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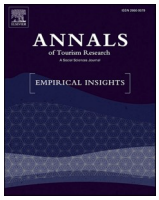

Tourism content on Twitter (X) during a crisis

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ABSTRACT

This study explores the themes and actors that dominated tourism-related tweets over the first two years of the COVID-19 emergency (2020–2021) and examines Twitter (X)'s potential as a communication tool within tourism crisis management. A mixed-methods research design was adopted to analyse almost half a million Twitter (X) posts that included the keyword 'tourism' and pandemic-related terms. The outcomes suggest that a select number of actors and user categories generated most of this Twitter (X) content and many of these had no specific involvement in tourism or displayed bot-like patterns of interaction. Content relating to crisis management abounded but so did content about geek culture, cryptocurrency, and NFTs. This calls for further monitoring and moderation of content and profiles on social media platforms.

1. Introduction

Mass tourism has experienced different moments of crisis since its emergence in the mid-20th century (Hall, 2010). These have included the inflationary crises of the 1970s, the Great Recession after the 2008 financial crash, the Eyjafjallajökull volcano eruption in 2010 and the Ebola pandemic in 2014, among others. Nevertheless, the crisis caused by the COVID-19 pandemic has been exceptional due to its unparalleled scope, idiosyncrasy, and intensity (Škare, Soriano, & Porada-Rochoń, 2021; UNWTO, 2021). Aside from its devastating effects on human lives and livelihoods, the pandemic has also been flagged as a potential catalyst of long-term change within the tourism sector, particularly in relation to digitalization. The pandemic has arguably spurred the ongoing digitalization of work processes, health- and safety checks, the development of 'virtual' tourist destinations, and the radical restructuring of tourism supply chains (Gretzel et al., 2020). At the same time, social media platforms have served as key arenas where a broad variety of actors have been able to digitally air their hopes and concerns about the impact of the COVID-19 emergency on tourism.

Social media platform Twitter (now also known as 'X') has been an important space for tourism scholars to investigate pandemic-related topics. Studies have broadly concentrated on how tourists and tourism firms have reacted to the COVID-19 pandemic on Twitter (X), or how Twitter (X) has been effectively appropriated by the tourism industry to engage in crisis communication. Carvache-Franco, Carvache-Franco, Carvache-Franco, and Iturralde (2022), for example, have carried out a sentiment analysis of travel- and tourism-related Tweets in relation to tourists' emotional responses to pandemic-related content during the first two months of the pandemic. In a similar vein, Lu and Zheng (2021) have studied the public's sentiment towards cruise tourism on Twitter (X), whereas Li, Wang, Filieri, and Zhu (2022) have studied tourism consumers' reactions to tourism firms' crisis responses during the pandemic. Their work has provided various communication strategies for tourism businesses such as hotels and restaurants to generate favourable consumer reactions during crises. Pasquinelli and Trunfio (2022), on the other hand, have conducted an empirical analysis of how post-COVID tourism issues were framed in Italian-language content on Twitter (X) vis-a-vis pre-pandemic debates on sustainable tourism. They have shown that prior knowledge on 'overtourism' "provided a meaningful framework for reaching novel insights into post-pandemic tourism dimensions, actions and models" (p. 243).

Despite this important work, the credibility of tourism-related Twitter (X) content during the crisis has not been sufficiently addressed in tourism studies (Williams, Wassler, & Ferdinand, 2022). Additionally, while there has been a focus in these studies on how Twitter (X) can be employed most effectively by businesses and governmental authorities during a crisis, little has been said about the type of user accounts that have created tourism-related content. This empirical study therefore has the objective to examine Twitter's potential as a communication tool within tourism crisis management while taking into account that factors such as uneven representation, commercial interests, and misinformation shape content. We first explore

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the tourism-related content that prevailed on Twitter (X) during the two most critical years of the pandemic (2020–2021) and the users who led this content. We then verify to what extent this published content was *actually* related to tourism and the pandemic, or whether it had ulterior purposes. This was with a view to advancing understanding of the opportunities and pitfalls for tourism crisis communication on social media sites. In doing so, this study responds to the call to acknowledge both the diversion of communication towards goals not directly related to tourism or the recovery of the tourism industry, and the circulation of 'misinformation' in Twitter (X) space, which could effectively alter risk perceptions of travellers, and which could then hamper any effort to restart tourism safely after a crisis (Williams, Wassler & Ferdinand, 2022). Ultimately, with this study we therefore set out to assess the extent to which Twitter (X) facilitated tourism communications management related to the COVID-19 health emergency and/or, on the contrary, the extent to which it may have failed to serve this purpose and favoured other interests instead.

Hence, in this paper we first review the literature on the use of social media platforms in crisis management, covering the main logics, topics, and actors that have shaped Twitter (X) in this regard. We next summarize the literature on issues of representation on Twitter (X) and the emergence of misinformation processes and non-human actors including social media bots. After outlining our research methodology, we present the results of our analysis, organizing them as a function of the dominant themes and users in Twitter (X) content about the pandemic and tourism. Finally, we state our conclusions and propose future lines of inquiry.

2. Uses and possibilities of Twitter (X) in managing crises

Among the major social media platforms, Twitter (X) is currently seen as one of the most prominent, given its scope for mediating and shaping different kinds of social interaction among its users (Burgess & Baym, 2022). Often conceptualized as a 'micro-blogging site', Twitter (X) is commonly used by individuals, collectives, media players, private and public organizations, and political actors to circulate information, voice opinions, maintain a public presence, build networks, mobilize movements, and (not least in importance) to advertise products and services (Burgess & Baym, 2022). The ambiguous nature of Twitter (X)'s function and image has been drawn out in various historical analyses, which show that Twitter (X) was once predominantly a site for sharing individual and personal content but quickly shifted towards becoming a more informational public communication platform (Barnard, 2018).

Despite the turmoil that the company has experienced since its takeover by Elon Musk in mid-2022, Twitter (X) undoubtedly remains one of the most popular social media platforms and a key channel for a range of contemporary conversations. It has played a crucial role in the amplification of political debates (Gruzd & Roy, 2014; Soares & Recuero, 2021), and has been appropriated both for citizen resistance (Garay, Morales, & Wilson, 2020) and for the marketing of companies and territories (Garay & Pérez, 2017). In the governmental and political context, administrations and world leaders have used institutional and personal Twitter (X) accounts to develop relationships with stakeholders, reach new audiences, influence public opinion, and respond to social unrest (Barberá & Zeitzoff, 2018). Similarly, over the past decade, the platform has been used to communicate and manage a range of social, environmental, and health crises by governments, organizations, citizens and other actors (Bruns & Burgess, 2014; Pont-Sorribes, Suau-Gomila, & Percastre-Mendizábal, 2020; Pulido Polo, Hernández-Santaolalla, & Lozano González, 2021; Rosenberg, Syed, & Rezaie, 2020; Terpstra, Stronkman, de Vries, & Paradies, 2012; Wicke & Bolognesi, 2020).

Studies have shown that monitoring tweets via ad hoc sets of content and tweet-type filters can usefully inform operational responses and crisis communications across a range of contexts (Bruns & Burgess, 2014; Eriksson & Olsson, 2016; Gascó, Bayerl, Denef, & Akhgar, 2017; Gruber, Smerek, Thomas-Hunt, & James, 2015; Kersten & Klan, 2020; Malik, Khan, & Quan-Haase, 2021; Pont-Sorribes et al., 2020; Pulido Polo et al., 2021). Furthermore, Twitter (X) can facilitate two-way communication between governments and citizens in terms of validating useful information, communicating policy responses, and refuting rumours. According to Panagiotopoulos, Barnett, Bigdeli, and Sams (2016), governments can employ the platform to increase citizens' confidence in their management of emergency situations. These authors found that frequent brief messages on Twitter (X) "can improve adaptability to emerging risks by building an informed community, for example, addressing queries from the public, sharing and promoting actions in progress by individuals and organizations (e.g., effective coordination of riot clean-up) or providing support with emotional coping" (Panagiotopoulos et al., 2016, p. 93).

Thus, in addition to government communications through traditional media such as newspapers and television, distributing crucial information via social media can be a highly effective means of mitigating risk and influencing public reaction during crises. In crisis contexts, the social media accounts of government bodies should not issue communications in isolation; rather they should strive to become 'hubs', whose information output is retweeted by other users within broader flows of information. Nevertheless, Gascó et al. (2017) found that while citizens' tweets about crises follow a generally coherent pattern of concerns, they can also be influenced by information and communications that are unrelated to the crisis (for example, by the deliberate inclusion of hashtags that are currently trending but off-topic).

Critically, social media communication during crises can also fall short or even be counterproductive. For example, studies have pointed up the limitations of crisis management via social media platforms in relation to the 2014 Ebola outbreak (Pont-Sorribes et al., 2020). Much of the Twitter (X) content regarding Ebola revolved around collateral issues; this offered a case study for the detection of growing rumour-based information on the platform, whose impact even surpassed that of communications through traditional media such as television and newspapers (Jin et al., 2014).

Undoubtedly, the COVID-19 pandemic has provided another case study for researching the role that social media platforms can play in the management of crises. Petersen and Gerken (2021) analysed pandemic-related hashtags on Twitter (X), identifying a set of prevailing themes that included practical health information concerning COVID-19 and possible precautions that could be taken such as #stayathome, and #washyourhands; other topics were linked to outbreaks in specific regions and localities, as well as to the pandemic's impact on the social, religious, political, military, or business and technology spheres. The authors emphasized that ample scope remains for health authorities both to enhance and intensify their presence on the platform and to monitor the most prevalent concerns among citizens, which may be identified via hashtags. Meanwhile, Wicke and Bolognesi (2020) focused on the war-related metaphors that shaped discourse around the pandemic, as well as the role of so-called 'super-tweeters'. Importantly, the latter are likely bots, which can contribute to the viral spread of misinformation as we discuss in more detail in the next section.

3. Deflection of information on Twitter (X)

Social media have regularly been presented in academic studies as 'neutral' distributors of information. They supposedly act as broadcasters of "different public voices and opinions", giving exposure to certain topics for short periods of time, and making it appear as if the world were "a continuous flow of events" (van Dijck & Poell, 2013, p. 4). Yet, social media companies such as Twitter (X) play an important role in ensuring continuous engagement. More specifically, they 'programme' content by tweaking traffic through interfaces and algorithms. Which content is prioritized over other content via such programming is a highly political matter.

With regard to representation, previous studies have already

confirmed that social media tend "to be dominated by few users with large followings, partly because the platform assigns more weight to highly visible users" (van Dijck & Poell, 2013, p. 7). These findings have also been confirmed in pre-pandemic tourism studies, which have highlighted how certain user clusters, or 'hubs', on Twitter (X) enjoy greater popularity than others in distributing information about tourist destinations (Williams, Inversini, Ferdinand, & Buhalis, 2017). Similarly, certain voices and opinions that are amplified and positively valued on social media are frequently those who already enjoy celebrity status, which then puts to question how certain affected user groups are adequately heard about tourism-related issues (Mkono, 2018; O'Regan & Choe, 2022), including those groups that are potentially affected by the pandemic. While media and institutional Twitter (X) accounts with a large reach, such as Skift and the UNWTO (United Nations World Tourism Organization), wield major influence within the tourism industry as information providers, they rarely interact with other accounts. Likewise, political debates on Twitter (X) concerning Airbnb's role in 'overtourism' and the housing crisis tend to be dominated by users with large followings, ranging from print media organizations to high-profile intellectual activists, city council members, and political party leaders (Wilson, Garay-Tamajon, & Morales-Perez, 2022). Far from being neutral choreographers of social interaction, social media platforms thus employ specific strategies and mechanisms that can filter out or privilege some posts (and users) over others in a bid to maintain continuous engagement (Gillespie, 2010).

Beyond issues of representation, the prevalence of misinformation on social media platforms has become a popular field of study within various disciplines. We define misinformation here as an amalgam of "false or misleading news reports, hoaxes, conspiracy theories, click-bait headlines, junk science, and even satire" that is based on neither empirical evidence nor expert opinion (Shao et al., 2018, p. 2). Studies have shown that Twitter (X) has provided ample opportunity for users to manipulate information and distribute misinformation (Gruzd & Mai, 2020; Rosenberg et al., 2020), particularly via so-called 'social bots' or 'fake-users'. These are usually (partially) automated accounts that can operate on social media platforms like Twitter (X) with some level of autonomy (Gorwa & Guilbeault, 2020; Gruzd & Mai, 2020). Bots are part and parcel of 'coordinated' activities that purposely aim to artificially inflate or propagate specific content, with a view to interfering in political communication via the spread of partisan content or misinformation. Following Gruzd and Mai (2020, p. 2) "these forms of social manipulation, if left unchecked, could skew the conversation, manufacture anger where there is none, suppress opposition, or dampen debate".

Important questions have been raised about the impact of misinformation on democracy, institutions, and society at large. Misinformation – in its manifold manifestations – has been known to influence politically-centred communications, for example during election campaigns (Martini, Samula, Keller, & Klinger, 2021; Soares & Recuero, 2021) when different political movements strategically used misinformation to advance their own interests (Zimdars & McLeod, 2020). This has fostered a culture of denialism surrounding particular political issues (Bloomfield & Tillery, 2019). Denialism is predominantly manifested through the rejection of scientific consensus, but also relies on the fabrication of conspiracy theories, the election of 'fake experts', selectivity, and "the creation of impossible expectations of what research can deliver" (Diethelm & McKee, 2008, p. 3). Denialism, anecdotal information, and unscientific approaches to the COVID-19 pandemic have proliferated since its outbreak and have been particularly instrumental to certain populist agendas, producing major disruptions in the management of different local and global crises and jeopardizing efforts to contain the further spread of the virus (van Dijck & Alinejad, 2020).

For example, during the pandemic several Twitter (X)-user accounts associated with conservative and far-right politicians promoted and fuelled the so-called #FilmYourHospital conspiracy theory, which encouraged followers to violate social isolation regulations and film allegedly 'empty hospitals', effectively stalking healthcare practitioners and disrupting their work (Gruzd & Mai, 2020). Within the context of tourism, Barrientos-Baez, Martinez-Sala, Altamirano, and Dominguez (2021) have examined the proliferation of misinformation or 'fake news' about the consequences of the pandemic for tourism across various media channels. Their study, which mainly focused on news written in Spanish, has shown that fake news has not only hampered government administrations to communicate effectively but that it has also introduced alarmism and uncertainty among citizens. While numerous studies have shown that reliable information regarding the COVID-19 pandemic is still far more prevalent than misinformation in terms of scale across various Internet platforms, (viral) patterns of sharing ensure that misinformation nevertheless obtains substantial reach (Green et al., 2021).

At the same time, Twitter (X) has been appropriated to direct users' attention towards specific topics. For example, it has been used to advance commercial spam campaigns beyond paid advertisement on the platform (Bindu et al., 2018) and to push financial hyper-speculation and fraud, particularly in relation to digital cryptography systems such as cryptocurrencies and NFTs (non-fungible tokens) (Kaspersky, 2023; Mackenzie, 2022). In their analysis of various cryptocurrency schemes on Twitter (X) and Telegram, Nizzoli et al. (2020) pointed up the proliferation of bots or suspended accounts in so-called 'pump-and-dump' and 'Ponzi' schemes. The role of the bots is to generate hype and false promises about potential returns on investment, with a view to luring people into investing in the schemes. In these contexts, so-called 'social media routers' (synonymous with bots) play a key role in amplifying the information spread by certain economic and financial 'experts'.

Having reviewed the background literature, we may now articulate the aim of our study in terms of the following research questions. First, what themes and actors dominated tourism-related tweets during the COVID-19 pandemic, and specifically throughout 2020 and 2021? Second, was the platform helpful to the management of communications relating to tourism and the pandemic? If yes, whose purpose did it serve specifically? And if the platform failed to serve this purpose, did it act as a channel to communicate other interests? It is with these questions in mind that we now describe the methodology and methods that helped us achieve our research objective.

4. Methodology

In connection with the objectives of this research, a mixed-methods approach was adopted to examine both quantitative and qualitative aspects of the data. To explore what topics and types of users were most prevalent on Twitter (X) in relation to tourism and the COVID-19 pandemic during 2020 and 2021, we examined a set of tweets that included the term 'tourism' in combination with pandemic-related terms such as 'covid', 'coronavirus' and 'corona'. We excluded Boolean operators that referred to tourism-related terms such as 'travel' or 'holidays', which could have resulted in a larger volume of Tweets but could have also distorted the results if they were not related to tourism.

We used the Twitter (X) Developer Portal to download and analyse a database of 483,831 Tweets, which was obtained by submitting a request to Twitter (X) (management) that explained our research objective. We confined our analysis to English-language content, given that English is the lingua franca of international tourism and that this still allowed us to capture most of the tourism-related content on Twitter (X). Additionally, as scholars whose first language is Spanish and Dutch, English represents our shared academic language and the language through which we conducted our analysis. The terms and conditions regulating our use of the database included compliance with ethical guidelines, such as drawing on publicly accessible Twitter (X) content only (as provided by the company) and anonymizing specific tweet content and/or user data. Accordingly, all the Twitter (X) content and

users in this study are presented in an aggregated and anonymous manner. Furthermore, while users' original tweets and replies were included in the database, retweets were discarded to avoid misleadingly inflating the content to be analysed and especially to factor out insofar as possible the impact of fake users or bots.

The database commences on January 13, 2020 with the news that an infected Chinese tourist was being treated in Thailand, and proceeds through the end of 2021, when border closures were still a reality across the globe, severely impacting the tourism sector. We first analysed how the tweets evolved over time, observing them for each month of the two years under study and investigating whether particularly large upticks in tweets corresponded with major events publicized via traditional media such as Reuters. Next, we used the qualitative analysis software NVivo to determine which terms – other than our primary search terms (e.g., tourism) – were most frequently mentioned in the corpus of tweets. Similarly, we analysed the occurrence of tagged constructs, which in the case of Twitter (X) are identified by *hashtags*, marked by the # symbol. The purpose of hashtags is to popularize a specific theme and make related tweets more easily searchable.

We then carried out co-occurrence network analysis using a modularity algorithm designed to measure the relative strength of division of a network into modules (also termed groups, clusters, or communities). Networks with strong modularity feature dense connections between nodes within modules but sparse connections between nodes in different modules. We used Python and its RE (regular expression) library to identify the hashtags in our corpus of Tweets. We then used Gephi to estimate the average weighted degrees of the edges and nodes and the Gephi modularity algorithm to detect communities (Blondel, Guillaume, Lambiotte, & Lefebvre, 2008). When working, as in this case, with undirected degrees, the degree of a node represents the number of times that a hashtag appears in hashtag-hashtag pairs. A higher degree implies a stronger association with the rest of the hashtags in the network. Next, we triangulated the previous descriptive and group analyses by conducting a more basic content analysis that allowed us to focus on certain content or specific users. The resulting analysis was richer than a purely conceptual one, given that it also considered the context in which words were used and the extent to which automated mechanisms contributed to the communications of certain users, a proxy indicator for the presence of social bots.

We approached the categorization of Twitter (X) user accounts with caution, given that the platform is open to multiple, sometimes overlapping uses (e.g., personal and professional) and may be appropriated to pursue different interests over time, including the spread of false information by 'fake users' or bots. Types of user groups may be as many as there are styles of communication and it might be argued that assigning any kind of category is contentious or only appropriately done through self-identification. In light of these considerations, we tentatively assessed the capacity in which the 'most active' and 'most-replied-to' users were tweeting by scanning the sort of content they tweeted and analysing their Twitter (X) handles with the Botometer (see below). While we acknowledge that this procedure offers an inherently partial view, we opted to classify accounts as appearing to be held by: *individuals* tweeting in a personal or professional capacity (i.e. not as an organization or entity), or *organizations* whose primary content is related to the product/business/activity they are involved in or are promoting, or *media* in terms of traditional and/or online media organizations (e.g., broadcasters, newspapers, radio stations) and media staffers, or *governments* in terms of bodies such as central government ministries or regional authorities or individuals such as politicians, state leaders, and policymakers, or *academics* understood as individuals in the employ of third-level institutions.

Finally, to estimate the prevalence in the dataset of automated features such as bots, we used the Botometer tool to complement our own qualitative assessment of user profiles that engaged in seemingly suspicious or excessive Twitter (X) activity. The Botometer is available via a public API. It is based on machine learning and trained on data that includes "spam bots, political bots, porn bots, vendor purchased fake followers and more" (Martini et al., 2021). Studies have shown Botometer's shortcomings (Rauchfleisch & Kaiser, 2020) and "estimate that the tool produces between 41% and 76% false positives and 71% and 90% false negatives, also depending on data and language" (Martini et al., 2021, p. 5). Despite yielding highly accurate ratings, we have used the Botometer with caution and have only used it in a complementary way to support our own qualitative assessment of the most active and most-replied-to user accounts.

5. Findings

5.1. The temporal metrics of Twitter (X) activity between 2020 and 2021

To track the volume of Twitter (X) communications and identify periods of particularly heated discussion, we first outline the temporal dynamics of Twitter (X) activity related to our key terms of analysis. Fig. 1 visually reflects the chronology of some of the major events reported in the mainstream media (see Reuters, 2021). A first significant uptick in tweets may be observed around March 2020, coinciding with the initial formal declaration of the COVID-19 pandemic by the World Health Organization (WHO). A second peak followed in early April 2020, which saw the one millionth COVID-19 infection worldwide. These two peaks in Twitter (X) activity also correspond with the period when many governments first established mobility restrictions and lockdowns, closing countries to visitors. These early peaks were followed by a progressive drop in comments throughout the second half of 2020, when many restrictions on mobility and border closures remained in place.

The decline in Twitter (X) activity surrounding topics like tourism and the pandemic ceased around the beginning of 2021. Output then remained relatively stable throughout the first half of 2021, with new developments – such as the first vaccination campaigns or the emergence of new, more contagious variants such as *Omicron* attracting the attention of users. In the second half of 2021, a further decline in Twitter (X) activity could be observed, perhaps associated with the gradual reopening of borders and a further uptick in mobility, as well as growing vaccine uptake in a substantial number of high-income countries including many EU states.

5.2. Main terms, hashtags and thematic clusters

Table 1 shows, in descending order, the terms most frequently mentioned in conjunction with our key terms of analysis, such as the tourism *industry*, *economy*, or *business*. Other words such as *people, hit* and *impact* also stand out, as do concepts linked to the measures adopted by governments in different countries to mitigate adverse health impacts, which, to a large extent, led to the shutdown of tourism activity.

Impacted groups involved in tourism (*people, tourists, visitors, cases)* are often mentioned, as are the public health- and epidemic related measures (*lockdown, restrictions, quarantine*) and terms associated with potential recovery (*vaccine, recovery, future*). Finally, in conjunction with these concepts, which allude to the evolution of the pandemic and the measures adopted in response, the tweets also highlight specific tourist destinations (*Thailand, Florida*) and leading international source markets for tourism (*US, UK, China, Europe*). Notably absent from the list of key terms are references to sickness, illness, death, or any of the other destructive impacts of the COVID-19 disease on the health of local populations and tourism workers. References to traditional sources of authority during the crisis, such as the World Health Organization (WHO) or the United Nations World Tourism Organization (UNWTO) are also absent from the list of most popular terms. Instead, the key terms seem to speak of tourism predominantly as an economic sector in need of recovery, rather than as an activity that also contributed to the circulation of the virus and, consequently, to infection and death (Iaquinto, 2020).

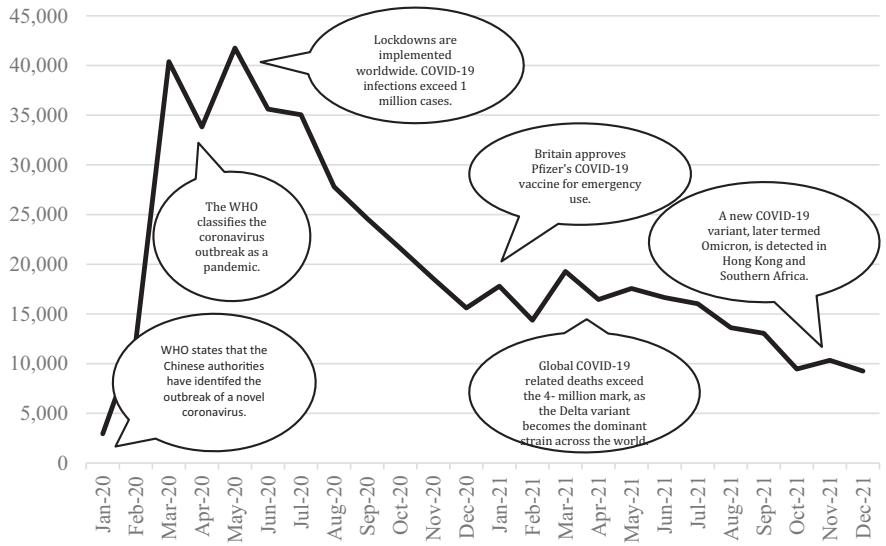

Fig. 1. Monthly volume of tweets containing the key terms of analysis across 2020–2021.
Number of tweets.
Source: Authors' own work.

Table 1
Main terms mentioned in conjunction with the key terms of analysis in tweets (2020–2021). Terms and number of tweets.

Term	Tweets	Term	Tweets	Term	Tweets	Term	Tweets	Term	Tweets
Travel	84,622	Recovery	15,521	Visitors	10,700	Day	7928	Well	6859
Industry	61,166	Government	15,341	Jobs	10,339	Holiday	7916	Free	6849
Covid19	38,015	Time	15,244	Thailand	10,319	Visit	7898	Quarantine	6756
Sector	28,774	Global	14,472	Virus	10,314	Sectors	7857	Greece	6683
People	25,666	State	13,833	Million	10,189	Live	7834	Think	6647
Economy	23,819	Cases	13,505	Vaccine	9493	Safe	7798	Cruise	6634
Post	21,987	Countries	13,262	Summer	9351	Way	7607	Borders	6615
World	21,414	Support	13,233	Future	9174	Covid_19	7583	Billion	6611
Tourists	21,067	Health	13,085	China	8969	Florida	7539	Months	6597
Hit	20,526	International	13,062	Outbreak	8766	Money	7410	Great	6553
Business	20,018	Restrictions	12,922	City	8689	Africa	7358	Please	6532
Impact	18,995	Open	12,622	Hard	8607	India	7353	Times	6380
Hospitality	18,594	Local	11,887	Come	8589	South	7147	Industries	6284
News	18,479	Economic	11,794	Uk	8402	Home	7139	Lost	6189
Corona	18,190	Need	11,664	Affected	8360	Europe	7133	Latest	6187
Year	17,604	Lockdown	11,626	Today	8333	Plan	7015	Reopening	6139
Businesses	17,222	Minister	11,445	Domestic	8311	Know	7006	Relief	6068
Help	16,595	Hotels	11,289	Work	8200	Boost	6995	Reopen	6051
Back	15,769	Crisis	11,055	Good	8195	Make	6930	Measures	6045
Country	15,754	Tourist	10,801	Hotel	8026	Workers	6896	Week	6027

Source: Authors' own work.

In conjunction with our analysis of the main terms in the database, we also analysed the main hashtags (Table 2) in order to further refine our understanding of salient collective interests on this platform. Apart from the predictable prevalence of #tourism and #pandemic, hashtags referencing certain tourist destinations (*Thailand*, *Greece, India*, or *Spain*) stand out, as well as hashtags related to aviation (*airlines, aviation, flights, airport)* and others flagging the newsworthiness of the tweet in question (*travelnews, coronavirusupdates*). Again, impacted tourism subsectors (*hotels, resorts, trips*) are frequently invoked, with an even higher rate of occurrence than hashtags related to the aviation industry and related infrastructures (*airlines, aviation, flights, airport)*.

Notably, our analysis identified a multitude of terms that seemingly bear very little association with the pandemic or the crisis in the tourism sector. These hashtags relate to digital currency or digital innovations such as *technology, digital, blockchain, crypto, drone, krypto, electronic, selfdriving, elonmusk, digitalmoney*. This suggests the possible deflection of information or manipulation of content towards other, non-pandemic- or non-tourism-related interests. Finally, there is a notably low occurrence of hashtags related to traditional authorities, governmental activity, recovery, sustainability, or hashtags related to illness and death.

Next, we used the modularity algorithm to examine how certain hashtags are clustered together to form patterns across content and discussions on different themes and interests. At least eight different groups of clustered hashtags could be differentiated, which we have visually represented in Fig. 2 and Table 3. The largest cluster in terms of volume is labelled "Tourism" and makes up for 77% of all hashtags (shaded dark purple in Fig. 2 and numbered 2 in Table 3). The second largest cluster labelled "Hospitality news", makes up for 7% of all hashtags (shaded dark green in Fig. 2 and numbered 4 in Table 3) concern hashtags about the impact of the pandemic on the tourism industry.

However, directly following these groups, a distinctive cluster of hashtags, which we term "Fintech", makes up 4% of the sample (shaded light purple in Fig. 2 and numbered 3 in Table 3) and evokes digitization, technology, cryptocurrencies, and blockchains. Similarly, Cluster 6,

Table 2
Main hashtags that are mentioned in tweets in conjunction with key terms of analysis (2020–2021). *Number of mentions.*

Hashtag	Tweets	Hashtag	Tweets	Hashtag	Tweets	Hashtag	Tweets
Tourism	67,833	Coronaviruspandemic	1772	Italy	1179	Usa	922
Coronavirus	37,554	Vaccine	1757	Quarantine	1178	Drone	911
Covid19	36,763	Resorts	1722	Tourists	1171	Trip	910
Travel	33,952	Flights	1715	Future	1166	Coin	904
Covid	13,974	Health	1612	Covid_19	1149	Mine	903
Pandemic	8128	Hotel	1578	Cruises	1144	Kripto	903
Covid_19	7513	Trips	1558	Digital	1139	Car	900
News	6075	Covid−19	1554	Blockchain	1123	Goa	898
Corona	5398	Turismo	1523	Southafrica	1113	Electronic	898
Thailand	4351	Cruise	1515	Bangkok	1100	Selfdriving	896
Hotels	3807	Europe	1502	Covid19gr	1057	Nature	892
Hospitality	3676	Traveling	1477	Photography	1035	Elonmusk	880
Travelnews	3097	Africa	1393	Eu	1031	Caribbean	874
Lockdown	3002	Hawaii	1391	Dubai	1021	Holidays	856
Vacation	2972	Australia	1390	Crypto	1010	Government	854
Holiday	2849	Airport	1367	Asia	997	Florida	835
Coronavirusupdates	2806	Japan	1330	Auspol	996	Srilanka	829
Business	2787	Staysafe	1323	Tour	993	Digitalmoney	828
Economy	2774	Tourist	1319	Bitcoin	987	Canada	827
Greece	2635	Technology	1297	Outdoor	980	Delta	824
China	2257	UK	1244	Covid19greece	969	Singapore	816
India	1989	Rt	1228	Coronavirusoutbreak	964	Recovery	810
Airlines	1938	Adventure	1207	Traveltip	954	Pubs	797
Ttot	1874	Spain	1188	Worldtourismday	948	Resort	795
Aviation	1780	Phuket	1187	Traveltips	945	Sustainable	795

Source: Authors' own.

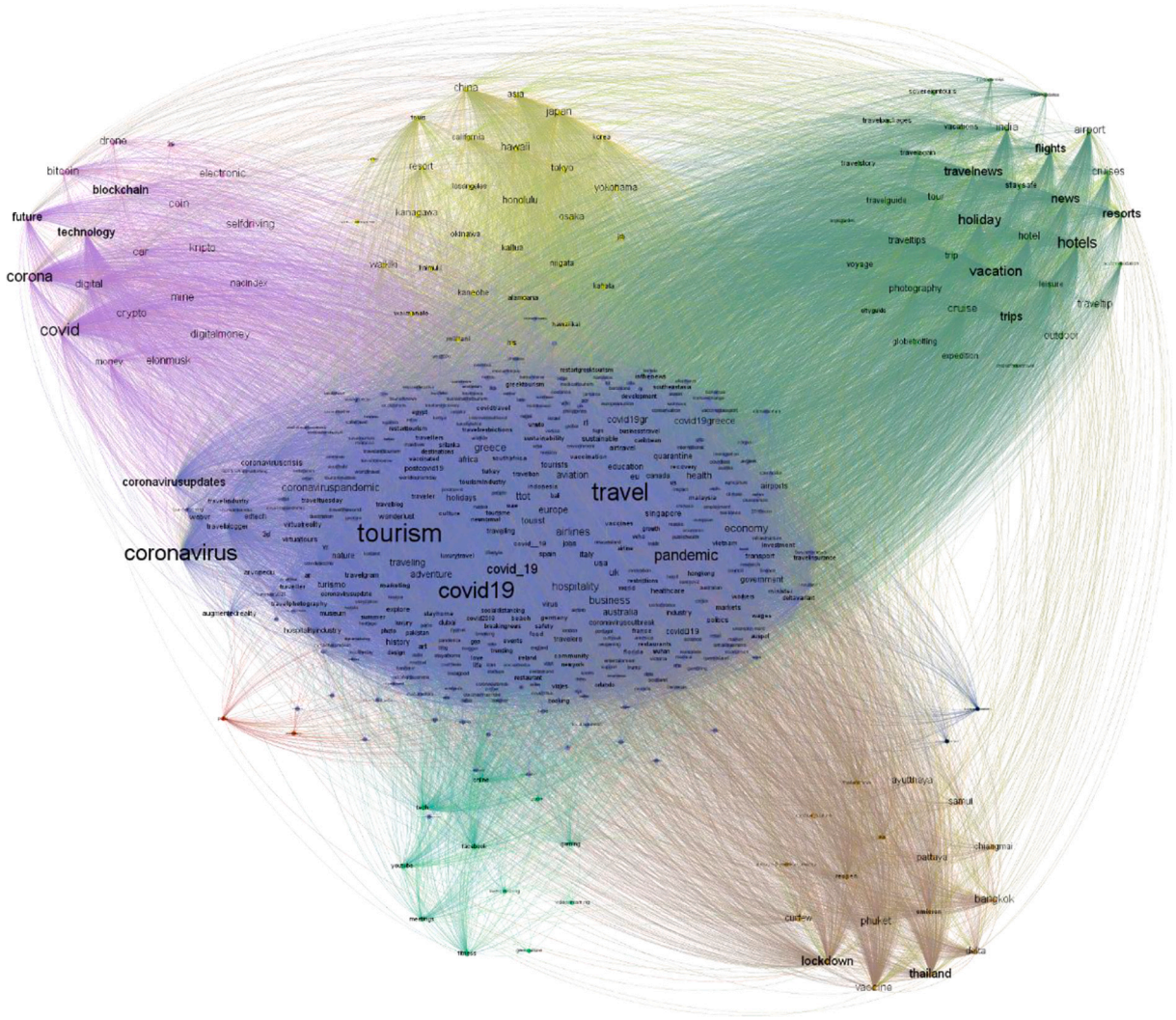

Fig. 2. Main hashtag clusters identified among tweets containing key terms of analysis (2020–2021). *Co-occurrences.*
Source: Authors' own work.

Table 3
Main hashtag clusters among tweets containing key terms of analysis (2020–2021). *Co-occurrences.*

Cluster 1 Pacific destinations		Cluster 2 Tourism news		Cluster 3 Fintech		Cluster 4 Hospitality News	
Hashtag	Weighted degree	Hashtag	Weighted degree	Hashtag	Weighted degree	Hashtag	Weighted degree
China	13,371	Tourism	272,258	Covid	57,714	Hotels	35,941
Hawaii	12,921	Travel	181,033	Corona	37,269	Vacation	28,084
Japan	11,833	Covid19	140,23	Technology	18,084	Holiday	27,802
Honolulu	11,262	Coronavirus	139,067	Future	17,686	Travelnews	23,379
Waikiki	11,216	Pandemic	34,911	Blockchain	17,293	News	23,269
Resort	10,018	Covid_19	25,475	Digital	16,965	Resorts	22,249
Asia	9293	Coronavirusupdates	18,272	Bitcoin	16,681	Trips	18,399
Tokyo	8778	Economy	16,607	Crypto	16,577	Flights	17,745
Yokohama	8172	Ttot	15,671	Drone	16,279	Airport	15,482
Osaka	8008	Airlines	15,539	Coin	16,273	Cruise	15,179

Cluster 5 UK Pubs		Cluster 6 Geek culture		Cluster 7 South Asia Destinations		Cluster 8 Love is not Tourism	
Hashtag	Weighted degree	Hashtag	Weighted degree	Hashtag	Weighted degree	Hashtag	Weighted degree
Pubs	728	Online	2407	Thailand	21,452	Loveisnottourism	273
Pubrooms	312	Meetings	2215	Lockdown	20,649	Loveisessential	186
		Facebook	2,1	Vaccine	15,421		
		Fitness	2,01	Phuket	11,943		
		Gaming	1965	Bangkok	11,942		
		Youtube	1,87	Delta	10,399		
		Tech	1808	Curfew	9836		
		Zoom	1,73	Samui	9691		
		Livestreaming	1694	Pattaya	9401		
		Geekculture	1642	Ayutthaya	8639		

Source: Authors' own work.

"Geek culture", comprises 2% of all hashtags (Table 3) and gathers concepts related to new digital technologies and applications and geek culture, which is a subculture led by enthusiasts who share a variety of interests such as technology, science fiction, fantasy, video games, comic books, and other forms of niche media. Cluster 1 "Pacific destinations" (6% of all hashtags) and Cluster 7 "South Asia destinations" (3% of all hashtags) comprise hashtags related to tourist destinations, in either the east or the west of the Great Pacific Region, while Clusters 5 "UK pubs" and Cluster 8 "Love is not tourism" refer to campaigns designed to safeguard pub culture in the United Kingdom (UK) and to reunite families separated by the health crisis, and only include less than 0.5% of all hashtags. In other words, we identified at least two interest groups whose tweet content appeared to fall outside the domain of crisis management. These groups appear to be primarily focused on techno-economic themes, especially blockchain, Bitcoin, cryptocurrencies in general, and social media.

Clusters 3 ("Fintech") and 6 ("Geek Culture") seem unrelated to the consequences of the pandemic, but rather are focused on other types of information. Cluster 3, for example, focuses on technology, cryptocurrencies, and the blockchain, while Cluster 6 concerns geek culture but also other aspects that appear to have salience to the management of the pandemic, such as the emergence of video streaming and online meetings. While it cannot be excluded that part of these Tweets may relate to tourism and to the pandemic crisis, Twitter (X) has been widely known to be appropriated to find and spread cryptocurrency information, not in the least by a significant percentage of bot accounts (Kraaijeveld & De Smedt, 2020). Twitter (X) has also been used by spammers that appropriate certain hashtags to boost unsolicited or commercial messages about other content (Yardi, Romero, & Schoenebeck, 2010).

5.3. Representation: analysis of the most-active and most-replied-to user accounts

To estimate the visibility and importance of each user in the dataset, we evaluated users based on the volume of content (tweets) contributed by each. Among the top 40 *most-active* accounts, over half were online media accounts that mostly (re-)tweeted content from other webpages or Twitter (X) accounts such as news sites. Differently to traditional media such as newspapers and news channels, most of these accounts operate in online spaces *only*, and are not necessarily linked to any formally registered entity outside of Twitter (X). Importantly, among these media accounts, only 15 were explicitly tourism-focused, and many were disseminating information on networks (infomediation) without providing any original, first-hand, or in-depth content. Moreover, only two National Tourism Organizations featured among the top 40 most-active accounts, but so did two major NFT sellers, while the most prolific user account in this dataset was that of an individual who seemingly had no direct involvement in tourism whatsoever. Other individual users that could be classified as human (as opposed to bots) included academics expressing concern about the management of the crisis, although their position in terms of volume of activity on Twitter (X) was relatively marginal.

While highly active users who produced large volumes of tweets over time may feature prominently in the dataset, this does not necessarily mean that they significantly drove Twitter (X) content or enjoyed major visibility among peers (Bruns & Stieglitz, 2014). Users who provide less quantity (i.e., tweet less) may nevertheless generate significant further content, with and among peers who either reply to or retweet their content. Consequently, we also analysed the top 40 *most-replied-to* user accounts. In stark contrast with the most-active user accounts, half of the most-replied-to accounts were associated with government representatives, including high-ranking politicians, state leaders, and three Ministries of Tourism. Additionally, almost a quarter of the top 40 most-replied-to user accounts were held by traditional media such as newspapers and news channels. These media and governmental accounts all have followings of tens of thousands, hundreds of thousands or even millions of Twitter (X) users, and all scored very low on the Botometer. Although the majority of these user accounts are not specifically related to tourism, any of their tweets that refer to tourism will likely enjoy

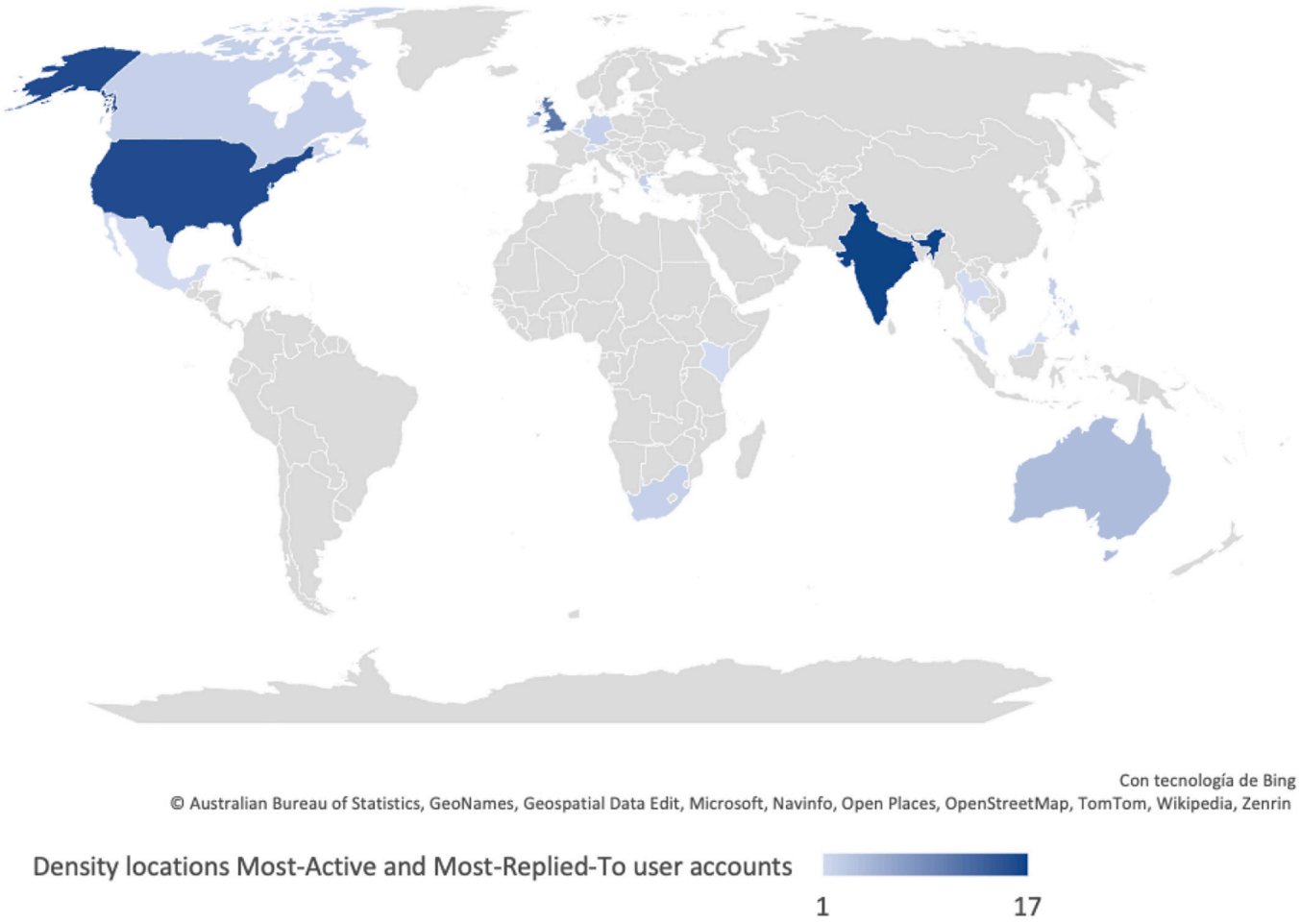

Fig. 3. Map of the locations of the top 40 Most-Active and Most-Replied-To user accounts.
Source: Authors' own work.

significant visibility because of the sheer quantity of their followers.

Interestingly, in all but two cases, the governmental accounts in this top-40 dataset were associated with conservative and right-wing political parties in the United States of America (USA), India, the UK, and Australia. These included the accounts of five well-known government officials who have been attributed with dispensing misinformation about COVID-19, rejecting COVID-19 measures, or downplaying the severity of the pandemic. Interestingly, two of these contested government officials also had the first and second most-replied-to accounts in the dataset, and they held leading political positions in US states where tourism is a key source of income. Their respective follower counts of over 4 million and over 500,000 allow us to appreciate why their tweets on tourism would generate so much engagement. Although the sixth most-replied-to account is that of a very large transnational tourism authority, tourism businesses, other than one entrepreneur and two travel agencies, do not feature in this sample, nor do accounts of academics.

A more detailed look at the top 40 most-active and most-replied-to user accounts casts up several notable findings. Over half of these user accounts were associated with countries where English is the first language or an additional official language, as in many former British colonies (see Fig. 3). Over half of the accounts seem to have no specific connection with tourism and tweet on a host of other topics. These include well-known news agencies that publish a large quantity of original or first-hand content on Twitter (X), but also businesses marketing their own wares on Twitter (X), such as sellers of NFTs and web domains. In the most-active dataset, we were able to tentatively link nine user accounts to men and 28 user accounts to organizations, whereas the most-replied-to user accounts appeared to be linked to 19 men and 18 organizations. User accounts ostensibly belonging to women were grossly underrepresented, with only three women featuring in each category. Further analysis suggested that two out of three user accounts associated with women in the most-active top 40 were wholly automated or associated with a fake profile, leaving only one user account seemingly held by a woman that produced original first-hand content.

The most active accounts included at least six user accounts that shared content automatically or manually from other blogs, social media platforms, and websites. The tweets of the most active user account in this subsample consisted entirely of almost identical replies to other users' posts, over a period of two years. These replies were cryptic, populated by emoticons and usually reiterated the words 'trace', 'test' and 'corona'. The tweets to which this account replied were usually posted by Indian media or high-profile accounts and regularly had little to do with tourism. It scored high on the Botometer and indeed displayed many bot-like features upon our own verification. Another prolific account in this subset retweeted a large number of posts, associating them with hashtags related to islands and locations in the Hawaiian archipelago, and places in Japan and the USA. This user amplified content from both low-credibility and high-credibility sources, which may have been a tactic to avoid being flagged for spreading misinformation, although we can only speculate about this.

In a subsequent additional analysis of user accounts, we examined

Table 4
Bot scores for user accounts leading the main hashtag clusters. User Category, Number of uses of the hashtags forming each cluster and Bot Score calculated with Botometer.

Cluster 1 (Pacific destinations)			Cluster 2 (Tourism news)		
Category	Hashtag uses	Bot score	Category	Hashtag uses	Bot score
Individual, tourism related with bot features	8813	1.0 / 5.0	Media, tourism related	16,115	4.2 / 5.0
Media, tourism related	391	4.7 / 5.0	Media, non-tourism related	6968	4.4 / 5.0
Individual, financial consultant	218	1.7 / 5.0	Individual, tourism related	5739	4.2 / 5.0

Cluster 3 (Fintech)			Cluster 4 (Hospitality news)		
Category	Hashtaguses	Bot score	Category	Hashtag uses	Bot score
NFT Business	16,284	0.9 / 5.0	NFT Business	13,132	1.4 / 5.0
Individual, tourism related	885	4.2 / 5.0	Media, tourism related	3519	4.7 / 5.0
Media, tourism-related	885	3.8 / 5.0	Business, tourism-related	3207	4.2 / 5.0

Cluster 5 (UK Pubs)			Cluster 6 (Geek Culture)		
Category	Hashtag uses	Bot score	Category	Hashtag uses	Bot score
Individual, non-tourism related	567	3.0 / 5.0	Business, fin-tech	780	4.3 / 5.0
Media, tourism-related	438	3.9 / 5.0	Individual, fin-tech	582	3.4 / 5.0
Government, non-tourism related	10	1.0 / 5.0	Individual, fin-tech, with bot features	308	1.0 / 5.0

Cluster 7 (South Asian destinations)			Cluster 8 (Love is not tourism)		
Category	Hashtaguses	Bot score	Category	Hashtag uses	Bot score
Business, tourism related	7862	1.8 / 5.0	Individual, non-tourism related	47	0.4/ 5.0
Media, tourism related	760	5.0 / 5.0	Activist organization	19	1.0 / 5.0
Business, non-tourism related	351	1.9 / 5.0	Individual, tourism related	17	1.3 / 5.0

Source: Authors' own work.

which accounts led each of the previously mentioned thematic clusters. Table 4 shows the profiles associated with bot behaviours. Interestingly, the 'love is not tourism' cluster – which mobilized content by activists calling for the relaxation of restrictions on mobility so that families could be reunited during the pandemic – was the only one led by users that could be unequivocally classified as humans by the Botometer tool. Clusters that specifically concerned the management of the crisis were mainly driven by user accounts that displayed bot-like features. Similarly, clusters that generated content on topics unrelated to crisis management were also led by user accounts suspected of being bots.

Thematic clusters that focused on tourism-related topics – such as COVID-19 related measures and recommendations – were generated by a set of individual users but also by bots that seem to have engaged in a significant level of activity. This may be an indication of how bots strategically appropriate content related to crisis management to further other interests. This tactic is also employed by individuals, businesses, and traditional media companies, who use information propagation techniques similar to those of bots to advance their own (commercial) interests. In short, although a large volume of human users created and spread content related to tourism and the pandemic, there is undeniable evidence of automated accounts in the database of tweets that we analysed.

6. Discussion and conclusion

In this study, we examined tourism-related Twitter (X) content that was produced over the first two years of the COVID-19 pandemic. We focused on the topics that recurred most frequently in tourism-related tweets and the types of user account that were the most prolific or the most frequently replied to, reserving particular scrutiny for dynamics and strategies deployed to deflect away from the topic of tourism. With respect to our first research question, we found that a variety of themes and topics prevailed across the content. Some terms and hashtags clearly alluded to the potential recovery of the tourist sector while others bore little or no relationship to tourism. This finding was confirmed through our analysis of hashtag clusters, which included both clusters aligned with tourism recovery themes and clusters related to commercial spam and alternate political interests. Additionally, credible tourism-related content on Twitter (X) was, to a large degree, undermined by issues of representation, as previously observed in studies that focused on other topics (Mkono, 2018; O'Regan & Choe, 2022). Yet, what this study has further clarified, is that these issues of representation concern both the types of users involved in spreading the greater *quantity* of content as well as the types of users whose content is *most replied to*. While informal tourism-related media were actively involved in sharing large quantities of content related to tourism, globally-acknowledged tourism authorities and tourism-related governmental entities remained underrepresented when it comes to consistently and frequently publishing original or first-hand content. Certainly, the content of some Ministries of Tourism and formal tourism organizations is among that most replied to, but our study also found that these user accounts are few in number and are overshadowed by the user accounts of conservative and right-wing politicians and state leaders in the North American, Indian, UK, and Australian contexts.

Furthermore, we found that content written in English also displays issues of representation when it comes to the locations in which content is produced: informational hegemony is given when Twitter (X) accounts primarily originate in countries in the Global North and/or where the English-language is an official language as opposed to a lingua franca. In addition, our study shows that women are exceptionally underrepresented on tourism-Twitter (X), accounting for under 8% of both the top 40 most-active and the top-40 most-replied-to profiles. Further issues arise when the most active user accounts mainly reflect one side of a political spectrum.

With regard to the *most-replied-to* content in our dataset, the dominance of conservative- and right-wing-led content may have contributed to shaping how COVID-19 related information was presented and (re) shared; this is borne out by the presence of politicians who have been associated with disseminating misinformation or denying the severity of the pandemic and the need for related measures. Echoing van Dijck and Alinejad (2020), this may have serious implications for how effectively a crisis can be managed and contained by tourism authorities and major players in the tourism industry, as for example in relation to mitigating the spread of COVID-19 among travellers and tourism and hospitality workers.

Given their significant underrepresentation on Twitter (X), government administrations in countries beyond the Global North as well as government representatives from across the political spectrum could consider the importance of engaging on this platform to enhance citizens' and travellers' confidence in their management of emergency situations such as the COVID-19 pandemic. This also concerns expert tourism organizations who still have a role to play in amplifying credible content and flagging and correcting misinformation with a view to improving media literacy among tourists and travellers (Vraga, Bode, & Tully, 2022).

Second, we question the usefulness of social media platforms such as Twitter (X) within broader communications management strategies during crises that impact tourism. Although this study – similarly to other research conducted in crisis contexts (Pont-Sorribes et al., 2020) – identified Twitter (X) content that was salient to the management of the pandemic, it also brought novel insight. It showed that a large amount of content had little or nothing to do with tourism, despite being linked to tourism via tourism-related hashtags or terms. This unrelated content may have considerable reach, but it does not necessarily bear operational value in addressing crises of this kind. Our analysis also suggested that automated (bot) accounts make a major contribution to the distribution of such content. These include accounts associated with the promotion of commercial activities such as the advertisement of cryptocurrency schemes, NFTs, or private web domains. Again, there is a need for greater social media participation and intervention on the part of governments, formal tourism organizations and businesses, if they are to position themselves as reliable sources of information during a crisis on platforms such as Twitter (X) (Pulido Polo et al., 2021).

6.1. Limitations and directions for future research

Although this study examined one of the most prominent contemporary social media platforms and focused on the first two and most impactful years of the pandemic, we should also acknowledge its limitations. While various studies have found Twitter (X) to offer great potential for crisis communications management, today there are many alternative digital spaces through which such communications may also be managed, perhaps even more effectively. Relatedly, audiovisual platforms such as Instagram and TikTok have been having an increasing impact on specific age groups (e.g., 'millennials' and 'Generation Z'), who are accounting for a progressively greater share of tourism and leisure consumption. Furthermore, while the impact of the pandemic appears to have subsided at the global level, it is still significantly affecting certain world regions such as China that bear enormous social and economic weight.

In addition, as mentioned in the methodology section, our sample only included English-language content and was therefore linguistically determined. Future studies could include multi-lingual analyses and consider content from other-than-English-speaking contexts. This would mean also analysing the participation of other governments and traditional sources of authority in terms of their engagement with citizens and monitoring of misinformation in local languages. Finally, future studies on tourism and Twitter (X) could more seriously consider the extremely dynamic, partial, and sometimes unreliable nature of Twitter (X) data before starting any analysis, particularly in relation to the presence of bot accounts and the diversion of content towards other (non-tourism related) purposes. We believe this could be partially achieved by applying a qualitative content analysis in conjunction with a quantitative analysis, as described in our methodology section. Finally, a longitudinal analysis of the main tourism-related terms and themes across Twitter (X) content could provide further insight into the evolution and severity of misinformation on the platform, thus informing action by governments, formal tourism organizations and other actors.

CRediT authorship contribution statement

Lluís Alfons Garay-Tamajón: Visualization, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Maartje Roelofsen:** Supervision, Methodology, Investigation, Formal analysis, Data curation, Conceptualization.

Declaration of competing interest

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