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The construction of the meanings of #coronavirus on Twitter: An analysis of the initial reactions of the Italian people

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ABSTRACT

The first months of 2020 saw the coronavirus pandemic explode. Moving from China, it arrived in Europe and hit Italy. The place where the debate around it exploded was the media ecosystem. In a short time, it was an explosion of tweets related to the hashtag #coronavirus on Twitter. With the aim of reconstructing the meanings of the hashtag and the content, in terms of sentiment and opinions, of the reactions of the Italians, we collected in a large size corpus, the hundred thousand Italian tweets containing the #coronavirus produced during the media hype period from the Twitter repository (February 24th - 28th, 2020). Media hype period was discovered by digging in the online articles of ‘la Repubblica’, based on the presence of the words: coronavirus and Italy. The media hype is February 26th. The corpus underwent Emotional Text Mining (ETM), an unsupervised methodology, which allows social profiling based on communication. The study of the word chosen to talk about a topic and their co-occurrence allows the understanding of people’s symbolizations, representations, and sentiment, about the coronavirus. In a retrospective logic, this mechanism allows us to reconstruct the sensemaking and nuances of meaning attributed by users to the coronavirus hashtag.

KEYWORDS

Coronavirus; Emotional Text Mining; hashtag studies; public debate; Twitter

1. Introduction

The year 2020 will be remembered as the year of the COVID-19 pandemic. An event – with a global reach – that no country and no citizen expected, albeit with some exceptions from the scientific world (Quammen, 2012). It all started on December 31st, 2019, when China informed the World Health Organization (WHO) of the existence of a new virus whose origin was unknown, both to scientists and workers, and visitors to a wet market in the city of Wuhan. Wuhan and its wet market are the city and the place where it all began. On January 9th, 2020, Chinese authorities identified a new type of pneumonia belonging to the Coronavirus (2019-Cov) as the causative agent of the disease. This is the SARS-CoV-2 virus (acronym for Severe Acute Respiratory Syndrome – Coronavirus-2) also COVID-19 – declared a global pandemic on March 11th, 2020 by the WHO – which suddenly projected us into a completely new and unexpected situation

(Greco & La Rocca, 2020). In Italy, the pandemic wave arrived on February 21st, and it is from this date that the narration and evolution of the #coronavirus in Italy begins.

In truth, going backwards, a state of crisis had already been announced with the declaration of the national state of emergency, sanctioned by the Government on 31st January, in conjunction with the identification of the first two cases of infection by COVID-19 on the national territory and the consequent closure of the Italian airspace to all direct flights and coming from China. But, at that time nobody could have imagined that a lockdown would have come, and that Italy and the world would have stopped. Not only, could anybody imagine what would have happened, but the people, the audience, the governments – maybe – did not even think it possible. To believe that a small virus could paralyze the western world meant to think that they were fallible and vulnerable. So – slowly – the virus made its way: infecting people and the media. From here on, it is possible to define COVID-19 as a spreadable virus: in the media, in populations, in minds. A state of anxiety quickly spread in the media (Giuncato, 2020) which penetrated the plots of the collective imagination, leveraging an unknown, mysterious danger, generating fear and uncertainty. From the beginning of 2020 to today, there have been several articles and books that have focused on the analysis of the role of communication in pandemic times (for Italy see Boccia Artieri & Farci, 2021; Mazzoli & Menduni, 2020; Salzano & Scognamiglio, 2020). Our aim is to analyze the triggering of this media spiral in Italy, to understand its generative mechanisms and the manifest and latent *nuances* in communication via Twitter by people. We go back in time, to the end of February 2020, with the aim of answering two research questions:

[RQ1] What are the reactions of users on Twitter at the start of the coronavirus news? What kind of emotional reactions has this virus elicited in users?

[RQ2] How do users' actions and reactions help redefine the meaning of the coronavirus hashtag?

As already argued in a previous study (see Boccia Artieri et al., 2021), we define this conversational flow as reactions because as happens in chemistry, the addition of reagents changes the identity of the substances, which in turn are transformed into different substances. The reactants here are represented by the news that passes in the mainstream media, ads by Public national and global authorities, chasing each other with each other quickly and require coping strategies and interpretive categories of events by citizens.

2. Previous studies on Twitter and its hashtags

The social media have already been studied in terms of creating *ad hoc* publics (Bruns & Burgess, 2015), networked publics (Boyd, 2010), spreaders of social and political activism (e.g. Bonilla & Rosa, 2015; Rambukkana, 2015a), and as an environment for sharing opinions and emotions (e.g. Döveling et al., 2018). They have the power to connect people, environments, and stories together.

The social media have got an extraordinarily strong narrative power in disseminating news stories while creating social narratives. They have a flexible narrative form (Massa & Simeoni, 2017), with a multi-story plot; these entries intersect and change the meaning of

keywords and hashtags (Dobrin, 2020; La Rocca, 2020a, 2020b). Inside social media, the hashtags and their use realize a new perspective of connectivity (Bruns & Moe, 2014), especially if one considers retweet or quoting operations (Rathnayake & Suthers, 2018).

For these reasons, the study of hashtags has already been much explored within digital activism, whereas has been emphasized by Yang (2016, p. 14) their ‘capacity to create stories on social media by using hashtags in a way that is collective and recognized by the public’, is a kind of agency in digital activism that can have moral, political, and social implications. Bruns and Burgess (2011) discuss the use of hashtags in digital movements from a media studies perspective, touching upon the cultural workings of imagined communities online as representative of the *ad hoc* publics formed around a specific hashtag. Other studies (e.g. Dobrin, 2020) examine the transformational journey of the hashtag from a tool facilitating action to the face of a movement, crisis, event to eventually becoming a cultural object for public consumption.

With this background in mind, we choose to observe the rise of the coronavirus flame in Italy within Twitter. To reconstruct how Italians felt the announcement of the first coronavirus cases and how they reacted to them, we analyze the debate on Twitter. The choice of social media and of Twitter occurs for several reasons:

- Twitter is the social media sentinel tool to monitor function.
- Social media and hashtags are tools for sharing feelings and emotions.
- There is the users’ gatewatching practice due to the continuing multiplication of available channels for news publication and dissemination (Bruns, 2005; Bruns & Moe, 2014).

In recent years, Twitter has become more than just a social platform, as it has helped spread catastrophic pictures of countries, but also hope, feelings of belonging to a community, possibility of staying in touch despite physical distances. As Burgess and Baym write (2020), Twitter has evolved as a technology, a company, and a culture, from its origins as a personal messaging service to its transformation into one of the most globally influential social media platforms. Under this transformation Twitter has become a place where history and culture are not only recorded but written in real time.

In this perspective, we can look at Twitter – in conjunction with this historical period – as a form of instant shared diary and interactive dialogue in which traces of the feelings, emotions, fears of the citizens have been left. Citizens, all together and all closed in their own homes, experienced the same situation. And it is within Twitter that a culture of hashtags and a logic of their use has developed in order to gather communities of practices engaged in shared activities, possibly simultaneously such as watching a television program or sporting event and sharing comments on Twitter, activating a second screen practice (e.g. Kroon 2017); sharing emotions (Boccia Artieri & La Rocca, 2019; La Rocca & Rinaldi, 2020); of creating and promoting a meme. Hashtags are also used to express a collective response (Ross, 2019), expressions of solidarity and support (Giglietto & Lee, 2017); to drive television advertising and consequently commercial products (Arvidsson & Caliendo, 2015; Stathopoulou et al., 2017); support national communication campaigns. Although many platforms use hashtags, it is within Twitter that they remain ‘the most comfortable fit, and it was Twitter that turned it into a highly significant, multi-functional features’ (Burgess & Baym, 2020, p. 61). Burgess and Baym (2020) suggest us

to look at hashtags, abandoning the prehistoric vision that considers it as a thematic aggregator and start considering it, instead, as ‘iconic a symbol of Twitter’ as the ‘now-ubiquitous hashtag’ that is a ‘powerful part of the world’s cultural, social, and political vocabulary’ (pp. 61–62).

These modifications become visible starting from the introduction of a concept, which is crucial in the analysis of the change in use of hashtags: it is folksonomy (Wal, 2006). The folksonomies refer to classification systems that are elaborated by groups in a free and less official way than the institutionalized taxonomies of the scientific community. Wal (2007) defines the value of folksonomy as created by external tagging derived

from people using their own vocabulary and adding explicit meaning, which may come from the inferred understanding of the information/object. People are not so much categorizing, as providing a means to connect items (placing hooks) to provide their meaning in their own understanding.

Thus, folksonomies define situations in which members of society create words and categories to describe the world in a way that seems relevant to them (Neal, 2007). It is a paradigm shift, which marks the passage from visitors of digital environments to users. It is the users that with their practices become user community activities adding value to further applications built on these architectures. Like Neal (2007) explains, the folksonomies are a result of the users’ ability to alter and modify the web from their own words and concepts, without restrictions to terms previously used or pre-defined by the systems (Siqueira, 2020). Based on these studies it makes sense to consider that the hashtag can, over time, change its meaning; being itself a way of labeling one’s thoughts, comments, emotions, hooking them to thematic trends. At the same time, the hashtag modifies, multiplies its meanings at a figurative and literary level (La Rocca & Rinaldi, 2020). This happens through human reaction and interaction. The whirlwind of feelings and emotions – within social media – travels through hashtags. Under a hashtag – considered as a label with a hash sign in front of it – are gathered various semantic nuances. It is, therefore, an umbrella which gathers images, meanings, emotions, words that widen or change its original meaning (La Rocca & Rinaldi, 2020). In this way, through the evolution of the meanings of the hashtag, it is possible to study the evolution of citizens’ opinions, attributing to social media – in this case Twitter – the monitoring sentinel function (e.g. Tavošchi et al., 2020). This monitoring function is intricately linked with the gatwatching practice (Bruns, 2005) of users, who participate in a distributed and organized effort to watch – to keep track – of what information is conveyed by *legacy* channels, by politicians, to then re-appropriate it through a debate many-to-many within social media. The public character of Twitter has made it an important platform for negotiating discourses prevalent in the mainstream media (Eriksson, 2018). In this way, the users become co-commentators of coronavirus event and crisis containment strategies, developing the meanings of the hashtag. Because the hashtag and its nascent public becomes ‘a space, an event and a network’ to engage with (Sauter & Bruns, 2015, p. 47). For these reasons, the observation point chosen in this work is Twitter, with the aim to reconstruct – through text mining techniques – the generative mechanism of the fear and emotions attached to the hashtag #coronavirus in Italy.

2.1 Setting the research path

It is important to consider two aspects of #coronavirus: 1. the event that generates the hashtag; 2. the starting period of its diffusion. Regarding the first of these two aspects, the literature on hashtags has two types of events that generate many reactions in Twitter's hashtags, such as: 'acute events' (from natural disasters to political unrest), and 'media events' (from major sports and entertainment broadcasts to election-night political coverage). Due to its characteristics, the #coronavirus falls into the Bruns et al. (2016) 'acute events'. In the case of dramatic, acute, and emergent public events, such as a pandemic, the Twitter platform stands out from other social spaces by its ability to convey public responses at high speed (Krutrök & Lindgren, 2018). The period of spread of the hashtag and the pandemic – analyzed in this study – is the starting one, when the virus arrives. In fact, the declaration of the first lockdowns arrives in Italy on March 4th, 2020; they concern schools and universities and after 9th March the Prime minister announces the lockdown. It is therefore a period in which the hashtag has not yet reached its peak of diffusion (to deepen the peak of diffusion see Boccia Artieri et al., 2021). This is an important element, because as it suggests Faltesek (2015) the 'studies of the circulation of hashtags need to pay particular attention to the temporality of their circulation' (p. 84). This caveat depends on the fact that hashtags are neither registered nor controlled, the meaning that #coronavirus has today could be different from that of the initial period of its spread. It seems that the role and meaning of any hashtag is all but static and might change considerably over time (Bruns & Burgess, 2015). Therefore, specifying the context of circulation of the hashtag is fundamental for its interpretation. Searching for press news to find out when the virus arrives in Italy is therefore a preliminary operation that allows us to identify the initial time of its appearance and then allows us to search Twitter for the appearance of the coronavirus hashtag.

In order to explore COVID-19's representation in the first stage of the Italian contagion and looking for an answer to our first research question, we analyzed the news of a widespread Italian newspaper, *la Repubblica*, to identify when the idea of the Italian involvement in the pandemic took place. We chose this newspaper due to its audience extent (Accertamenti Diffusione Stampa, 2020) and the accessibility of its online archive. This is because as other studies have already pointed out, in the first four months of 2020, there was a sharp decrease in advertising and newspaper subscriptions in favor of digital platforms (e.g. Canovaca de la Fuente, 2020). So, the articles in the press had their echo, in creating and spreading fear and information through social networks.

We collected all the news containing the word *coronavirus* from January 17th to March 3rd, 2020, to identify when there was the mediatic hype. The number of news published by *la Repubblica* increased over time from January to February 26th, 2020, decreasing the following days (Figure 1). Until January 20th, the news – about coronavirus – are sporadic and they reflect the idea that the contagion does not concern Italy since it is limited to China. From January 21st, the publication of news about coronavirus starts to be constant, increasing over time, and the first signs of alert for an Italian contagion appears. From January 24th to 27th the articles focus on false alarms, while two days before Conte's official statement of the first Italian case, on January 30th, 2020, the news focus on the concern about suspected cases. After more than three weeks the number of news increases tenfold, reaching the communicative hype on February 26th, 2020 and

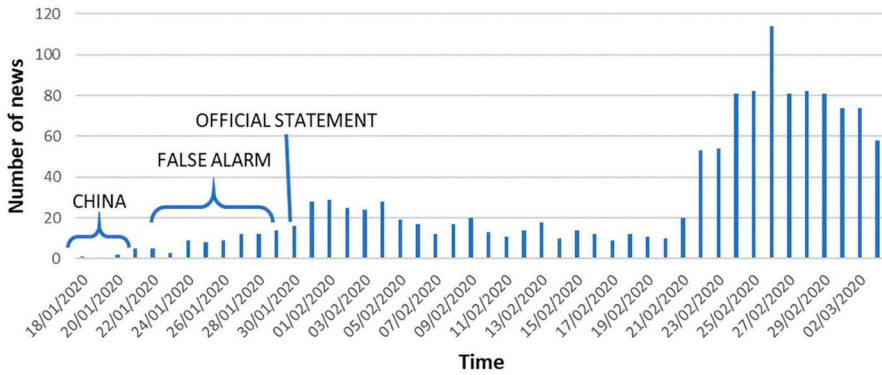


Figure 1 . Number of news published by la Repubblica per day from January 17th to March 3rd, 2020.

subsequently decreasing. This was the moment in which the virus becomes viral in Italy, both in the media and in the contagion phenomenon.

In this period, we scraped all the messages in Italian language containing the #coronavirus over four days from Twitter, from February 24th to February 28th, 2020.¹

The pandemic is an unexpected and multi-semantic event, and as such, full of emotional loads and the need of adaptive semiotic categories. Analyzing the reactions of the Italians on Twitter means working with a swirl of feelings. Being aware of this, to identify the emotional reaction to the pandemic, we performed Emotional Text Mining (ETM) (Greco, 2016a; Greco & Polli, 2020). This method allows us to find a way to answer our second research question.

ETM is based on a text mining procedure that, employing a bottom-up logic, allows for a context-sensitive text mining approach on an unstructured large amount of data. ETM is an unsupervised text mining procedure based on a socio-constructivist approach (Greco, 2016b). According to this approach, the sentiment is not only the expression of a mood but also the evidence of collective representations setting people interactions, behavior, attitudes, expectations, and communication. Thus, according to a semiotic approach to the analysis of textual data, ETM allows performing social profiling. This has already been applied in different fields (Cordella et al., 2018a, 2018b) and, particularly on social media communication to profile social media users and to identify their sentiments and opinions (e.g. Greco, 2019; Greco & La Rocca, 2020; Greco & Polli, 2021).

3. Method and data results

The sample of 436,925 tweets was collected from February 24th to February 28th, 2020, during the communication hype. It was made up of 72.8% of retweets, and it resulted in a large *corpus* of 11,324,811 tokens. As Bruns and Stieglitz (2012) explain, a large number of retweets occur when there are natural disasters, and they fall largely into a category which may be best described as ‘breaking news’ or ‘rapid information dissemination’. This high number of retweets can be attributed to a specific conversational practice on Twitter: gatewatching (Bruns, 2005).

All the messages were collected in a *corpus* and two lexical indicators were calculated: the type-token ratio (TTR) and the percentage of *hapax* (Hapax%) to check whether it

was possible to statistically process data. Based on the large size of the *corpus*, both lexical indexes highlighted its richness² and indicated the possibility of proceeding with ETM. The texts selection and pre-processing reduced the sample of tweet to 98,788 documents.

We created a set of steps:

- We cleaned and preprocess data and we select(ed) the documents that have at list (least) nine words excluding the retweet.
- Then, in order to select the terms, we lemmatized and excluded the stop words, ‘coronavirus’ and ‘#coronavirus’ and the words of the low rank of frequencies (Bolasco, 1999).
- On the document-term matrix, we performed a cluster analysis based on a bisecting *k*-means method based on cosine similarity (Steinbach et al., 2000), limited to ten partitions, excluding all the tweets that did not have at least two keywords co-occurrence.
- To choose the optimal solution, we calculated the Calinski–Harabasz and the intra-class correlation coefficient (ρ) indices.
- Then, we performed a correspondence analysis (Lebart & Salem, 1994) on the cluster-term matrix. To facilitate the correspondence analysis results interpretation, each term is considered only in the factor in which it has the highest absolute contribution compared to those of the other factors. In this way each factor has only exclusive terms.
- We considered also the cluster partition in which each cluster was divided into two sub-clusters to identify two subtopics for each macro area (cluster) previously identified.
- Finally, we measured the sentiment according to the number of messages classified in the sub-cluster and its interpretation.

The interpretation simulated the social mental process underlying communication, proceeding from the highest level of synthesis, the symbolic meanings, to the lowest one, the collective representations and the sentiment (Greco, 2016a; Greco & Polli, 2020). Firstly, we interpreted the factorial space according to word polarization to identify the symbolic meanings setting the collective representation of the hashtag and the sentiment. Secondly, we interpreted the cluster according to their location in the sensemaking space (factorial space) and to the words characterizing the messages classified in the cluster. The cluster interpretation allowed the identification of the collective representation of coronavirus (Section 3). The results found were subsequently interpreted in the light of a theoretical framework (Section 4). The methodological path outlined allow us to find answers to our research questions. It is a methodological journey into the reactions of the Italians on Twitter at the moment of the pandemic’s arrival.

3.1 The flame and emotions for the coronavirus

In showing and discussing the results, it is important to point out that while in the communication the semiotic level precedes the semantic one in generating the text (Greco, 2016a), the statistical procedure simulates the inverse process of the communication production, from the semantic level to the semiotic one. For this reason, ETM performs a sequence of synthesis procedures, from the text pre-processing and the selection of the keywords to the multivariate analysis, to identify both the semiotic level and the socially

Table 1 . Correspondence analysis results.

Factor	Eigenvalues	%	Cum %	Label	Negative pole	Positive Pole
1	0.303	39.0	39.0	Actor	Institution	People
2	0.269	34.5	73.5	Danger	Contagion	Alarm
3	0.206	26.5	100	Reaction	Control	Lockdown

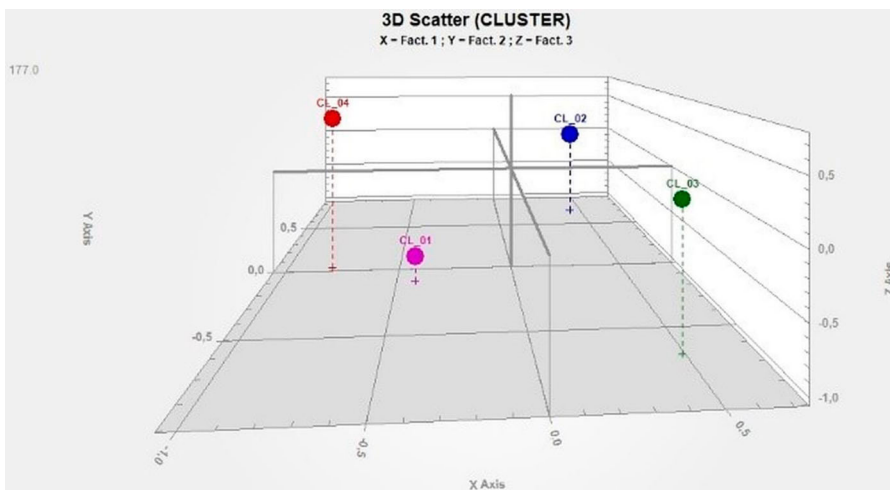
shared cultural symbolization, starting from the semantic one, the collective representation. The interpretation process proceeds from the correspondence analysis results (semiotic level) to the cluster analysis results (semantic level).

The results of the cluster analysis show that the 643 terms allowed for the classification of 89.3% of the documents. The clustering validation measures indicated that the first optimal solution was four clusters. The correspondence analysis detected three latent dimensions, and the explained inertia for each factor is reported in Table 1. In Figure 2, we can appreciate the emotional map of the COVID-19 emerging from the Italian tweets. It shows how the clusters are placed in the factorial space produced by the three factors.

As shown in Table 1, ultimately, the Twitter users symbolize COVID-19 by means of three general dimensions: the *actor*, the *danger*, and the *reaction*.

The first factor distinguishes the *actors* in *institution* and *people*; the second factor reflects the double nature of the *danger*, the *contagion* and the *alarm*; and the third factor categorizes the *reaction* in terms of movement restriction (*control*) and *lockdown*. The location of the clusters in the factorial space has a specific configuration: they are located on the axes of the second and the third factors (Figure 3). It implies that each cluster is always almost explained only by two factors: the first and the second factor for classes 2 and 3 and the first and third factor for cluster 1 and 4.

We find this configuration of the factor space whenever the topic is symbolized by two opposite dimensions that cannot be integrated with each other (Cordella et al., 2018b; Greco, 2016b), which in our case are *institution* and *people*. We find this special shape when the theme of communication recall for dimensions connected to life and death

**Figure 2** . Factorial space.

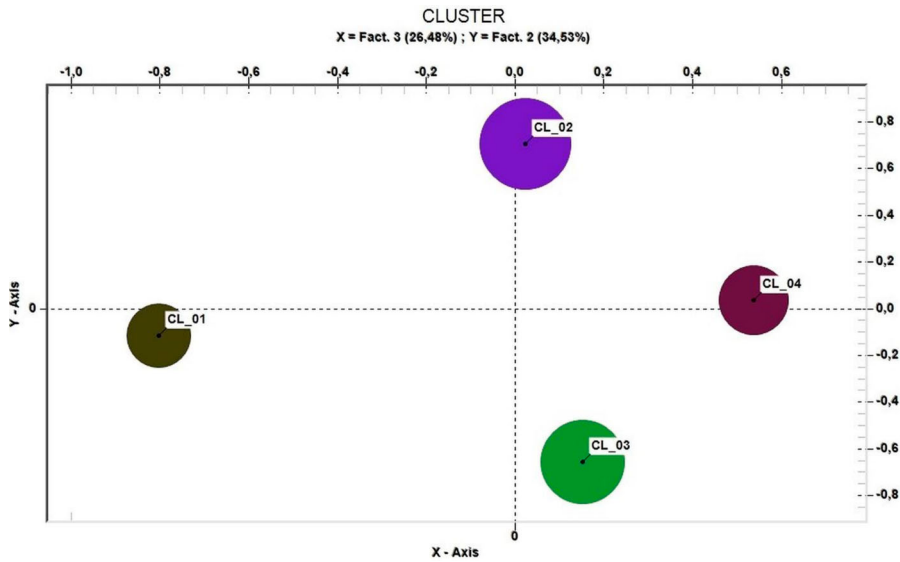


Figure 3 . Factorial space.

as, for example, when physicians talk about their work (Cordella et al., 2015), or when terrorists claim their attack (Greco, 2016b), or in media communication about assisted reproduction (Cordella et al., 2018a). E.g. the physician’s symbolization of the patient is both as a person who suffers and needs care, and as a disease that must be attacked and destroyed. This ambivalence is well known, and it allows the physician to perform a surgical intervention, attacking and destroying the illness and, at the same time, taking care of the patient (Cordella et al., 2015). In the COVID-19 symbolization, the first factor distinguishes the actors in victims (*people*) and protectors (*institutions*). The *danger* (Factor 3) concerns only the victims while the *reaction* (Factor 3) pertains to the protectors. This irreconcilable distinction suggests a conflict between the institution, that should protect, and the people, who need protection, and, probably, a distrust of citizens towards institutions.

The interpretation of the factorial space highlights the emotional map by which people, in general, emotionally symbolize COVID-19, and support the cluster interpretation according to their location in the symbolic space (Table 2).

This virus is represented as an invisible enemy which can limit people’s rights and threaten their lives. As happened in other countries, in the initial phase in which there was little scientific knowledge, it was often represented by the media using stereotyped

Table 2 . Cluster location in the symbolic space.

Custer	Tweet	Tweet %	Label	Factor 1 Actor	Factor 2 Danger	Factor 3 Reaction
1	17,902	20.30	The Damned North	Institution		Control
2	26,488	30.04	The Rising of the Flame	People	Alarm	
3	24,229	27.48	The Affordances of the Virus	People	Contagion	
4	19,553	22.18	The Hidden Dimension	Institution		Lockdown

images or using other attributes of previous episodes of coronaviruses being not scientifically accurate but motivated by the journalistic objective of representing the main characteristics of the virus and as threatening to life (Jiménez-Gómez et al., 2020). So, the virus becomes a danger and calls into question: citizens, public actors, institutions and new control policies. We are informed of these aspects by the results of the analysis, which distribute the clusters in the factorial space.

The four clusters are of different sizes (Table 3) and reflect different COVID-19's representations (Table 3). As the four clusters reflect four main macro-areas, we interpret also the eight-cluster partition in which each cluster was divided into two sub-clusters, highlighting the specificities of each macro-area.

Looking at the first point of our first research question: What are the reactions of users on Twitter at the start of the coronavirus news? [RQ1]. We can now give the first answer.

As news in the press leveled up, the flow of Twitter grew. This communicative flow has collected the reactions – made up of a multitude of feelings – of the Italians. The analysis allows us to find the elements of the mechanism of fear arousing appeal. Without a doubt, the pandemic is a frightening event. What emerges (see Tables 2 and 3) is above all the concern for the northern regions of Italy, which were the first to be affected. Subsequently, the flame of fear began to grow, and was linked to the speed of spread of the virus and to the consequences of the virus/environment interaction – which we have defined here as affordances – which show how no one, on the national territory, could feel excluded from the risk of contagion.

Linked to the second point of the first research question: What kind of emotional reactions has this virus elicited in users? [RQ1]. We can start scratching under reactions to start peeking at the emotions they contain. As a reaction to this event, the results of the analysis in the factorial space show that there were reactions of anxiety, perception of exaggeration, and sometimes a removal of the information because it is difficult to accept. The factors identified allow us to underline how – by the Italians – there was a questioning of the institutions and an evaluation of the initial work of the Government and the spread of the virus. Slowly, this evaluation of the information produced a recommendation of the prescriptions as to what was safe to do and what was dangerous to do. Furthermore, the scientific testimonials called to explain the situation and the prescriptions confirmed the presence of a dangerous virus. All of this was engulfed by the spiral of communication, which was driven by a generative mechanism of fear.

4. Discussion and conclusions

Within a few days the meaning of the hashtag coronavirus changes, through human use and interaction, and above all, following social, political, and pandemic events. Then coronavirus becomes an umbrella under which multiple meanings and emotions are collected. The work that takes place here gives us the opportunity to analyze – at a specific point of time – the evolution of its meanings. What we do is a retrospective reconstruction of sensemaking (La Rocca, 2020a). Offering the opportunity to analyze, almost simultaneously, the formation of a collective memory, of what later in time will become public memory. According to Kligler-Vilenchik (2011) collective memory is best shaped at the intersection of the media memory and the public memory agendas,

Table 3 . Cluster analysis results.

Cl	Label	Tweet	Tw%	Subcl	Label	Tweet	Tw%	Term	Translation	Tw in Cl				
1	Damned North	17,902	20.3	1	The North	8171	9.27%	Lombardia	Lombardia	1385				
								situazione	situation	1044				
				Veneto	Veneto	828								
				economia	economy	798								
				crisi	crisis	677								
				8	Its Damnations	9731	11.04%	regione	region	2211				
								misura	measure	1590				
								aggiornamento	updating	947				
ordinanza	order	763												
salute	health	704												
virus	virus	2081												
2	Rising of the Flame	26,488	30.0	2	The Flame	12,923	14.66%	paura	fear	1559				
								influenza	flu	1074				
								panico	panic	869				
								morire	to die	784				
								parlare	to speak	1618				
								vedere	to see	1309				
								casa	home	1041				
				5	Reasons for Arising	13,565	15.38%	cinese	Chinese	1007				
								Amuchina	disinfectant	922				
								contagiare	to infect	2056				
								morto	dead	1972				
								persone	people	1024				
								guarire	to heal	988				
								vittima	victim	967				
3	Affordances of the Virus	24,229	27.5	3	Affordances	10,119	11.48%	positivo	positive	3247				
								primo	first	2422				
								italiano	Italian	1656				
								quarantena	quarantine	1380				
								test	test	1285				
				4	Hidden Dimension	19,553	22.2	4	Unsustainable Lightness of the Closure	10,692	12.13%	scuola	school	3108
												Conte	Prime minister	2900
												governo	government	2707
												Salvini	Oppos. leader	1612
												chiuse	closed	1115
7	The Thin Red Zone	8861	10.05%	zona	area	1006								
				rossa	red	849								
				stop	stop	639								
				rinvviare	to postpone	602								
				paese	country	587								

turning Twitter reactions into traces of moments when the past events most salient in the legacy media also become those perceived as most important by individuals.

If we knock inside the tweets, we will discover the many meanings of coronavirus. Everything that is anchored to a single hashtag contributes to redefine its meaning. This new meaning is created by the users through their actions, that is through an agency (La Rocca & Rinaldi, 2020). These are meanings that we can enclose in interpretative categories. These interpretative categories come from below, because they collect the meanings that users have attributed to coronavirus. In the step's analysis, that we have developed, they descend from the sub-clusters (see Table 3), but here – now – we re-understand their contents and specify their meanings.

It is at this level that we can begin to answer our second research question. How do users' actions and reactions help redefine the meaning of the coronarius hashtag? [RQ2].

We obtain eight interpretative categories of meaning, each of them with a symbolic weight; it depends on the different use that users made over the days – here analyzed – of the meanings related to coronavirus (Figure 4).

In a ranking of meaning we find, in first place: 'its damnations' (sub-cl 8), which collects all the tweets which describe the consequences for the Italian regions. We must remember that we are in the initial phase of the Italian epidemic wave and that the first regions to be affected are those of Northern Italy.

Sub-cluster 8 – Tweet: *The Italian regions have set up toll-free numbers to respond to requests for information on the #coronavirus and on urgent measures to contain the infection. here are the numbers region by region (Score³ = 14,549.09).*

Sub-cluster 8 – Tweet: *from Monday 24 February 2020, the ordinance, signed by the president of the region, stefano bonaccini, and by the minister of health, roberto speranza, which provides for preventive measures to counter the spread of coronavirus, is in force. #piusaimiglios-tai #coronavirusitalia (Score = 7547.47).*

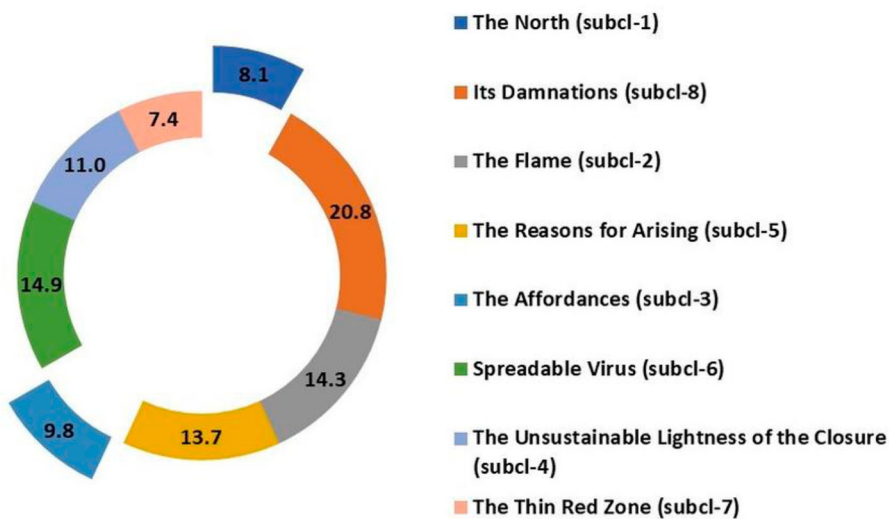


Figure 4 . The ranking of coronavirus nuances.⁴

Indeed, in clustering, it is combined with sub-cluster 1: ‘the North’, which however in our ranking of the most used meanings is only in seventh place, collecting within itself the names of the regions and the political figures.

Sub-cluster 1 – Tweet: *With our careful checks we have screwed up tourism and exports with potentially devastating consequences for our economy, all other countries (except China and Southeast Asia) have made minimal checks, counting their probable deaths from #coronavirus continues (Score = 3350.15).*

Sub-cluster 1 – Tweet: *Conte does er ganassa to try to put the blame of the infected on the presidents of Lombardy and Veneto, who responded in kind: ball-coronavirus, Conte wants full powers: Commissioner Lombardy and Veneto? Fontana: offensive (Score = 6365.18).*

In second place, we find ‘the spreadable virus’ (sub-cluster 6), which tells of the spread of the contagion, positive cases, serological tests, and the rapid spread of the disease.

Sub-cluster 6 – Tweet: *#coronavirus suspected case in the Pesaro area: positive a sample analyzed in the afternoon which tomorrow will be sent to the national diagnostic center of the higher health institute. if positive, it would be the first case in the Marche region. the patient isolated at home is fine. #ioseguotgr (Score = 28,559.21).*

Sub-cluster 6 – Tweet: *#coronavirus first positive case (certainty is expected tomorrow morning after the ISS release) in #marche (PR. #pesaro): the patient in excellent health has been isolated. #coronaviritalia (Score = 10,553.21).*

It is no coincidence that in third place, for number of tweets, we have the category ‘the flame’ (sub-cluster 2), which collects words such as: fear, panic, dying.

Sub-cluster 2 – Tweet: *#coronavirus suspected case in the Pesaro area: positive a sample analyzed in the afternoon that will be sent tomorrow to the national diagnostic center of the higher health institute. if positive, it would be the first case in the Marche region. the patient isolated at home is fine. #ioseguotgr (Score = 10,552.51).*

Sub-cluster 2 – Tweet: *#coronavirus first positive case (certainty is expected tomorrow morning after the ISS release) in the #marche (PR. #pesaro): the patient in excellent health has been isolated. #coronaviritalia (Score = 7036.93).*

In an orderly succession of events, in fourth place we have the conceptual category ‘the reason for arising’ (sub-cluster 5), where the reasons underlying the spread of the coronavirus are collected; in fact, we find the words: Chinese, to touch, which trace the path of the spread of the virus in the world and in Italy.

Sub-cluster 5 – Tweet: *If you plan to fight the coronavirus with basic hygiene rules (wash your hands) I warn you that we are done for: I see people leaving the bathroom without washing their hands and you think they start now? (Score = 10,884.75).*

Sub-cluster 5 – Tweet: *I saw the video where an Italian beat a Filipino believing he was Chinese and I hope this coronavirus disappears as soon as possible because I can't see such scenes, I feel bad (Score = 6538.11).*

In fifth, sixth and eighth place we find the conceptual categories: ‘The Unsustainable Lightness of the Closure’ (sub-cluster 4), ‘The Affordances’ (sub-cluster 3), ‘The Thin Red Zone’ (sub-cluster 7) which tell us about the beginning of something that would have paralyzed the world, the lockdown.

Sub-cluster 4 – Tweet: *The president of the Marche makes a conf. press to announce closure of schools, Conte live blocks it. the next day governor closes the schools anyway. government challenges decision. How did we come to this? (Score = 26,291.00).*

Sub-cluster 4 – Tweet: *Rome, coronavirus, school and university closures, demonstrations and public places: the measures region by region the government: the closure of schools across the country and a fake news (Score = 14,150.38).*

Sub-cluster 3 – Tweet: *#coronavirus 1 dead 12 infected Conte: Italy is safe 3 dead 44 infected Conte: Italy is safe 4 dead 110 infected Conte: Italy is safe 11 dead 322 infected Conte: Italy is safe # covid19italia (Score = 34,834.56).*

Sub-cluster 3 – Tweet: *@robertoburioni non-controversial question. #coronavirus fatality rate: deaths/infected (2707/80376) 3.3%, deaths/total deaths - healed 9%, deaths/infected less incubation time 4.5%. critical cases 19%. why is 1% indicated as a probable rate? @corradoformigli (Score = 10,665.56).*

Sub-cluster 7 – Tweet: *coronavirus, green light for closed-door races, training skips in Formello Acerbi, postponed the 21st day of spring (Score = 6312.49).*

Sub-cluster 7 – Tweet: *coronavirus, in Cesaro (FI): green light for competitions, verified if candidates come from red areas?: Naples, 25 February - we learn that the regional council has given the green light to the selective tests of the competitions that will see #politics (Score = 10,355.90).*

What this sub-cluster analysis allows us to get back can be defined as an emotional-folksonomy *a posteriori*. Without a doubt, made using labels that draw on a shared conceptual imaginary – which comes to us from the past and from old media representations with a known meaning – but which still fails to be peculiar to COVID-19. For example, The Thin Red Zone label recalls the 1998 film *The Thin Red Line* by Malick anticipating what will be a prevalent metaphor of the pandemic during the first wave of its diffusion between March 2020 and May 2020 (e.g. Boccia Artieri et al., 2021; Scaglioni, 2020). Thus, within the tweets of this sub-scluster are words like risk, alarm, block. All words that refer to the danger and the reactions to it, and that also make us understand how this danger is still unknown, it lies within a hidden dimension (see Tables 2 and 3). Therefore, the defense reactions to it are generic, they draw on war. The Unsustainable Lightness of the Closure label, on the other hand, recalls Kundera's novel *The Unbearable Lightness of Being* from 1984, and has been used here because, similarly to the events narrated in the novel, the life of Italians is interrupted by an external event. The invasion of Prague by the Warsaw Pact – in the novel – the invasion of the virus in Italy. This sub-cluster collects many words whose root is linked to the verb to close, the infinitive of the verb and the nouns closed and closures. Instead, the Spreadable Virus label recalls the study by Jenkins et al. (2013) *Spreadable media*, where the authors map fundamental changes taking place in our contemporary media environment characterized by cultural convergence, hybridization, and rapid circulation of content by users. The characteristics of spreadable media pass here to the virus. This sub-cluster tells us about the effects related to the contagiousness of the virus, we find the words positive, quarantine, hospital, patient. The affordances label obviously refers to the ecologic theory of perception (Gibson, 1979), where the concept is born and subsequently adopted in other fields. It refers to the properties of the environment that activate or offer potential action by an agent. As several studies have shown (Wells, 2002), affordances are not just properties

of the environment: they exist only as a relationship between an agent and his/her environment. In this work, this concept is used to group the consequences produced by the interaction between viruses, citizens, and the social environment, and which are told by the word's dead, epidemic, victim and by the presence of institutions, between these the World Health Organization.

We are therefore looking for interpretative categories, for an unexpected and unpredictable event. The same disorientation is felt in Italian studies published immediately after the appearance of the virus and the lockdown (e.g. Boccia Artieri, 2020; Bonini, 2020). What we find in this study is a strong disorientation due to the lack of interpretative categories capable of facing the symbolic reversal due to a devastating event. COVID-19 has plunged into our society as a fracture, and as such it has imposed itself as a radical and irreversible discontinuity in our lives and in our daily lives (e.g. Boni, 2020; Ronchi, 2020). This madness can be traced as much in the prolific literature on COVID of 2020 as in the initial reactions of the Italian people on Twitter. It is only through an overview of our conceptual or emotional-folksonomy categories that we can trace an interpretative framework of the impact of the initial phase of COVID-19 in Italy. We can look at the reactions on Twitter that we have analyzed looking for an answer to the question – that we have all asked ourselves and perhaps still ask ourselves – ‘What’s happening here?’. We immediately realize that it is nothing more than a contextual specification of ‘What’s happening?’, the stimulus question for writing tweets. Nothing good, maybe the human and social sciences can help us interpret it.

Our emotional-folksonomy, indeed, can be read according to two oppositional categories: (1) the first is contamination and guilt, which collects sub-clusters: the flame, the reason for arising, its damnations, the North; (2) the second is lockdown and acceleration, which collects sub-clusters: the unsustainable lightness of the closure, the thin red zone, the spreadable virus, the affordances (see Figure 5). The function of these oppositional categories is to help us interpret the social representation of COVID-19 in the initial phase of the pandemic (Figure 5).

The first category ‘contamination and guilt’ recalls the dimensions of risk and uncertainty analysis, proposed, and developed by several sociologists (Bauman, 2000; Beck,

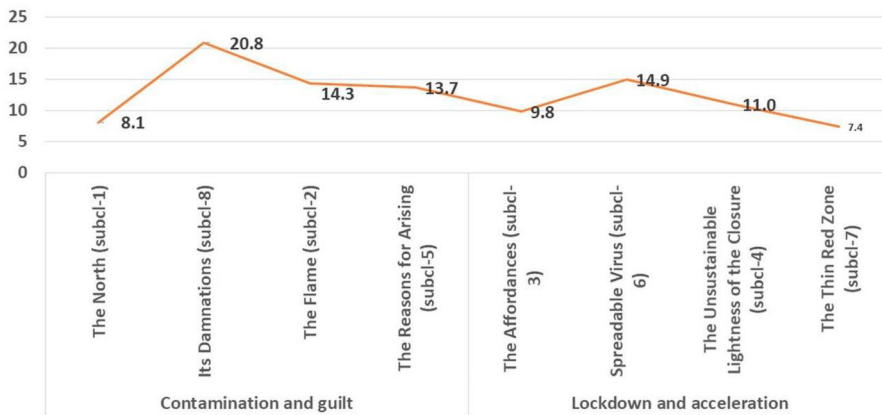


Figure 5 . Framework of emotional-folksonomy.

1992; Giddens, 1990). Here they are represented by the contamination of a place, the regions of northern Italy, and by the actions that from there begin to raise and spread the flame of the COVID and fear. Fear arises from the danger of contamination – as Douglas (1966) argued – which threatens our purity, and undermines a social, biological, cultural system, undermining it in its integrity and security. It is from there, from this fear of contagion, that insecurity and the attribution of guilt and responsibility arise, underlined here by the sub-cluster ‘it’s damnation’. Because of the spread of the contagion and the fears come the decrees which establish the closure of Lombardy and the emergence of the red areas and what will be known, after, as lockdown. Here a contrast emerges between the mobility or spreadability of the virus and the immobility of citizens. It recalls the analyzes of Hannam et al. (2006) which focus on new immobility, or those processes of social exclusion that limit or prevent the free movement of certain categories of people. The categories forced into immobility are – for us – those of citizens of northern Italy and, on the other hand, the only category that can move and does so quickly is represented by the virus.

4.1 The emotional journey of the meaning of coronavirus

Inside the initial reactions of the Italian people on Twitter we have found emotions that revolve around fears, guilt, contamination; they depend on an unknown virus and on the social changes that the decrees begin to trace. Not surprisingly all the messages in the emergency period highlight a negative sentiment, but if we consider the sentiment from a different perspective, the result is particularly interesting.

Under our perspective, sentiment is analyzed using two categories: surrender and resist. It is the dichotomization of two extreme reactions: in the face of an invisible and pervasive enemy, all that remains is to decide whether to capitulate before it or to implement defense strategies. Hooking up this polarization of sentiment linked to the pandemic allows for a range of feelings associated with these messages which is wide and variegated and reflects human nature. One third of the representations (35.5% of texts) reflect the intention to surrender to the health threat while almost two thirds (64.5%) highlight the intention to resist and face the emergency (Figure 6). We have considered *The North*, *The Flame*, and *Affordances* as representations, highlighting a passive position in facing the pandemic (*Surrender*). The health emergency was such an unexpected and frightening event that it left people astonished and in need of information and support. On the other hand, we considered *Its Damnations*, *Reasons for Arising*, *Spreadable Virus*, *Unsustainable Lightness of the Closure*, and *The Thin Red Zone* as representations reflecting the intention to react to the pandemic facing the emergency (Figure 6).

Sentiment analysis allows us to add another important piece in the *a posteriori* construction of our emotional-folksonomy. The construction of this emotional-folksonomy is always based on the emotions – expressed through words – that Italian people have attached to the coronavirus hashtag, but it intertwines two dimensions: (1) an interpretative-conceptual dimension based on sociological theories (2) with an emotional-statistic based on sentiment. In fact, based on sentiment analysis we have two new ‘surrender’ and ‘resist’ categories within which our sub-clusters are reclassified.

At this second level of analysis, we are ready to fill the conceptual categories that we have attributed to the sub-clusters with meaning coming from the tweets (see Table 4).

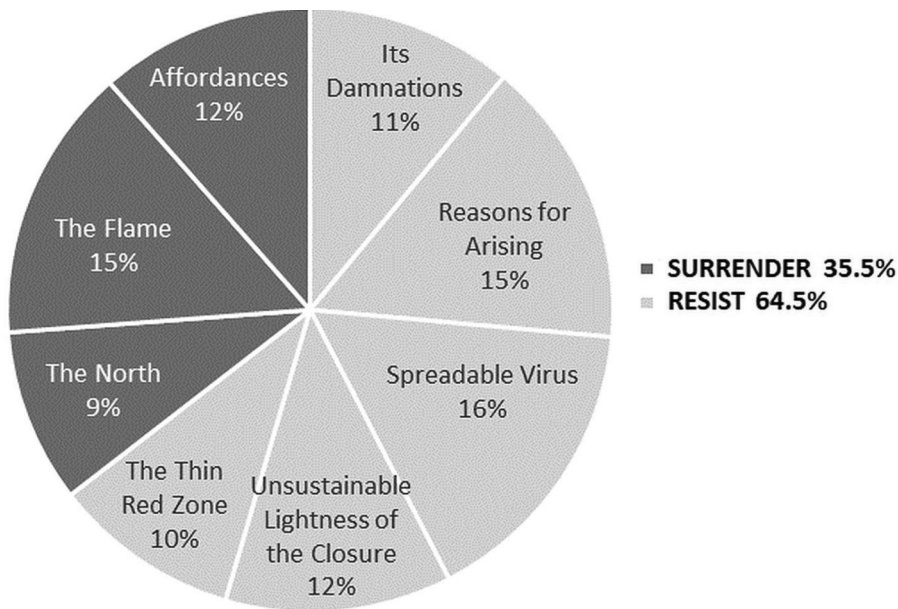


Figure 6 . The sentiment on Coronavirus.

These are coping trajectories within emotional folksonomy, which allow us to explore the sensemaking of clusters.

We call them ‘trajectories’ and not ‘strategies’ because they only allow us to identify the route of the prevailing moods in the tweets, but they can give nothing back on the behavioral strategies implemented by the Italians.

They tell us that a twofold trend emerges from the tweets:

- Active/confrontive towards contamination and fear, guided by an attitude aimed at resistance towards a virus that runs extremely fast and imposes red zones and closures. A virus that forces immobility and takes the spaces of social life for itself, depriving Italians of the pleasure of physical proximity.
- Avoiding/escaping from the virus, which looks at what is happening in the northern regions of Italy, at the lighting of the COVID flame and its implications (affordances) given by the interaction between viruses, institutions and citizens as an uncontrollable event who admits surrender to the blocks imposed to safeguard health as unique possibility of salvation.

Table 4 . Coping trajectories within the emotional-folksonomy.

Cluster	Framework	Sentiment	Trajectory
The North (subcl-1)	Contamination and guilt	Surrender	Avoiding/Escaping
Its Damns (subcl-8)	Contamination and guilt	Resist	Active/Confrontive
The Flame (subcl-2)	Contamination and guilt	Surrender	Avoiding/Escaping
The Reasons for Arising (subcl-5)	Contamination and guilt	Resist	Active/Confrontive
The Affordances (subcl-3)	Lockdown and acceleration	Surrender	Avoiding/Escaping
Spreadable Virus (subcl-6)	Lockdown and acceleration	Resist	Active/Confrontive
The Unsustainable Lightness of the Closure (subcl-4)	Lockdown and acceleration	Resist	Active/Confrontive
The Thin Red Zone (subcl-7)	Lockdown and acceleration	Resist	Active/Confrontive

Undoubtedly, the #coronavirus collects multiple meanings within itself, and they have changed over time, following the events and perceptions of users about what was happening.

4.2 Conclusions

The analysis path allows us to make two different orders of considerations.

The first concerns the analysis of the feelings and emotions conveyed by users on Twitter, and the raising of a crucible of fears related to the virus as an invisible enemy. This underlines the use of Twitter as a shared space for discussion, within which users' structure gatewatching practices over acute events. The analysis of clusters and sub-clusters allows us to break down and – subsequently – to organize the content of the reactions into conceptual categories that emerge from below (see [Tables 3 and 4](#), and [Figures 4 and 5](#)). ETM also gives us the possibility of grouping them around a polarized sentiment, which although negative, is articulated around two semantic axes typical of those who face an emergency, a crisis, almost a war. So, there are two alternatives in front of the enemy: surrender or resist [RQ1] (see [Figure 6](#)). The tweets collected cover 4 days; these have been identified as those in which there is a media hype due to the growth of online press news in the coverage of the coronavirus topic. This media hype has the consequence of moving the relationship between themes and attributes from media agendas to those of the public.

In fact, as explained the third level of the agenda-setting, called Network Agenda Setting Model 'the news media can actually bundle different objects and attributes and make these bundles of elements salient in the public's mind simultaneously' (Guo et al., 2012, p. 55). Thus, the salience of the interrelationships among constructs can be transferred from the media agenda to the public agenda. To confirm this transfer of relations back to us is the analysis of the meanings of the hashtag, which rests on a double path to be reconstructed: the statistical one and the content one.

The analysis into the meanings of the coronavirus hashtag and the discovery of its different nuances (see [Figures 4 and 5](#)) shows that:

(...) hashtag-mediated discursive assemblages are neither simply the reflection of pre-existing discourse formations nor do they create them out of digital aether. Rather, they are nodes in the becoming of distributed discussions in which their very materiality as performative utterances is deeply implicated. (Rambukkana, 2015b, p. 3)

At this point the coronavirus hashtag becomes more than a polysemic collector of reactions, which shows its strength of temporary connection affordances (Rathnayake & Suthers, 2018).

This is where the second consideration begins, which is linked to our second research question, how do users' actions and reactions help redefine the meaning of the coronavirus hashtag? [RQ2]

By knocking on #coronavirus, we have the opportunity to discover how reactions change quickly in so few days, and to experience first-hand how the action of the user changes the meaning of the hashtag itself. A complex path of data analysis has been developed to reconstruct the multiple meanings that are collected within a hashtag and especially a hashtag linked to a rupture event. However, it was able to give us

back an emotional-folksonomy, the result of an interpolation of conceptual and statistical dimensions, which tells us which coping trajectories are contained in the tweets of the initial phase of spread of COVID-19 in Italy.

The emotional-folksonomy certainly emerges from below, it is contained in the tweets but in an implicit form, as it is based on the tagging choices made by an *ad hoc* public that is gathered under #coronavirus. In ETM method, the interpretation of the results and the decoding of the outputs make it possible to reveal it. That is, they give way to mood trends to emerge and be looked at as a whole. This process of quantitative hermeneutics of the textual datum transforms tacit knowledge into explicit (see La Rocca, 2009; La Rocca & Fielding, 2022). So, we find answers to our research questions.

Then, if we look at the construction process of the emotional-folksonomy it gives us information on what are the reactions of users on Twitter at the start of the coronavirus news, and on what kind of emotional reactions has this virus elicited in users [RQ1].

The dissemination of information through legacy media pours into tweets, filling them with moods that polarize the trajectories of coping of the COVID in active/confrontive and avoiding/escaping (see Table 4). We discover in this way that there are two different ways of giving up and/or resisting the consequences of COVID. The consequences of COVID are represented by contamination, by the process of attributing blame and responsibility generated by the closures and by the uncontrolled acceleration of the virus (see Figure 5). And it is all these elements that make us understand that the hashtag takes on multiple meanings over time that have a dynamic nature.

Notes

1. The data extraction was carried out with the rtweet package of R (v.0.7.0; Kearney, 2020) providing an interface to the Twitter web API.
2. TTR = 0.008; Hapax% = 36.3.
3. $\text{Score} = \sum \chi_{ij}^2 \frac{n_j}{N_k} - \chi^2$ = chi square value of term (*i*) in the document (*j*) classified in the cluster (*k*); n_j = number of terms in the document (*j*) classified in the cluster (*k*); N_k = number of terms in cluster (*k*) (Lancia, 2018).
4. The percentage values were calculated using the absolute values of the number of tweets grouped for each sub-cluster.

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No potential conflict of interest was reported by the author(s).

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