Topics and feelings of entrepreneurs during a crisis period: Analysis of business Twitter hashtags

Temas y sentimientos de los emprendedores durante un período de crisis: Análisis de hashtags de Twitter empresarial

Orly Carvache-Franco

Facultad de Economía y Empresa. Universidad Católica de Santiago de Guayaquil. Ecuador.
orly.carvache@cu.ucsg.edu.ec • https://orcid.org/0000-0002-3108-9410

Ana Gabriela Víquez-Paniagua

Escuela de Administración de Empresas. Instituto Tecnológico de Costa Rica, Campus San Carlos, Costa Rica.
aviquez@itcr.ac.cr • https://orcid.org/0000-0002-7070-2329

Mauricio Carvache-Franco

Universidad Espíritu Santo-Ecuador, Samborondón, Ecuador.
mauricio2714@hotmail.com • https://orcid.org/0000-0003-3639-9263

Wilmer Carvache-Franco

Facultad de Ciencias Sociales y Humanísticas, Escuela Superior Politécnica del Litoral, ESPOL, Guayaquil, Ecuador.
wcarvach@espol.edu.ec • https://orcid.org/0000-0001-5420-1092

Allan Pérez-Orozco

Escuela de Administración de Empresas. Instituto Tecnológico de Costa Rica, Campus San Carlos, Costa Rica.
aperez@itcr.ac.cr • https://orcid.org/0000-0003-3963-0766

Abstract: The study seeks to identify the discussion topics and establish the sentiment of Twitter texts related to entrepreneurship and entrepreneurs during a crisis period. The data was collected from 163,843 tweets between May and June 2020. A group of popular hashtags about entrepreneurship and business was identified. The extensive data process was carried out using the term association technique and text sentiment analysis. The results indicate that crisis communications in businesses and by entrepreneurs had two objectives, to communicate the crisis inside the business due to the pandemic and communicate the elements of crisis solution by highlighting the skills, knowledge, means, and critical issues to overcome. The study contributes to the situational crisis communication literature by understanding the characteristics of crisis communication during a crisis period in popular entrepreneurship hashtags.

Keywords: Entrepreneurship, Twitter, crisis, communications.

Resumen: El estudio busca identificar los temas de discusión y establecer el sentimiento de los textos en las comunicaciones de crisis de Twitter relacionadas con el emprendimiento y los emprendedores durante períodos de crisis. Los datos se recopilaron de 163.843 tuits entre mayo y junio de 2020. Se identificó un grupo de hashtags populares sobre emprendimiento y negocios. El proceso de big data se llevó a cabo utilizando la técnica de asociación de términos y análisis de sentimiento de texto. Los resultados indican que la comunicación de crisis realizada en las empresas y por los empresarios tuvo dos objetivos, comunicar la crisis al interior de las empresas por la pandemia y comunicar los elementos de solución de crisis mencionando las habilidades, conocimientos, medios y cuestiones necesarias a superar. El estudio contribuye a la literatura de comunicación de crisis situacional con el conocimiento de las características de la comunicación de crisis durante periodos de crisis en los hashtags de emprendimiento popular.

Palabras clave: Emprendimiento Twitter, comunicaciones, crisis, Covid-19.

1. Introduction

For data processing in Twitter, two essential techniques can be considered, the first called association of terms and the second related to the analysis of sentiments, particularly the first of them has an approach that allows finding syntagmatic relationships between words or terms (Correia et al., 2018). Sentiment analysis is an essential field within data mining and deals mainly with sentimental content (Pandey et al., 2017). Sentiment analysis with Twitter data is a topic of interest because, on Twitter, people express their feelings (Geetha et al., 2017).

On the other hand, entrepreneurship is a multilevel knowledge phenomenon (Audretsch et al., 2020). Hence, it is argued that proper knowledge management is a significant factor (Durst & Runar-Edvardsson, 2012). The cognitive elements are a crucial resource (Sommer & Haug, 2011) for which entrepreneurship experiences should be studied. They promote the development of knowledge management at a high level (Woźniak & Wereda, 2020).

This research analyzes the crisis communication during the crisis in popular business hashtags on Twitter, using situational crisis communication and the networked crisis communication theories. The results of this study provide an understanding of communication in crisis in enterprises, which undoubtedly contributes to the literature since it allows the development of prevention plans in times of crisis and the consolidation of communication strategies for the crisis. Since it becomes very relevant to know the communication in social networks during the time of entrepreneurship crisis, it is possible to understand this population and their feelings in non-normal periods.

The present study sets the following objectives: (i) to identify the topics discussed in the entrepreneurship crisis communication on Twitter hashtags during the COVID-19 pandemic and (ii) to establish the sentiment of text in entrepreneurship crisis communication on Twitter hashtags during the COVID-19 pandemic.

The paper is structured as follows. Section 2 presents the arguments that support the study objectives. Section 3 contains a description of the methodology. Section 4 presents the results, and the final section synthesizes and discusses the main findings and describes their practical implications and future lines of research.

2. Theoretical background

Situational crisis communication theory argues that organizations can use communication strategies during crises. These strategies depend on the type of crisis, the situation, and the organization's responsibility (Coombs, 2015). This theory tries to establish response strategies to crises with positive results for the organization in the public perception of the crisis and the attitude towards the organization to protect its reputation and reduce adverse effects (Coombs, 2007; Coombs, 2014).

During crises, the strategic answer is the words and actions that organizations can take in crisis (Coombs, 2007). In crises, when there is a minimum responsibility of the organization, the appropriate communication strategies are the instructions and adjustment of information to achieve positive results for the organization, such as protecting its reputation and reducing adverse effects (Coombs, 2015; Coombs, 2017).

To Schultz et al. (2011), the consumer has different media types in social media in the context of different responses to crises they could have. So also, Schultz et al. (2011) and Utz et al. (2013) mention how social networks generate different responses that influence people's emotions.

According to the theory of planned behavior (Ajzen, 1991), personal attitude specifies how people react to certain situations and environmental influences. Usually, the behavior leads to a positive or negative attitude (Lechuga-Sancho et al., 2020). The perception of people's control influences business behaviors (Asante & Affum-Osei, 2019). The literature highlights that

entrepreneurs generally try to achieve better results, recognize and control changes, and overcome difficulties (Mahmood et al., 2020).

For Wennberg et al. (2016), entrepreneurs whose businesses face survival threats opt for growth rather than reducing losses. The reasons for failure can help to indirectly identify the crucial skills necessary to prevent it (Thom, 2016). It is necessary to analyze success and failure factors to create a sustained competitive advantage (Yoon et al., 2019) since the fear of failure always demotivates (Morgan & Sisak, 2016).

Despite many studies in the field, there needs to be more uniformity in research results to indicate which situational factors differentiate entrepreneurial Success and failure (Mcneil & Burgar, 1991). Because of this cause, exist a need for research on the relationship between Success and failure in entrepreneurship (Kerrigan et al., 2020).

According to Pardo & Alfonso (2017), the main failures of ventures are due to financial, organizational, external environment, and marketing causes. One of the most influential subtopics is legal and economic instability. Likewise, Grandy et al. (2020) show that the survival of SMEs during the C-19 pandemic depends on the transition these companies have toward digital services. The experience has generated learning to face survival (Majláth et al., 2019). In their study, Grandy et al. (2020) mentioned that the gaps between men and women entrepreneurs are quite marked in the environment. The latter do not have the same opportunities and benefits as men do. So, gender has a significant impact on entrepreneurship.

Global crises, whether pandemics or epidemics, create challenges for people. They generate changes in lifestyles, people's thinking, how they carry out transactions, and how they organize. The crisis caused by COVID-19 has caused damage to global supply chains and disrupted businesses and personal networks (Zahra, 2021).

Conditions are no longer favorable for entrepreneurs when implementing a retrospective in the context experienced before the pandemic, mainly because of markets and their varying conditions. Also, entrepreneurs' advisory, guidance, and support services often need to be appropriately directed (Chaves-Maza & Fedriani-Martel, 2020).

On the other hand, Bărbulescu et al. (2021) carried out a test. They determined that the profile of successful entrepreneurs in the context of COVID-19 is divided into courage, creativity, experience, and perseverance as fundamental pillars, identifying that many subjects consider themselves creative and courageous but with a feeling of little experience and desire to succeed.

Twitter hashtags concentrate communities that exchange messages, and collecting Twitter data through popular entrepreneurial hashtags is an appropriate means to examine the communication of pandemic crises such as COVID-19. Previous studies such as Kumar & Rehan (2021) and Lynn et al. (2020) mention the importance of data from hashtags and the analysis based on the issues that concern them.

The literature so far guides us in the importance of knowledge communication in times of crisis and the relevance of good management of it in companies to have projection with their environment and their market to consolidate and avoid adverse effects in times of challenges (Coombs, 2007; Coombs, 2014), management that is very relevant in social networks to influence the emotions of interest groups (Schultz et al., 2011; Utz et al., 2013) so that they can consolidate appropriate strategies at times that challenge the entrepreneur.

However, until now, the literature has not specified the communication of entrepreneurs in social networks in times of crisis and the feelings that derive from these investigations; however, the literature proposes a sequence of orientations that allow this study to be carried out and the relevance of its scope (figure 1).

To date, no academic studies have addressed crisis communication about entrepreneurship in Twitter hashtags during the crisis period. Therefore, considering this research gap, this study poses the following research questions.

RQ1. Which topics are discussed in entrepreneur crisis communication during the crisis period in Twitter hashtags?

RQ2. What is the sentiment of the texts in the entrepreneurship crisis communication crisis period in Twitter hashtags?

Figure 1. The sequence of orientations indicated by the literature prior to this study .

There are response strategies in periods of crisis that impact public perception and attitudes toward organizations (Coombs, 2007; Coombs, 2014).

In periods of crisis, positioning in social networks is essential for companies (Grandy et al. 2020).

For Bărbulescu et al. (2021) successful entrepreneurs require courage, creativity, experience and perseverance.

Adequate communication strategies protect the reputation of organizations and reduce negative effects (Coombs, 2015, Coombs, 2017).

It is essential to have skills to prevent business failure (Thom, 2016) and from there create competitive advantage is essential (Yoon et al., 2019).

The issues that concern or involve a sector can be analyzed through hashtags (Kumar & Rehan, 2021; Lynn et al. 2020), which undoubtedly guide entrepreneurs and their requirements.

Social networks generate diverse responses that influence people's emotions and behavior (Schultz et al., 2011; Utz et al., 2013).

The perception of control of people influences business behaviors (Asante & Affum-Osei, 2019).

3. Methodology

3.1 Data collection

The Twitter data collection was carried out between May and June 2020. First, groups of popular hashtags about entrepreneurship and business were identified, presented in Table 1. The data collection for this study uses Big Data, specifically through the Twitter API. Tweets drawn from different countries and languages contained the words entrepreneurship or entrepreneur.

The collected tweets come from different types of users: male, female, people without a specific gender, or organizations since they use identifications that are not derived from their names. A list of the 1,022 most common names of men and 3,938 most common names of women was used for gender identification. The study used the 1992 US census to attain the list (Thelwall, 2018).

Table 2 shows the gender of the authors of tweets identified from the names. When gender identification is impossible, such as organizations or people without an identified gender, they are listed as "none. "

Table 1. Distribution of the sample by company size, according to economic sector.

Hashtag	Number of tweets mentioned in the hashtag
#business	42,069
#marketing	39,297
#socialmedia	24,215
#digitalmarketing	21,129
#startup	16,598
#sales	15,339
#ecommerce	11,522
#branding	10,297
#entrepreneurship	9,635
#marketingdigital	8,335
#advertising	8,158
#entrepreneurs	7,313
#emprendedores	4,863
#publicidad	3,846
#onlinebusiness	3,834
#negocios	3,807
#emprendimiento	3,777
#ventas	2,123

Table 2. Tweets by gender.

Gender	Number of tweets	%
Male	33,168	15%
Female	17,030	8%
None	163,843	77%

The collection of information using hashtags is opportune in research since it concentrates on the opinions of a segment of analysis or the dialogue generated by a community on a particular topic (Fatanti & Suyadnya, 2015). Twitter data allows us to identify communication patterns and disseminate community information through hashtags (Park & Masi, 2016). Twitter data provides a means to analyze attitudes and behaviors from a broad spectrum of the population (Harlow & Oswald, 2016). Through Twitter, big data, data patterns, and text sentiment analysis are obtained (Kirilenko et al., 2018).

3.2 Techniques for data analysis

Currently, two techniques for analyzing Twitter big data have emerged (i) association mining and (ii) the analysis of sentiment of texts, which is the appreciation of the negative and positive sentiment expressed in the tweets using the Mozdeh significant data text analysis software. Both techniques have applications in entrepreneurship and are used in this research to process crisis communication data regarding the COVID-19 pandemic.

Among the techniques used in the field and in academic research to analyze Twitter business data are (i) association mining and (ii) the analysis of sentiment of texts, the first of which allows specifying the syntagmatic relationships between terms used in social networks and the second the appreciation of the feelings (positive or negative) expressed, for this case in tweets.

3.3 Association mining

Identifying the relationships between terms when they appear together is possible through the association mining technique (Correia et al., 2018; Carvache et al., 2022). When analyzing terms and hashtags, relevant topics and words for companies are located since the associations of localized words can be revealed in trends or constructs that, in an exploratory analysis, allow testing hypotheses and detecting relationships between constructs (Harlow & Oswald, 2016). These analyses almost always consider the quantitative approach (Kobayashi et al., 2018), for large volumes of data can be better clarified and explained (Harlow & Oswald, 2016).

3.4 Sentiment analysis

Text sentiment analysis is an automated process of examining semantic relationships and the meaning of Tweets (Alaei et al., 2019). A key element when researching entrepreneurship through big data is the study of emotions, such as the ability to discover positive and negative opinions in texts (Thelwall, 2019).

Sentiment analysis is one of the main activities of natural language processing (NLP). It is feeling, attitude, thought, or judgment (Fang & Zhan, 2015). Through the sentiment analysis technique, we can extract the context of the data in text form (Geetha et al., 2017). Combining sentiment analysis techniques for texts and other data such as Business, Success, small business, and crisis, patterns can be obtained that could not be understood before (Alaei et al., 2019).

According to Medhat et al. (2014), the sentiments captured in the data can be analyzed using various methods, including lexical-based methods, machine learning methods, and hybrid methods. The lexical-based methods need a predefined group of feelings used to determine the polarity of a text; this group of lexicons is the emotions in the text (Saif et al., 2016).

3.5 Data analysis

The following steps were followed for data analysis:

First, duplicate tweets were removed from the data. Second, the association technique was used to detect the terms associated with entrepreneurs and entrepreneurship. Next, Pearson's Chi-square statistical test, derived from a 2x2 contingency table, was used to obtain a critical threshold value of 3,841. Later the method Benjamini and Hochberg's method (1995) was used to reduce the risk of falsely believing that a word is significant when examining multiple Chi-square values. This procedure tests all the words at the same time and shows all the words as meaningful terms. This allows for controlling the risk of false positives when running multiple tests. Third, the sentiment of texts of the terms associated with entrepreneurs and entrepreneurship was calculated in the data collected using the SentiStrength technique, a lexicon composed of 2,310 words obtained from the Linguistic Inquiry and Word Count (LIWC) program (Pennebaker et al., 2003). SentiStrength is a technique that uses a lexical approach to detect the strength of the feeling, using a list of feelings and related terms; it is in the form of an algorithm that separates words, emoticons, and punctuation marks from each text (Thelwall, 2018). Then it searches for each word in the lexicon, and if found, the punctuation of said word is used in the lexicon. For each tweet, the SentiStrength algorithm generates a positive score of 1 to 5 and a negative score of -1 to -5 due to the match. The general score is the highest positive and negative of the words that make up the tweet (Thelwall, 2018).

4. Results

The results of the association of terms are presented in Table 3. First, the percentage of tweets that do not coincide with the initial search terms (entrepreneurship and entrepreneurs) is shown. Second, the 'Matches' column contains tweets that do match the initial search terms (entrepreneurship and entrepreneurs). Third, the 'Total' column is intended to reflect the number of tweets that contain the term. Fourth, the difference in the z-ratio is presented in the column 'DiffPZ .'Fourth, for relationships that have been meaningful for the Chisq test, the data will be displayed in the column 'Sig.'

Table 3 shows the topics discussed in the crisis communication on entrepreneurship during the COVID-19 pandemic in the Twitter hashtags. The terms were "startups," "business," "success," "small business," "motivation," "business owner," "read," "leadership," "COVID-19", and "online business," which answers the question RQ1 Which topics are discussed in crisis communication about entrepreneurs during crisis time in Twitter hashtags?.

The identification of the topics allows us to visualize the presence that the entrepreneurs had in the social network Twitter, mainly when mentions associated with their field were made, where topics such as Success, leadership, and online businesses stand out, which leads us to think about the importance that had the incorporation of digital strategies in the ventures.

Table 3. Association of terms with the word entrepreneur or entrepreneurship.

Word	MatchPc	NoMatch	Matches	Total	DiffPZ	Chisq	Sig (72187 tests)
Entrepreneur	75,10%	3,13%	19272	25679	75,6	5717,7	***
Entrepreneurship	52,20%	0,00%	14181	14181	272,6	74317,4	***
Startups	11,10%	1,10%	3944	4158	77,3	5974,5	***
Business	17,50%	7,50%	3636	19188	12,5	156,9	***
Success	7,60%	1,80%	2005	6947	47	2208,6	***
Small business	7,00%	2,10%	1806	8,999	43,4	1885,4	***
Motivation	4,90%	0,90%	1265	2947	40,1	1608	***
Business owner	4,70%	0,50%	1179	2087	33,6	1125,7	***
Read	4,60%	3,00%	1177	6788	13,9	193,4	***
Leadership	4,60%	1,10%	1175	3250	27,4	751	***
COVID-19	3,90%	2,90%	1009	6533	8,8	78,2	***
Online business	3,40%	1,60%	874	3834	20,9	436,3	***
Entrepreneur life	3,40%	0,20%	871	1190	65,3	4265,2	***
Money	3,20%	1,00%	819	2787	14,3	204,8	***
Education	2,70%	0,30%	685	1215	47,9	2292,1	***
Innovation	2,60%	1,00%	669	2560	22,3	495,2	***
Business strategy	2,20%	0,10%	553	749	52,3	2735,2	***
New business	2,10%	0,00%	538	613	57,9	3358	***
Business plan	2,00%	0,00%	524	596	57,3	3277,9	***
Reply	2,00%	1,20%	512	2865	9,8	96,7	***
Products	2,00%	0,10%	506	691	49,7	2473,7	***
Crisis	1,80%	1,00%	466	2382	11,5	132,7	***
Inspiration	1,80%	0,40%	454	1291	25,8	665,3	***
Mindset	1,70%	0,30%	440	915	33,8	1140,4	***
Economy	1,70%	0,50%	425	1313	22,9	523,4	***
Hustle	1,60%	0,10%	401	655	38,9	1515,7	***
Life	1,40%	0,70%	371	1788	11,5	132,7	***

Figure 2 shows a dendrogram of clusters, a hierarchical classification of the discussion topics from Table 1. In it, we can see how the support of the topics addressed by the entrepreneurs is found in the hustle and bustle, life, and the economy as mentions that support the topics in question.

The five words associated with each topic of discussion and the users' perceptions expressed in the tweets are presented in Table 4. These perceptions are expressed in need of attention for entrepreneurship in technology, innovation, review of the economy, motivation for the entrepreneur, ideas for Success in entrepreneurship, changes in commerce strategies, education for entrepreneurs, products, and online businesses during the pandemic crisis. Additionally, it is observed that the perceptions of Twitter users focus on the impact on entrepreneurship and entrepreneurs by the COVID-19 pandemic.

Figure 2. Clusters Dendrogram.
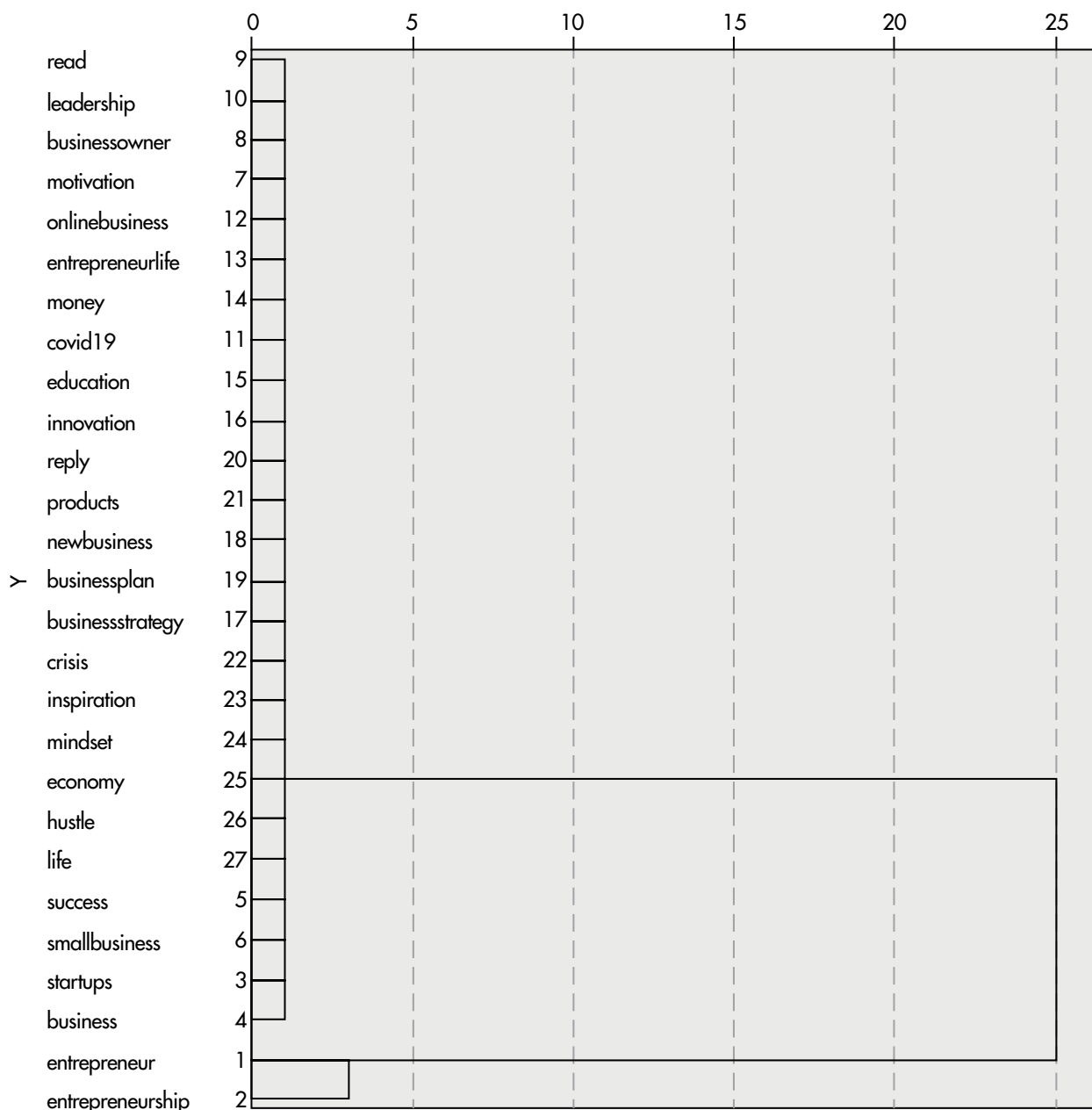
Table 4. The five words associated with each discussion topic and the perceptions in the tweets.

Word	Top 5 terms	Perceptions
Entrepreneur	Entrepreneurship, startup, business, about, listen.	Entrepreneurship, businesses, and startups require attention during the pandemic crisis.
Entrepreneurship	Startups, business, Success, small business, motivation	Entrepreneurship requires motivation and ideas for the Success of companies and businesses during the pandemic crisis.
Startups	Entrepreneurship, entrepreneurs, tech, innovation, economy	Startups and ventures require technology, innovation, and a review of the economy.
Business	Entrepreneurs, read, Success, motivation, money	Business and entrepreneurship require motivation and money for Success.
Success	Motivation, inspiration, entrepreneurs, hustle, mindset	Today's startup hustle requires motivation, inspiration, and a mindset for Success.
Small business	Entrepreneur, startup, trading, business owner, business strategy	Small businesses, ventures, and startups require changes in strategies for commerce
Motivation	Inspiration, Success, entrepreneur, entrepreneurship	Entrepreneurship requires motivation and inspiration for Success
Business owner	Entrepreneur, Success, small business, motivation, hustle	Today's hustle for business owners requires motivation for Success.
Read	Entrepreneurship, more, entrepreneurs, products. Online business	More fantastic reading of the COVID-19 effects on entrepreneurship, products, and online businesses
Leadership	Business, entrepreneurs, success, management, motivation	Leadership in business and entrepreneurship for motivation and management for Success
COVID-19	Business, how, e-commerce, during, entrepreneurs	During the COVID-19 how businesses and enterprises can carry out e-commerce
Online business	Entrepreneur, entrepreneurship, more, read, education.	More education is required for entrepreneurial online businesses
Entrepreneur life	Entrepreneur, entrepreneurship, business, Success, motivation	The life of the entrepreneur requires motivation for business success
Money	Business, entrepreneur, make, Success, Finance	The entrepreneur requires making money for the Success and finances of the business.
Education	Business, entrepreneurship, entrepreneur, more, read.	Startups and businesses require training.
Innovation	Business, startup, technology, entrepreneurship, entrepreneur	Entrepreneurs and startups require innovation and technology
Business strategy	Entrepreneurship, entrepreneur, more, online business, read.	Today's startups require business strategies like online businesses
New business	Entrepreneurship, entrepreneur, online business, Business strategy	Entrepreneurship requires changes in businesses, such as new businesses and online businesses.
Business plan	Entrepreneurship, entrepreneur, online business, read, new business	Startups require business plans that involve online businesses and new businesses.
Reply	Start-up, entrepreneurs, COVID-19, Success, innovation	A response to entrepreneurship due to COVID-19 is required to achieve innovation and Success
Products	E-commerce, service, how, can, more	How can you market more products and services on the web
Crisis	Entrepreneurship, entrepreneurs during COVID-19, business	Impact of the crisis on startups and businesses during COVID-19
Inspiratio	Business, motivation, Success, entrepreneur, marketing	Inspiration is required to motivate Success in business and marketing
Mindset	Business, Success, entrepreneur, entrepreneurship, motivation	The mindset for successful business and entrepreneurship requires motivation.
Economy	Business, entrepreneurship, more, read, commerce	The startup economy requires more trade.
Hustle	Business, entrepreneur, Success, entrepreneurship, startup	The Current hustle and bustle in business, entrepreneurship and startups hinder Success.
Life	Business, Entrepreneur, Success, motivation, entrepreneurship	Entrepreneurs require motivation to succeed in business

Table 5 shows the text sentiment analysis of each topic used. It is observed that the topics entrepreneurship, reading, money, online business, business strategy, new business, business plan, and inspiration have sentiment—negative text, showing situations of uncertainty, doubt, or unpleasantness. An answer is provided to RQ2 what is the text sentiment in the crisis communication on entrepreneurship during the COVID-19 pandemic in the Twitter hashtags, with the text sentiment in Table 5.

The results show us the themes and associations of feeling that entrepreneurs have in their communication through social networks, responding to our research questions, which leads to guiding the trends of this population when communicating in times of crisis.

Table 5. Sentiment analysis. Words associated with entrepreneurship or entrepreneur.

Word	Positive	Negative	Positive- Negative
Entrepreneur	1.5448	1.4624	0.0824
Entrepreneurship	1.5153	1.5903	-0.0749
Startups	1.5701	1.5537	0.0165
Business	1.6468	1.6076	0.0392
Success	1.6225	1.4814	0.1412
Small business	1.4528	1.3680	0.0847
Motivation	1.4691	1.3969	0.0722
Business owner	1.3741	1.2434	0.1307
Read	1.5563	2.8313	-1.2750
Leadership	1.6010	1.9199	-0.3189
COVID-19	1.6815	1.5430	0.1385
Online business	1.4640	1.7426	-0.2785
Entrepreneur life	1.3962	1.2135	0.1827
Money	1.5061	1.6389	-0.1328
Education	1.6399	1.5210	0.1189
Innovation	1.6776	1.4517	0.2259
Business strategy	1.3899	3.0895	-1.6996
New business	1.3083	3.4486	-2.1403
Business plan	1.3082	3.5343	-2.2261
Reply	1.5592	1.3490	0.2101
Products	1.6317	1.4782	0.1534
Crisis	1.8762	3.0281	-1.1520
Inspiration	1.3886	1.4352	-0.0466
Mindset	1.4969	1.4340	0.0629
Economy	1.8586	1.4721	0.3865
Hustle	1.4336	1.3540	0.0796
Life	1.7975	1.4139	0.3837

5. Discussion and Conclusions

The objectives of this study were: (i) to identify which topics are discussed in the crisis communication about entrepreneurship during crisis time in the Twitter hashtags and (ii) to establish what is the sentiment of the text in the crisis communication about entrepreneurship during crisis time in the Twitter hashtags.

We must first mention that the results show that the data collected and processed through big data techniques, such as term association techniques and sentiment analysis, can obtain information; it allowed us to know the characteristics of crisis communication during times of crisis in the communications of entrepreneurs. The above is possible using the theory of situational crisis communication (Coombs, 2007; Coombs, 2014); responses or communication strategies of companies and entrepreneurs are observed depending on the type of crisis (Business, Success, COVID-19, Innovation, Products, Economy, Life) and the crisis perceived by each organization or user.

This crisis communication can also be examined using the theory of network crisis communication (Schultz et al., 2011; Utz et al., 2013). This is an interactive communication with multiple voices of organizations, the public, and consumers, receiving and sending crisis communication through the web. According to this theory, different responses can be generated, which can be influenced by the medium, in this case, Twitter. Twitter is considered an information hub, especially in disasters. It also influences the participants' own emotions in crisis communication.

In the second place, the results show the topics of discussion and the sentiments of the messages, which show a global approach to crisis communication in enterprises during the COVID-19 pandemic. The most discussed topics were "start-ups," "business," "success," "small business," "motivation," "business owner," "read," "leadership," "COVID-19", "online business," among other topics, and the perceptions that users express on Twitter about these terms according to Table 4 reflect the need for care undertakings during the crisis of the pandemic in technology, innovation, the review of the economy, motivation for the entrepreneur, ideas of how to exit ahead in the crisis and how to be successful in entrepreneurship, the needs of changes in strategies for commerce, education for entrepreneurs, products and online businesses. In addition, it is observed that the perceptions of Twitter users focus on the impact on entrepreneurship and entrepreneurs by the COVID-19 pandemic.

The results show that this crisis communication reinforces what was mentioned by Wennberg et al. (2016). They ascertain that entrepreneurs seek to restore performance instead of losses when they observe threats to survival. Additionally, authors such as Majláth et al. (2019) have pointed out that entrepreneurs design better survival strategies when they learn due to challenging times or when they can see the experiences of others. Communication reflects the pandemic as a threat to entrepreneurship and focuses on finding ways and means for businesses to continue or survive. This reinforces the theory that entrepreneurs have courage, perseverance, and a capacity for risk (Bărbulescu et al., 2021). The results presented in table 4 show entrepreneurs with a predisposition to overcome the pandemic's difficulties (Mahmood et al., 2020). They show the situation they are going through and identify in communication the skills, knowledge, means, and issues needed to overcome difficulties (Thom, 2016). One such issue is openness to digital business or digital strategies, which is vital for the survival of ventures (Grandy et al., 2020).

Communication on the topics used also reflects doubts and uncertainty about the situation during the pandemic, which is in line with Chaves-Maza & Fedriani-Martel (2020). The authors explain that market conditions could have been more favorable for entrepreneurs before the pandemic due to the varying conditions and the advisory, guidance, and support services.

Third, and as far as the text, sentiment analysis shows a difference between the topics indicating that not every feeling is perceived with the same intensity. Some topics have negative sentiments, such as reading, money, online business, business strategy, new business, plan business, and inspiration, which are the topics that show situations of uncertainty, doubt, or unpleasant situations.

The literature shows the need to understand better the causes of these successes and failures of entrepreneurship (Kerrigan et al., 2020). Entrepreneurs create better strategies to survive difficult times (Majláth et al., 2019). Nevertheless, there is a gap in the literature on the type of strategies, the means used to create them, and their generation to survive the difficult times during the pandemic. The study contributes this way to the theories about entrepreneurship success and failure. It shows that crisis communication focuses on strategies to communicate elements of a solution. They concentrate on skills, knowledge, means, and aspects needed to overcome the difficulties of the undertakings due to the impact of the pandemic, in addition to the means used by Twitter, which is recognized as an effective means to communicate news and disasters. It is also a means to communicate strategies of solutions for start-ups during a pandemic crisis.

The study contributes to the literature on the theory of situational crisis communication in start-ups (Coombs, 2007; Coombs, 2014) with the knowledge of the characteristics of crisis communication in popular hashtags about entrepreneurship during the COVID-19 pandemic. They were identified through the topics of discussion found and the strategies to communicate elements of solutions for the ventures, and the assessment of the sentiment expressed in the messages during the COVID-19 pandemic.

The study also contributes to the literature on crisis communication during the COVID-19 pandemic on Twitter from the recipient's perspective, as there is a gap in the literature on crisis communication on social networks that can facilitate responses from multiple voices of organizations and the public or consumers (Liu & Fraustino, 2016; Utz et al., 2013).

In conclusion, the development of crisis response strategies aims to align the relationships of the interested parties according to what makes them agree or disagree, coinciding with the situational crisis communication theory (Coombs, 2007; Coombs, 2014) and examining the discussion topics of entrepreneurs, it is possible to perceive the main orientation issues of this population that is so relevant to society, as well as the appropriate communication strategies that protect the reputation of the organizations and reduce adverse effects in line with what has been mentioned literature (Coombs, 2015; Coombs, 2017).

Derived from the above and one of the most mentioned topics, "online business," positioning in social networks becomes relevant and essential for companies (Grandy et al., 2020). Just as the prioritization of issues and feelings also becomes relevant to align strategic actions that guide the best performance of companies and the impact on their environment so that work can be done creatively, coinciding with the requirements mentioned by Bărbulescu et al. (2021), but considering the issues and concerns using hashtags (Kumar & Rehan, 2021; Lynn et al., 2020), which undoubtedly guide the entrepreneur and their requirements.

The study has implications for the theories of Success and failure of entrepreneurship. The above contributes to closing the gap on the strategies to survive during the pandemic's challenging times, how they are generated, and the means used to create them. It shows that due to the qualities of entrepreneurs, crisis communication during the COVID-19 pandemic focuses on the crisis and the strategies to communicate the solution elements. They mention the skills, knowledge, means, and issues needed to overcome the difficulties enterprises face due to the impact of the pandemic. Also, it relates the use of Twitter as an effective means to communicate elements of the solution in enterprises to the pandemic crisis.

The study has theoretical implications in the Situational Crisis Communication Theory on entrepreneurship (Coombs, 2007; Coombs, 2014), given that it provides knowledge about the characteristics of crisis communication during the COVID-19 pandemic within the discussion topics of entrepreneurship hashtags. It also looks at the assessment of the different sentiments in each topic of discussion. The study also contributes to the Network Crisis Communication Theory (Schultz et al., 2011; Utz et al., 2013) because it presents evidence about communication on Twitter in a network environment with multiple voices of organizations, the public, or consumers. Also, it contributes from the receiver's perspective since there needs to be more literature on crisis communication in social networks that can facilitate responses from multiple voices of organizations and the public or consumers (Liu & Fraustino, 2016; Utz et al., 2013).

This research has been practiced for actors who accompany and support entrepreneurs who, in crisis, can use timely response strategies to avoid affectations in enterprises in a way that contributes to creativity and timely attention to crises that avoid economic losses and adverse consequences crises such as the pandemic.

Additionally, it urges the importance of strengthening online business and its demands for optimal management in serving the current and potential market. The research also has practical implications for developing pandemic crisis prevention plans.

The data's temporality limits the study during May and June 2020. Future research is suggested to analyze the data from Twitter to examine changes in the behavior of business clients, businesses' performance, and their scope in the post-health emergency stage.

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