://doi.org/10.1038/s41558-018-0121-1

Daskalopoulou, I., Karakitsiou, A., & Malliou, C. (2022). A Multicriteria Analysis of Life Satisfaction: Assessing Trust and Distance Effects. *Operations Research Forum, 3*(4), 1–20. https://doi.org/10.1007/s43069-022-00170-8

De Luca, F., Iaia, L., Mehmood, A., & Vrontis, D. (2022). Can social media improve stakeholder engagement and communication of sustainable development goals? A cross-country analysis.

Technological Forecasting & Social Change, *177*, 121525. https://doi.org/10.1016/j.techfore.2022.121525.

Do Valle, P. O., Pintassilgo, P., Matias, A., & André, F. (2012). Tourist attitudes towards an accommodation tax earmarked for environmental protection: A survey in the algarve. *Tourism Management* (1982), *33*(6), 1408–1416.

Downey, L. H., Hardman, A. M., & Byrd, S. (2019). P207 using formative research to develop the HappyHealthy social marketing campaign. *Journal of Nutrition Education and Behavior, 51*(7), S126–S126. https://doi.org/10.1016/j.jneb.2019.05.583

Esaiasson, P., Dahlberg, S., & Kokkonen, A. (2020). In pursuit of happiness: Life satisfaction drives political support. *European Journal of Political Research, 59*(1), 25–44. https://doi.org/10.1111/1475-6765.12335

Eastin, J. (2018). Climate change and gender equality in developing states. *World Development*, 107, 289–305. https://doi.org/10.1016/j.worlddev.2018.02.021.

Elsaman, H. A., & Sergio, R. P. (2021). the psychographics of green marketing strategy vis-a-vis corporate social responsibility: Implications to organisational growth. *International Journal of Entrepreneurship, 25*, 1–11.

Escobar, M. (1998). *Las aplicaciones del análisis de segmentación: el procedimiento Chaid*. Retrieved from https://e-spacio.uned.es/fez/eserv/bibliuned:Empiria-1998-DB19A741-F905-77F0-77D0-D0DF22E2872F/Documento.pdf. Accessed 1 Feb 2023.

European Union. (2021). Barometer Climate Change. Recuperado el 1 de septiembre del 2022 in https://europa.eu/eurobarometer/surveys/detail/2273. Accessed 1 Sept 2022.

Eurostat. (2022a). *Thematic glossaries*. Retrieved from https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Thematic_glossaries. Accessed 20 Nov 2022.

Eurostat. (2022b). *Quality of life indicators - overall experience of life*. Retrieved from https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Quality_of_life_indicators_-_overall_experience_of_life. Accessed 25 Nov 2022.

Fitri, V. A., Andreswari, R., & Hasibuan, M. A. (2019). Sentiment analysis of social media twitter with case of anti-LGBT campaign in indonesia using naïve bayes, decision tree, and random forest algorithm. *Procedia Computer Science, 161*, 765–772. https://doi.org/10.1016/j.procs.2019.11.181

Florence, E. S., Fleischman, D., Mulcahy, R., & Wynder, M. (2022). Message framing effects on sustainable consumer behaviour: A systematic review and future research directions for social marketing. *Journal of Social Marketing, 12*(4), 623–652. https://doi.org/10.1108/JSOCM-09-2021-0221

Foxall, G. (2004). *Consumer psychology in behavioral perspective*. Beard Books.

Fownes, J. R., Yu, C., & Margoli, D. B. (2018). Twitter and climate change". *Sociology Compass*, *12*(6), e12587. https://doi.org/10.1111/soc4.12587.

Friedmann, E. (2018). Increasing women's participation in the STEM industry: A first step for developing a social marketing strategy. *Journal of Social Marketing, 8*(4), 442–460. https://doi.org/10.1108/JSOCM-12-2017-0086

Fuentes-Lara, C., & Arcila-Calderón, C. (2023). El discurso de odio islamófobo en las redes sociales. Un análisis de las actitudes ante la islamofobia en Twitter. *Mediterraean Journal of Communication, 14*(1), 1–16. https://doi.org/10.14198/MEDCOM.23044

Fukuda-Parr, S., & Muchhala, B. (2020). The Southern origins of sustainable development goals: Ideas, actors, aspirations. *World Development*, *126*, 104706. https://doi.org/10.1016/j.worlddev.2019.104706.

Galiano Coronil, A., Ortega Gil, M. (2019). Social Marketing, welfare indicators and SDG. Analysis of the official account of the Spanish Government @desdelamoncloa. *Retos Journal of Administration Sciences and Economics*, *9*(18), 211–229. https://doi.org/10.17163/ret.n18.2019.03.

Galiano-Coronil, A., Jiménez-Marín, G., Elías Zambrano, R., & Tobar-Pesántez, L. B. (2021). Communication, Social Networks and Sustainable Development Goals: A Reflection From the Perspective of Social Marketing and Happiness Management in the General Elections in Spain. *Frontiers in Psychology*, 3657. https://doi.org/10.3389/fpsyg.2021.743361.

Gerdes, K. E., & Stromwall, L. K. (2008). Conation: A missing link in the strengths perspective. *Social Work, 53*(3), 233–242.

Giantari, I. G., Ketut, A., & Sukaatmadja, I. P. G. (2021). Effects of environmental orientation, green marketing mix and social capital on the competitive advantage of real estate developers in bali. *Property Management, 39*(2), 193–209. https://doi.org/10.1108/PM-01-2020-0005

Ghoson, A. (2011). Decision tree induction & clustering techniques in SAS enterprise miner, SPSS clementine, and IBM intelligent miner A comparative analysis. *International Journal of Management & Information Systems*, *14*(3). https://doi.org/10.19030/ijmis.v14i3.841.

Guidry, J. P. D., Waters, R., & Saxton, G. D. (2014). Moving social marketing beyond personal change to social change: Strategically using twitter to mobilize supporters into vocal advocates. *Journal of Social Marketing, 4*(3), 240–260. https://doi.org/10.1108/JSOCM-02-2014-0014

Guijarro, E., Santadreu-Mascarell, C., Blasco-Gallego, B., Canós-Darós, L., & Babiloni, E. (2021). On the identification of the key factors for a successful use of twitter as a medium from a social marketing perspective. *Sustainability (Basel, Switzerland), 13*(12), 6696. https://doi.org/10.3390/su13126696

Guo, C., & Saxton, G. D. (2014). Tweeting social change: How social media are changing nonprofit advocacy. *Nonprofit and Voluntary Sector Quarterly, 43*(1), 57–79. https://doi.org/10.1177/0899764012471585

Hamidov, A., Helming, K., Bellocchi, G., et al. (2018). Impacts of climate change adaptation options on soil functions: A review of European case-studies. *Land Degradation and Development, 29*, 2378–2389. https://doi.org/10.1002/ldr.3006

Holmberg, K., & Hellsten, I. (2015). Gender differences in the climate change communication on twitter. *Internet Research, 25*(5), 811–828. https://doi.org/10.1108/IntR-07-2014-0179

Hopke, J. E., & Hestres, L. E. (2018). Visualizing the Paris Climate Talks on Twitter: Media and Climate Stakeholder Visual Social Media During COP21. *Social Media + Society, 4*(3), 205630511878268. https://doi.org/10.1177/2056305118782687.

Howden-Chapman, P., Siri, J., Chisholm, E., Chapman, R., Doll, C. N., & Capon, A. (2017). *SDG 3: Ensure healthy lives and promote wellbeing for all at all ages. A guide to SDG interactions: from science to implementation*. France: International Council for Science, 81–126. https://council.science/wp-content/uploads/2017/03/SDGs-interactions-3-healthy-lives.pdf. Accessed 2 Dec 2022

Jiménez-Marín, G., Zambrano, R. E., Galiano-Coronil, A., & Tobar-Pesántez, L. (2021). Brand management from social marketing and happiness management binomial of in the age of industry 4.0. *Journal of Legal, Ethical and Regulatory Issues*, *24*(3), 1–10.

Johns, R. (2020; 2019). Consumer well-being research: Integrating social marketing and service research. *Journal of Social Marketing*, *10*(1), 125–138. https://doi.org/10.1108/JSOCM-10-2018-0119.

Keim-Malpass, J., Mitchell, E. M., Sun, E., & Kennedy, C. (2017). Using twitter to understand public perceptions regarding the #HPV vaccine: Opportunities for public health nurses to engage in social marketing. *Public Health Nursing* (Boston, Mass.), 34(4), 316–323. https://doi.org/10.1111/phn.12318.

Kelman, I. (2017). Linking disaster risk reduction, climate change, and the sustainable development goals. *Disaster Prevention and Management, 26*(3), 254–258. https://doi.org/10.1108/DPM-02-2017-0043

Kiriakidis S. (2015). Theory of planned behaviour: The intention-behaviour relationship and the perceived behavioural control (PBC) relationship with intention and behaviour. *International Journal of Strategic Innovative Marketing*, *03*, 40–51. https://doi-org.bibezproxy.uca.es/https://doi.org/10.15556/IJSIM.02.03.004.

Kirilenko, A. P., & Stepchenkova, S. O. (2014). Public microblogging on climate change: One year of Twitter worldwide. *Global Environmental Change, 26*(1), 171–182. https://doi.org/10.1016/j.gloenvcha.2014.02.008

Kotler, P., & Zaltman, G. (1971). Social marketing: An approach to planned social change. *Journal of Marketing, 35*(3), 3–12.

Kotler, P. & Roberto, E.L. (1992). *Marketing Social*. Diaz de Santos.

Kotler, P., Roberto, N., & Lee, N. (2002). *Social Marketing: Improving the quality of life*. Sage.

Krippendorff, K. (1990). *Metodología de análisis de contenido. Teoría y práctica*. Paidós Comunicación.

Lau, J.D., Kleiber, D., Lawless, S., & Cohen, P.J. (2021). Gender equality in climate policy and practice hindered by assumptions. *Nature Climate Change*, *11*, 186-192. https://doi.org/10.1038/s41558-021-00999-7.

Logie-MacIver, L., Piacentini, M., & Eadie, D. (2012). Using qualitative methodologies to understand behaviour change. *Qualitative Market Research, 15*(1), 70–86. https://doi.org/10.1108/13522751211192008

Lovejoy, K., & Saxton, G. D. (2012). Information, community, and action: How nonprofit organizations use social media. *Journal of Computer-Mediated Communication*, 337–353. https://doi.org/10.1111/j.1083-6101.2012.01576.x.

Manfredi-Sánchez, J.-L., Amado-Suárez, A., & Waisbord, S. (2021). Presidential Twitter in the face of COVID-19: Bet¬ween populism and pop politics. *Comunicar, 29*(66), 83–94. https://doi.org/10.3916/C66-2021-07

Manning, C., & Clayton, S. (2018). Threats to mental health and wellbeing associated with climate change. In *Psychology and climate change* (pp. 217–244). Academic Press. https://doi.org/10.1016/B978-0-12-813130-5.00009-6.

Martam, I. (2016). Strategic social marketing to foster gender equality in indonesia. *Journal of Marketing Management, 32*(11–12), 1174–1182. https://doi.org/10.1080/0267257X.2016.1193989

Marujo, H. A., & Casais, M. (2021). Educating for public happiness and global peace: Contributions from a portuguese UNESCO chair towards the sustainable development goals. *Sustainability (Basel, Switzerland), 13*(16), 9418. https://doi.org/10.3390/su13169418

Meadows, D. H., Meadows, D. L., Randers, J., & Behrens III, W. W. (1972). *The limits to growth-club of rome*. Universe Books. Retrieved from https://www.donellameadows.org/wp-content/userfiles/Limits-to-Growth-digital-scan-version.pdf. Accessed 4 Nov 2022.

Mehmet, M., Roberts, R., & Nayeem, T. (2020). Using digital and social media for health promotion: A social marketing approach for addressing co-morbid physical and mental health. *The Australian Journal of Rural Health, 28*(2), 149–158. https://doi.org/10.1111/ajr.12589

Miller, F., Davis, K., & Partridge, H. (2019). Everyday life information experiences in Twitter: A grounded theory. *Information Research, 24*(2), 1–23. https://www.webcitation.org/78moc4YgU

Oliveira, Paulo Roberto Vieira de, Alberton, A., & Kreich, M. (2021). The congruence of SDG communication in formal and informal channels performed by self-titled sustainable companies. *Revista De Administração Da UFSM, 14*(spe), 1182–1200. https://doi.org/10.5902/1983465964962.

Orminski, J., Tandoc, E. C., Jr., & Detenber, B. H. (2021). #sustainablefashion – a conceptual framework for sustainable fashion discourse on Twitter. *Environmental Communication, 15*(1), 115–132. https://doi.org/10.1080/17524032.2020.1802321

Parveen, R., & Ahmad, A. (2020). Public behavior in reducing urban air pollution: An application of the theory of planned behavior in Lahore. *Environmental Science and Pollution Research, 27*(15), 17815–17830.

Patton, D. U., Lane, J., Leonard, P., Macbeth, J., & Smith Lee, J. R. (2017). Gang violence on the digital street: Case study of a south side chicago gang member's twitter communication. *New Media & Society, 19*(7), 1000–1018. https://doi.org/10.1177/1461444815625949

Pavlova, A., & Berkers, P. (2020). Mental health discourse and social media: Which mechanisms of cultural power drive discourse on twitter. *Social Science & Medicine, 1982*(263), 113250–113250. https://doi.org/10.1016/j.socscimed.2020.113250

Pérez, C., & Santín, D. (2007). *Minería de Datos: Técnicas y Herramientas*. Ediciones Paraninfo, S.A.

Prochaska, J. O., & DiClemente, C. C. (2005). The transtheoretical approach. *Handbook of Psychotherapy Integration, 2*, 147–171.

Purvis, B., Mao, Y., & Robinson, D. (2019). Three pillars of sustainability: In search of conceptual origins. *Sustainability Science, 14*(3), 681–695. https://doi.org/10.1007/s11625-018-0627-5

Ravina Ripoll, R., Romero-Rodríguez, L. M., & Ahumada-Tello, E. (2022a). Guest editorial: Happiness management: key factors for sustainability and organizational communication in the age of Industry 4.0. *Corporate Governance: The International Journal of Business in Society*, 449–457. https://doi.org/10.1108/CG-05-2022-576.

Ravina-Ripoll, R., Tobar-Pesatez, L., Ahumada-Tello, E. & Galiano-Coronil, A. (Eds.) (2022b). *Un cisne amarillo que vuela hacia el marketing social, la felicidad y el bienestar*. Tirant Humanidades.

Ravina-Ripoll, R., Tobar-Pesántez, L.B. Galiano-Coronil, A., & Marchena-Dominguez, J. (Eds.). (2021a). *Happiness Management and Social Marketing: A wave of sustainability and creativity*. Peter Lang AG.

Ravina-Ripoll, R., Nunez-Barriopedro, E., Almorza-Gomar, D., & Tobar-Pesantez, L. B. (2021b). Happiness management: a culture to explore from brand orientation as a sign of responsible and sustainable production. *Frontiers in Psychology*, *12*, 727845. https://doi.org/10.3389/fpsyg.2021.727845.

Reyes-Menendez, A., Saura, J. R., & Alvarez-Alonso, C. (2018). Understanding #WorldEnvironment-Day user opinions in twitter: A topic-based sentiment analysis approach. *International Journal of Environmental Research and Public Health, 15*(11), 2537. https://doi.org/10.3390/ijerph15112537

Robertson, K., & Davidson, J. (2013). Gender-role stereotypes in integrated social marketing communication: Influence on attitudes towards the ad. *Australasian Marketing Journal, 21*(3), 168–175. https://doi.org/10.1016/j.ausmj.2013.05.001

Rodríguez-Peral, E. M., Franco, T. G., & Manso, A. G. (2022). Aplicación del proceso analítico jerárquico en la comunicación digital de los organismos públicos durante la pandemia de la COVID-19. *Revista Latina De Comunicación Social, 80*(80), 89–117. https://doi.org/10.4185/RLCS-2022-1532

Rodríguez, R., & Ureña, D. (2011). Diez razones para el uso de Twitter como herramienta para la comunicación política y electoral. *Comunicación y Pluralismo, 10*, 89–116. https://doi.org/10.36576/summa.30573.

Roldan-Alvarez, D., Martinez-Martinez, F., Martin, E., & Haya, P. A. (2021). Understanding discussions of citizen science around sustainable development goals in twitter. *IEEE Access, 9*, 144106–144120. https://doi.org/10.1109/ACCESS.2021.3122086

Roy, C.K. & Xiaoling, H. (2022). Achieving SDG 5, gender equality and empower all women and girls, in developing countries: how aid for trade can help? *International Journal of Social Economics, 49*(6), 930–959. https://doi.org/10.1108/IJSE-12-2020-0813.

Saif, H., He, Y., Fernandez, M., & Alani, H. (2016). Contextual semantics for sentiment analysis of twitter. *Information Processing & Management, 52*(1), 5–19. https://doi.org/10.1016/j.ipm.2015.01.005

Salgado, S., & Bobba, G. (2019). News on events and social media: A comparative analysis of Facebook users' reactions. *Journalism Studies, 20*(15), 2258–2276.

Sanford, M., Painter, J., Yasseri, T., & Lorimer, J. (2021). Controversy around climate change reports: A case study of twitter responses to the 2019 IPCC report on land. *Climatic Change, 167*(3–4), 59–59. https://doi.org/10.1007/s10584-021-03182-1

Spotswood, F., French, J., Tapp, A., & Stead, M. (2012). Some reasonable but uncomfortable questions about social marketing. *Journal of Social Marketing, 2*(3), 163–175. https://doi.org/10.1108/20426761211265168

Statista, (2022). *Forecast of the number of Twitter users in the World from 2017 to 2025*. Retrieved from https://www-statista-com.bibezproxy.uca.es/forecasts/1146722/twitter-users-in-the-world. Accessed 15 Sept 2022.

Struhl, S. (2015). *Practical text analytics*. Kogan Page.

Surucu-Balci, E., Balci, G., & Yuen, K.F., (2020). Social media engagement of stakeholders: a decision tree approach in container shipping. *Computers in Industry, 115*, 103152. https://doi.org/10.1016/j.compind.2019.103152.

Szabo, S., Nicholls, R. J., Neumann, B., Renaud, F. G., Matthews, Z., Sebesvari, Z., & Hutton, C. (2016). Making SDGs work for climate change hotspots. *Environment: Science and Policy for Sustainable Development, 58*(6), 24–33. https://doi.org/10.1080/00139157.2016.1209016.

Thoits, P., & Hewitt, L. (2001). Volunteer work and well-being. *Journal of Health and Social Behavior, 42*, 115–131.

Turner, G. M. (2008). A comparison of The Limits to Growth with 30 years of reality. *Global Environmental Change, 18*(3), 397–411. https://doi.org/10.1016/j.gloenvcha.2008.05.001.

United Nations. (2022). The Sustainable Development Goals Report 2022. Retrieved from https://www.un.org/development/desa/dspd/2022/07/sdgs-report/.

Van Hierden, Y., Rundle-Thiele, S., & Dietrich, T. (2022). Improving well-being in young adults: A social marketing proof-of-concept. *International Journal of Environmental Research and Public Health, 19*(9), 5248. https://doi.org/10.3390/ijerph19095248

Whitmee, S., Haines, A., Beyrer, C., Boltz, F., Capon, A. G., de Souza Dias, B.F. et al. (2015). Safeguarding human health in the Anthropocene epoch: report of The Rockefeller Foundation–Lancet Commission onplanetary health. *The Lancet, 386*(10007), 1973–2028. https://doi.org/10.1016/S0140-6736(15)60901-1.

Wilson, M. J., & Perkin, E. K. (2021). Going rogue: What scientists can learn about twitter communication from "alt" government accounts. *PeerJ (san Francisco, CA), 9*, e12407–e12407. https://doi.org/10.7717/peerj.12407

Zhang, M. (2010). *Brands all a Twitter: The Influences of Twitter on Brands and Consumers (tesis doctoral)*. The Pennsylvania State University. The Graduate School.

Authors and Affiliations

Araceli Galiano-Coronil[1] (ORCID) **· Manuela Ortega Gil[1] · Belén Macías Ortega Varela[1] · Rafael Ravina Ripoll[1]**

Manuela Ortega Gil
manuela.ortega@uca.es

Belén Macías Varela
belen.macias@uca.es

Rafael Ravina Ripoll
rafael.ravina@uca.es

[1]   University of Cadiz, Cadiz, Spain