

#CoronavirusCruise: Impact and implications of the COVID-19 outbreaks on the perception of cruise tourism

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ABSTRACT

Early in the COVID-19 pandemic, the *Diamond Princess* became the center of the largest outbreak outside the original epicenter in China. This outbreak which left 712 passengers infected and 14 dead, followed by subsequent outbreaks affecting over one-third of the active ships in the cruise industry's global fleet, quickly became a crisis that captured public attention and dominated mainstream news and social media. This study investigates the perception of cruising during these outbreaks by analyzing the tweets on cruising using Natural Language Processing (NLP). The findings show a prevalent negative sentiment in most of the analyzed tweets, while the criticisms directed at the cruise industry were based on perceptions and stereotypes of the industry before the pandemic. The study provides insight into the concerns raised in these conversations and highlights the need for new business models outside the pre-pandemic mass-market model and to genuinely make cruising more environmentally friendly.

1. Introduction

The COVID-19 pandemic caused by the novel coronavirus SARS-CoV-2 has exceeded 5 million confirmed deaths at the time of writing (AP, 2021), causing widespread disruption in many sectors of the world economy. Tourism was one of the worst-hit sectors due to the closure of national borders and the reduction in global travel (Gössling, Scott, & Hall, 2020). Cruise tourism in particular was severely affected because of COVID-19 outbreaks on several cruises early in the pandemic (Ito, Hanaoka, & Kawasaki, 2020), which resulted in stranded ships due to port closures and the temporary ban of cruises in some countries (Gössling et al., 2020). Some returning passengers from cruises contributed to the spread of the virus in their home countries (Ito et al., 2020). For example, as at the end of April 2020, one in ten COVID-19 cases in Australia were attributed to a *Ruby Princess* cruise voyage (ABC, 2020), while between February and mid-March 2020, about 17% of the confirmed cases in the United States (US) were linked to returning cruisers (Moriarty, Plucinski, Marston, et al., 2020).

Official and unofficial counts show that there were at least 3908

confirmed COVID-19 cases and 111 confirmed deaths linked to over 102 COVID-19 outbreaks involving at least 124 cruise ships as at October 2020 (CDC, 2020; Miami Herald, 2020). Fig. 1 shows that many cruise companies had outbreaks on their ships, including Carnival Corporation, Royal Caribbean, and Norwegian Cruise Line, the three biggest companies in the industry, which account for 80% of the industry's passenger capacity (Papathanassis, 2017). These cruise companies also suffered economic setbacks because of the pandemic, with their share prices falling off a cliff in the first quarter of 2020 (see Fig. 2). Cruises continue to record transmission of COVID-19 despite high vaccination rates among passengers and crew, with 1359 reported confirmed cases in the US between June and October 2021 (CDC, 2021).

Cruising was the most mentioned sub-sector of tourism in global news in the early period of the pandemic as the media reported these COVID-19 outbreaks (Gössling et al., 2020) and some cruise industry executives have claimed that the industry was unfairly tarnished by the media in the reporting of the outbreaks (Financial Times, 2020; Washington Post, 2020). It is important to have an appraisal of the impact that the extensive coverage of the cruise COVID-19 outbreaks in the news

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and social media have had on people and how it has affected their perception of cruising. Such research is scarce given the novelty of the topic, but will help to evaluate the purchase intention to cruise and the recovery of the cruise industry post-pandemic (Holland, Mazzarol, Soutar, Tapsall, & Elliott, 2021; Pan, Shu, Kitterlin-Lynch, & Beckman, 2021).

Related studies already published used questionnaire survey polls to gauge the outlook towards cruising and the willingness to cruise in the aftermath of the COVID-19 pandemic. For example, Holland et al. (2021) investigated the impact that the COVID-19 pandemic had on the perceived risk of cruising considering a list of 20 items, and found that the country of residence had a significant impact on risk perception of cruising and future intentions to cruise. Pan et al. (2021) tried to identify consumer perception of the cruise industry during the COVID-19 pandemic under the theoretical lens of leisure constraints and prospect theories. They found that travel constraints negatively influenced behavioral intention to travel with cruises, although perceived crisis management positively affects this behavioral intention. The survey instrument used in both studies is universally accepted for evaluating public opinion but has been criticized for treating public opinion as a quantitative distribution of opinions by disparate individuals having equal weight in society with a blind spot to the hierarchical and conversational nature of public opinion formation (Blumer, 1948). Social media conversations make up for these weak points, since they are hierarchical and conversational by nature (McGregor, 2019). Furthermore, surveys are appropriate to capture subjects' attitudes by directly asking respondent about their subjective experiences, perceptions, and attitudes about a topic, but have limited ability to observe actual behavior. Social media provides a wealth of information about actual user behavior, and not as limited or focused on specific questions (Couper, 2013). Research has also found a correlation between public opinion and sentiments expressed on Twitter (O'Connor, Balasubramanyan, Routledge, & Smith, 2010). Consequently, analysis of social media conversations can provide insight that can be used with survey results to provide a holistic view of the public opinion on an issue.

This study fills this research gap in developing a better understanding of the public perception towards cruising during the COVID-19

outbreaks on cruises in the early part of the COVID-19 pandemic, extending the research on this topic beyond the perceived risk of cruising or the intention to cruise. To do this, we analyze the relevant tweets using Natural Language Processing (NLP) methods. Based on this premise, this study intends to answer the research question: What insight can be derived from the public conversation on Twitter about cruising during the COVID-19 outbreaks on cruises?

The contribution of this study is to serve either as an empirical counterpart to the findings of the previous studies with survey data, as well as to uniquely show the hierarchical dimension of the public conversation with the influence of elites in driving awareness to issues in a way that surveys may not show. It is also hoped that the discussion of the implications of the findings will be a valuable addition to the academic literature on the prospects and outlook of the cruise industry after the COVID-19 pandemic.

2. Literature review

The COVID-19 cruise outbreaks were a crisis event that we investigated using social media data. Hence, it is important to examine the literature on the use of social media in crisis communication in tourism and cruise tourism. As mentioned, there was extensive media coverage and social media mentions of cruising in the early period of the pandemic (Gössling et al., 2020). This wall-to-wall media coverage usually affects public opinion, risk perception, and consumer behavior in a particular pattern. In the following sections, the theoretical foundation of this study is presented, which is based on the information integration theory (IIT) and the social amplification of risk framework (SARF) to explain risk perception and decision-making of tourists influenced by social media in times of crisis.

2.1. Role of social media during crises in tourism

One of the defining characteristics of a crisis is the mass generation of mostly negative comments and information (Coombs, 2018). Social media provides a platform for communicating decisions during a crisis and collecting feedback from the public (Sigala, 2011). The information

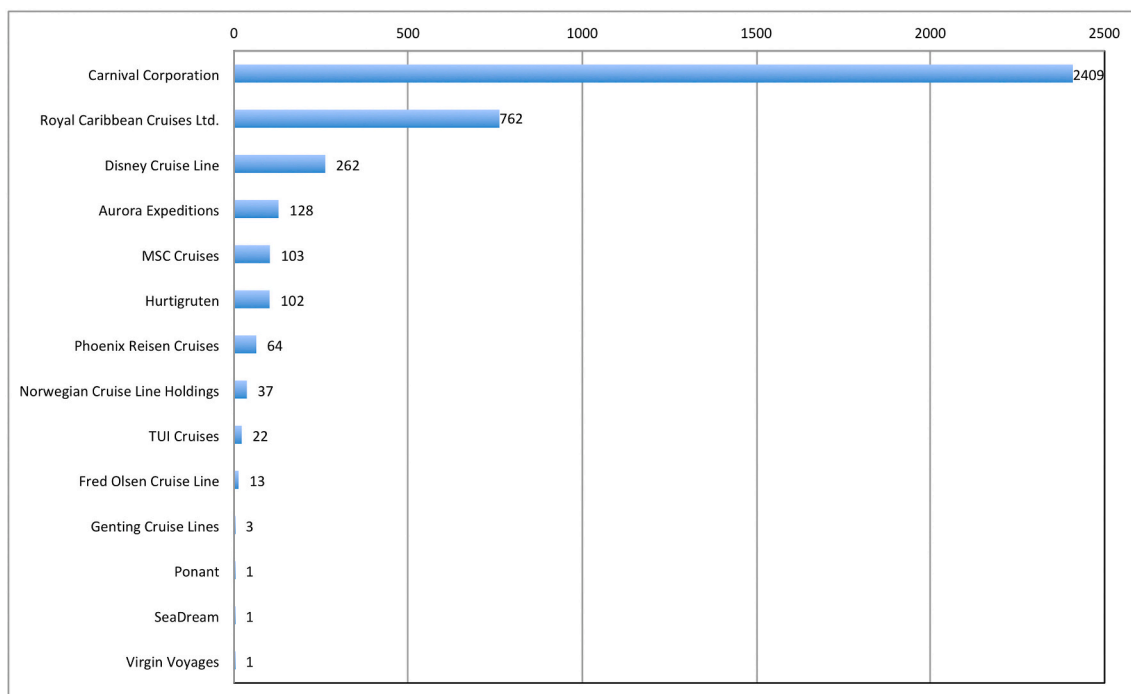


Fig. 1. Number of COVID-19 cases by Cruise Company (Data source: Miami Herald last updated on 2020-10-02 (Miami Herald, 2020)).

integration theory (IIT) states that new information is added into the preliminary beliefs of people, affecting how attitudes and behavior are formed, and the value of information determined to be favorable or unfavorable regarding the events and subjects involved (Anderson, 1981). This theory provides one of the theoretical frameworks for this study.

The amount of mass information generated by social media creates awareness and a forum for discussion during times of crisis (Sigala, 2011). This is because social media facilitates real-time interactivity, reciprocity, and instant reactions between users, hence it plays a central role when crisis events happen and in crisis management in tourism with potential effects on tourists' behavior (Schroeder, Pennington-Gray, Donohoe, & Kioussis, 2013; Sigala, 2011; Zeng & Gerritsen, 2014). International tourists have been found to have a high probability of turning to social media for information during periods of crisis (Schroeder et al., 2013). The electronic word-of-mouth (eWOM) shared on social media by members of the public during a crisis is a curated heritage or collective memory that can be explored to learn about the crisis (Liu., 2009). This fact supports the suitability of using social media to explore crisis effects. Hence, tourism scholars have used social media data to investigate health-related crisis (Yu, Li, Yu, He, & Zhou, 2020), political crisis (Luo & Zhai, 2017), natural disasters (Möller, Wang, & Nguyen, 2018), climate crisis (Schweinsberg, Darcy, & Beirman, 2020), service failures (Su, Stepchenkova, & Kirilenko, 2019), pest infestation (Liu, Pennington-Gray, Donohoe, & Omodior, 2015), and terror attacks (Barbe, Pennington-Gray, & Schroeder, 2018).

In cruise research, past literature on the role of social media during crises has focused on its impact on the corporate reputation of cruise companies. Ryschka, Domke-Damonte, Keels, and Nagel (2016) found that a prompt corporate response on social media and strong brand familiarity during a crisis led to positive perceptions of the cruise company. Penco, Profumo, Remondino, and Bruzzi (2019) found that the "degree of anger" and prior corporate reputation during a crisis influenced the intention to take a future cruise. While Penco, Profumo, and Remondino (2018) found that social media may help cruise companies to communicate more effectively during a crisis.

2.2. Media coverage, public opinion, and risk perception

The news media influences public opinions through its news coverage (Gene Zucker, 1978). In the absence of direct personal experience, members of the public learn about risks from other people and from the media (Kasperson et al., 1988). Therefore, as the media informs the public about happenings beyond their immediate circle, it shapes the public's perception and understanding of risks (Rowe, Frewer, & Sjöberg, 2000; Smith, 2005).

The social amplification of risk framework (SARF) is a seminal integrative and interdisciplinary risk perception framework that has been used to account for findings from a wide range of fields, from media to medical research (Kasperson, Kasperson, Pidgeon, & Slovic, 2003; Wang, Zheng, & Zuo, 2021; Womack, Anderson, & Ledford, 2020). We combined the SARF with the IIT to explore how risk perceptions during COVID-19 influenced potential tourist attitudes and behavior about cruising, as illustrated in Fig. 3, which is an adaptation of the simplified representation of the SARF framework.

The SARF framework suggests that the social amplification of risk by the media increased its memorability and imaginability, which leads to increased risk perception (Kasperson et al., 1988). Four attributes of the information flow from the media influence the extent of social amplification. They include volume of information flow, disputability of the information, degree of dramatization, and symbolic connotations (Kasperson et al., 1988). It is worthy of note that high volumes of information flow about a risk attract public attention, mobilize latent fears about the risk, and trigger the recollection of previous failures or accidents (Kasperson et al., 1988; Renn, 1986). Degree of dispute deals with how much the facts about the event are disputed. Dramatization, usually in the form of sensational headlines, is an important attribute of information that increases perceived risk and memorability of the incident. While symbolic connotations deal with the specific terms used to convey information and how they may have other meanings and be interpreted by individuals and groups (Kasperson et al., 1988). Likewise, there are four attributes of the interpretation and response mechanism in the second stage of social amplification: heuristics and values which deals with the simplification of risk, social group relationships which deals with politicization and/or polarization, signal value on the seriousness

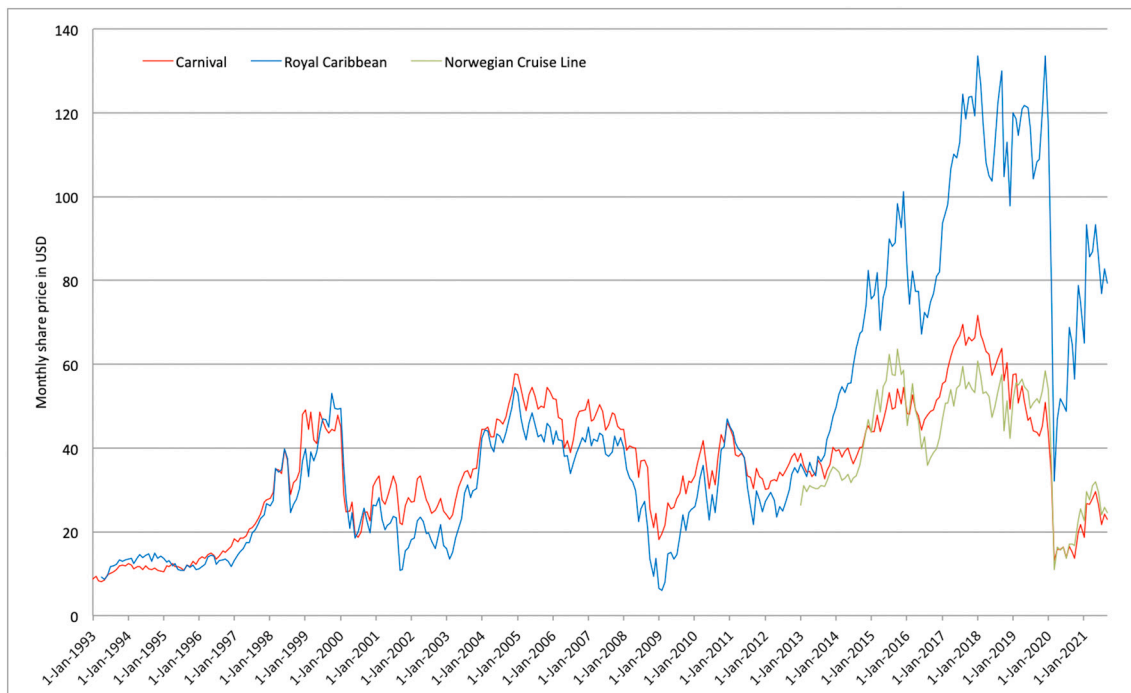


Fig. 2. Share prices of the three largest cruise operators from January 1993 to September 2021 (Data source: Eikon, downloaded on 2021-09-07).

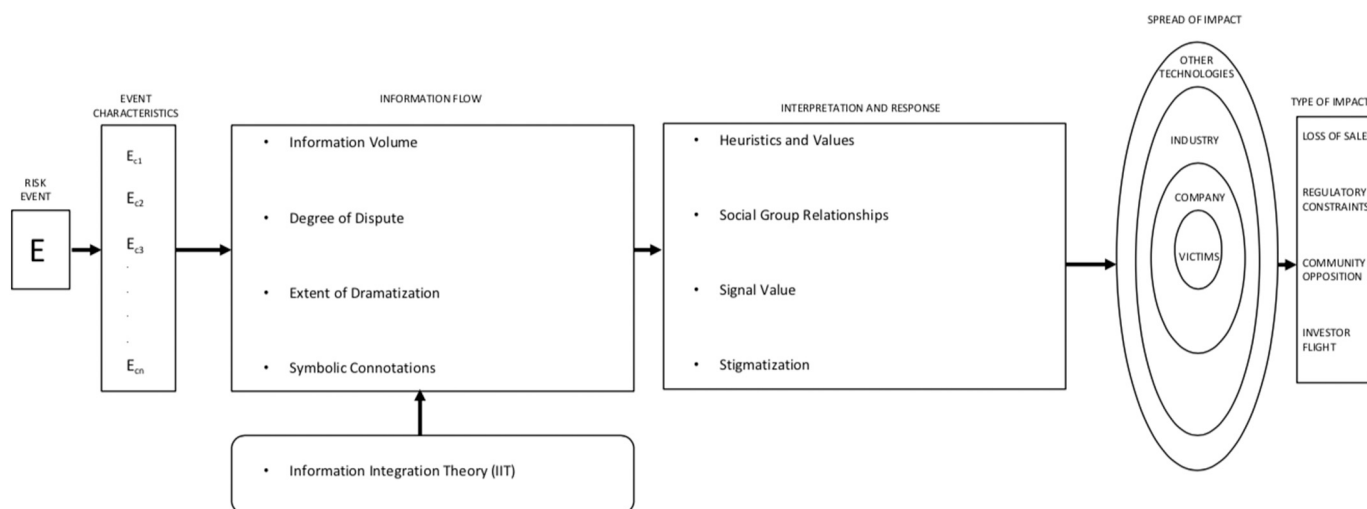


Fig. 3. Proposed conceptual map of SARF and IIT adapted from Kasperson et al. (1988).

of the risk, and stigmatization (Kasperson et al., 1988).

3. Method

3.1. Data collection

We analyzed the tweets from the start of the pandemic through the period of the early outbreaks on cruises, highlighted by an increased publicity on cruising, which was pinpointed using Google search trends. Google Trends has been demonstrated to show the popularity of a search query as an indicator of real public interest (D’Avanzo, Pilato, & Lytras, 2017). Fig. 4 shows that the worldwide search queries for selected relevant phrases like “cruise coronavirus” and “cruise ship coronavirus” rose from zero between January 19–25 and returned to zero around May 3–9,¹ a period coinciding with the major outbreaks (Google Trends, 2020). “Cruise covid” rose from zero after February 11, the day the International Committee on Taxonomy of Viruses (ICTV) officially named the new virus SARS-CoV-2 and the disease it causes COVID-19 (WHO, 2020).

Therefore, we used the ninth version of the open-source COVID-19 dataset of tweet IDs by Banda et al. (2020). The data covers the period from 4th January to 10th May 2020 and includes our period of interest, to capture the tweets posted about the COVID-19 outbreaks on cruises at the time of the major outbreaks at the start of the pandemic when the outbreaks dominated news and social media. It was the time when the attention on the cruise COVID-19 outbreaks were highest, as indicated by excessive mentions of cruise and COVID-19, and pinpointed with Google Trends. This data was gathered by collecting all tweets on the novel coronavirus from the Twitter application programming interface (API) stream by filtering the API stream with relevant keywords connected to the pandemic as stated in the dataset publication (Banda et al., 2021). These keywords include, among others, “coronavirus”, “2019ncov”, “corona virus”, “COVD19”, “CoronavirusPandemic”, “COVID-19”, “2019nCoV”, “CoronaOutbreak”, “WuhanVirus”. The authors of the dataset provide a full and a clean version of the data; with the clean version comprising only original tweets without retweets. We used this clean version, which contained 66,538,356 tweet IDs because retweets contain the text of the original tweet and may disrupt our intended natural language processing tasks (Banda et al., 2021).

We rehydrated these tweet IDs to retrieve the full tweets that had not been deleted for analyses using TWARC version 1.8.3 (Summers et al.,

2021) because deleted tweets are unretrievable. The rehydration process lasted about 186 h. We successfully retrieved 60,483,491 full tweets (9.1% deleted), and the resulting JSONL (JavaScript Object Notation Lines) file was 263 gigabytes. The retrieved tweets were in over 64 languages, with the majority (57%) in English (34,431,646). Due to difficulties in translating such a huge number of languages, we restricted our analyses to only the tweets in English.

The required information (posting time, name of Twitter handle, text of tweet, number of retweets, and number of likes) from each tweet were parsed from the tweet json files and loaded into a Python Jupyter Notebook (Kluyver et al., 2016; Van Rossum & Drake, 2009) for analysis using Pandas DataFrames (McKinney, 2010). Preprocessing tasks like tokenization (breaking of words to smaller units), lemmatization (reduction of words to their root), and removal of unnecessary elements like stop words, URL links, and mentions (@user) were carried out. We also split and removed the hashtag signs (#) and the newline characters (\n) from the tweet text before analysis. The data preprocessing is a necessary step in order to clean the raw, noisy data before advanced analytical processes. We searched for the occurrences of cruise(s), cruise line(s), cruise ship(s), and cruising and got 139,054 tweets. We randomly checked the obtained tweets manually to ensure that there were no false positives or irrelevant tweets in the data, as done in previous studies (Ainin, Feizollah, Anuar, & Abdullah, 2020) by exporting the tweets as a csv file and checking them in Microsoft Excel. This manual inspection revealed that there were 586 tweets about actor Tom Cruise halting a movie shoot because of the pandemic; which were then removed.

3.2. Data analysis

This study used sentiment analysis as the main analytical method to automatically classify the tweets into positive, neutral, and negative. Sentiment analysis is the automated process of opinion detection by using semantic relationships to determine the overall polarity of a text document as positive, neutral, or negative (Alaei, Becken, & Stantic, 2019; Feldman, 2013). The rapid growth of sentiment analysis has coincided with the growth of social media, which has provided enormous volumes of digital opinionated data (Liu, 2012). Therefore, social media sites like Twitter and Facebook are a centre of interest for sentiment analysis applications (Feldman, 2013). Social media offers tourists a platform to share their views, feelings, and sentiments about their experiences (Li, Xu, Tang, Wang, & Li, 2018). Sentiment analysis is one of the most common techniques for analyzing online text data on social media (Khong, Teng, Butt, & Muritala, 2021; Muritala, Sánchez-Rebull,

¹ The unit of Google Trends data for the past year is given in 6-day intervals

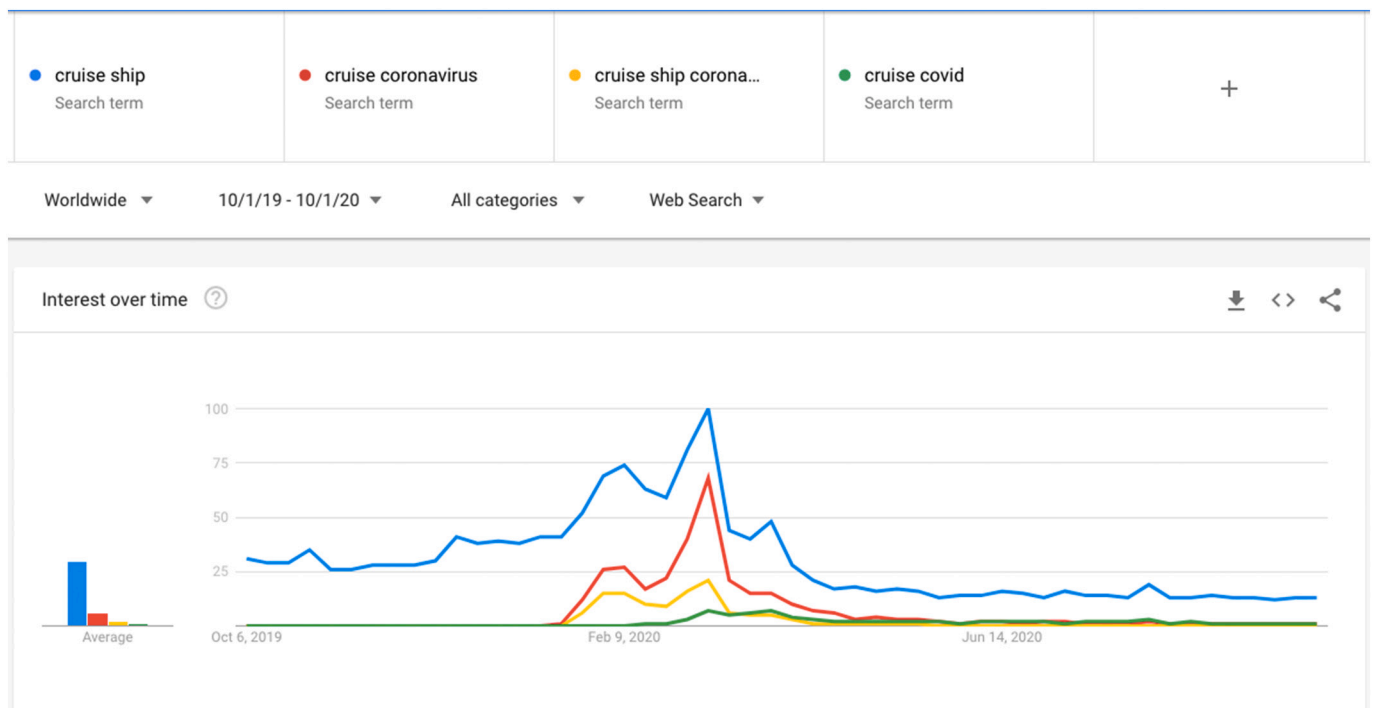


Fig. 4. Google search trends for cruise ship, cruise coronavirus, cruise ship coronavirus, and cruise covid (Data source: Google Trends).

& Hernández-Lara, 2020) and at a relatively low cost (Neri, Geraci, & Camillo, 2010). Sentiment analysis and opinion mining are used interchangeably (Feldman, 2013), although the use of the term “opinion mining” has been declining in the tourism and hospitality literature (Muritala et al., 2020).

However, because of its unstructured form and noisiness, social media data presents some challenges for automated sentiment analysis. Sentiment analysis algorithms are usually not equally effective across a variety of languages, hence, it is usual for researchers to restrict analysis to a single language, leading to loss of information (Li et al., 2018). The noisiness of social media with liberal use of slangs and lots of spelling, grammatical, and punctuation errors makes accurate analysis more difficult (Feldman, 2013). Sentiment analysis is also domain-dependent, with positive words in one domain, not positive in another (Pang & Lee, 2008). Identification of sarcasm also poses a challenge to sentiment analysis systems (Feldman, 2013) with Twitter exhibiting rich sarcasm (Zhang, Zhang, & Fu, 2016). Despite these challenges, sentiment analysis remains very useful for researchers and industry practitioners for analyzing large amounts of data compared to manual processing (Philander & Zhong, 2016).

Kietzmann, Hermkens, McCarthy, and Silvestre's (2011) seven functional blocks of social media provide the conceptual framework for understanding the sentiment analysis results. Twitter is a conversation-based platform (Kaplan & Haenlein, 2011), hence, the relevant block for this study is the conversation block of the framework. The conversation block posits that to make sense of the conversation; the conversation velocity, i.e. the frequency of new conversations over time, and the change in how favorable or unfavorable the sentiment they contain needs to be analyzed in order to understand the conversation (Kietzmann et al., 2011). To make sense of the conversation on cruising during the COVID-19 outbreaks on cruise ships, the frequency of new conversations is the frequency of tweets on the topic over the analyzed period and the sentiment analysis score measures the change in sentiment of the tweets. This informed the decision to make a plot of the daily frequency of cruise-related tweets and their average daily sentiment in Fig. 6, to show how the frequency and sentiment of the conversation towards cruising changed during the analyzed period.

Apart from sentiment analysis, we construct a word cloud based on the 500 most frequent words and bigrams (two-word combination), and also present the three tweets with the highest amount of engagement. Tweets have unequal reach, and the engagement metrics on a tweet indicate the amount of people that saw and interacted with the tweet. We selected the most engaged tweets by checking the tweets with the highest number of likes, because viral tweets usually have more likes than retweets.

The word cloud of the most frequent words was constructed using WordCloud version 1.5.0 package in Python (Mueller, 2020). A simple ranking of the tweets based on their number of likes produced the most engaged tweets. Finally, the sentiment analysis was performed using VADER (Valence Aware Dictionary and sEntiment Reasoner) (Hutto & Gilbert, 2014) implementation in Python's NLTK (Natural Language Toolkit) (Bird, Loper, & Ewan, 2009). VADER is well suited for analyzing social media text since it handles many of its typical elements like acronyms, emojis, and slangs well. VADER assigns a score to the analyzed text based on the summation of valence scores of the words in a tweet between 1 (extreme positive sentiment) and -1 (extreme negative sentiment), while neutral sentiment spans 0.05 to -0.05 (Hutto & Gilbert, 2014). It is also important to do a manual validation of the sentiment classification results to confirm that the assigned sentiment scores reflect the content of a tweet. This validation effort showed that there were some negative tweets given positive scores. These tweets were about reports of people who tested positive for the coronavirus, and “positive” as a positive word, shifted the sentiment weighting of these tweets to positive, even though this carries a negative sentiment in this context. We adjusted this by replacing the word “positive” with “infected” in these tweets, which made the algorithm to reflect the sentiment more accurately.

4. Results

138,468 cruise-related tweets posted by 58,644 Twitter accounts were obtained. The mean and median number of tweets per account was 2.37 and 1 respectively, showing a likely preponderance of tweets from personal accounts, compared to news organizations or blogs that usually

have multiple posts reporting the same information.

4.1. Word cloud

The word cloud of the 500 most frequent words and bigrams in the analyzed tweets is presented in Fig. 5. Fig. 5 shows the names of some of the cruise ships (*Diamond Princess*, *Grand Princess*, *Ruby Princess*, *Westerdam*), company/brand names (Carnival, Royal Caribbean, Norwegian Cruise (Line), Holland America), and places (Japan, US, China, Australia, Hong Kong, Italy, Cambodia, UK, Malaysia) that featured prominently in the Twitter conversation during the examined period. There are also many names related to the US like former president Donald Trump, the CDC, as well as American cities that were associated with some cruise COVID-19 outbreaks (California, San Francisco, Florida, New Jersey, New York). Petri dish was one of the most frequent bigrams visible on the word cloud because several tweets referred to cruise ships as “petri dishes” or “floating petri dishes”, a derogatory cliché about cruise ships being a fertile platform for infectious diseases. Similar words or bigrams that reappear on the word cloud i.e. “test positive”, “tested positive”, and “tests positive” or different words that refer to the same entity like US, USA, and America are because the word cloud algorithm counts any change in spelling separately, and this shows the noisiness of social media data. We did not combine these similar words to avoid introducing any bias.

4.2. Most-engaged tweets

The three tweets with the highest amount of engagement (retweets, quotes, and likes) were uncomplimentary remarks about the cruise industry by influential public personalities in the US with verified Twitter accounts and many followers (see Fig. 6). The first was by Judd Apatow, an American film director with over 2.4 million followers, whose tweet had over 9300 retweets and quote tweets and over 75,800 likes. The second was by Sheldon Whitehouse, an American senator with over 468,000 followers. His tweet, which also shared a *Washington Post* article, had over 10,400 retweets and quote tweets and over 22,600 likes. While the third was by Bill Maher, an American talk show host with over 11 million followers, who shared a video of an episode of his talk show about the cruise industry. The tweet had more than a thousand retweets and quote tweets and over 4600 likes, while the attached video was viewed over 234,500 times.

Coincidentally, these three tweets were posted within a week from each other during a period when there were rumors that cruise companies would be included in the COVID-19 government bailout package following former President Trump’s tweet on 12th March 2020, in which he described the cruise industry as a “great and important industry” that will be kept that way. These rumors turned out to be untrue but as these tweets show, there was opposition to the idea on the basis that cruise companies incorporate outside the US and sail under flags of convenience (FOC)² to avoid paying taxes in the US and pollute the environment.

4.3. Sentiment analysis

The sentiment analysis result is presented on a dual-axis time series plot of the daily frequency of cruise-related tweets and the average daily sentiment of these tweets in Fig. 7. The highest volume of tweets per day were posted during the outbreak on the *Diamond Princess* with the two highest peaks in February 2020. The negative sentiment between January 26 and February 3 was due to the cancellation of cruises with Chinese port of calls and fears about the spreading novel coronavirus. However, from February 3rd with the outbreak on the *Diamond Princess*

² Registration of a ship in another country to avoid restrictive labor and tax regulations in the shipowner’s country.

and subsequent cruise outbreaks, the negative sentiment was mainly because of the negative news stories on new confirmed cases, hospitalizations, passenger deaths, stranded ships, and people’s reactions. The negative sentiment about any specific incident was usually persistent long after the news initially broke on Twitter because of repetition and round-the-clock coverage of the 24-h news cycle, resulting in the predominantly negative sentiment throughout the analyzed period. The only time the sentiment crossed the neutral line was on the release of a CDC report on March 24 showing that the novel coronavirus survived in the *Diamond Princess* cabins for 17 days after passengers disembarked. The tweets about this report had a positive sentiment scores because the verb “survive” is a positive word.

Fig. 8 shows the proportion of positive, neutral, and negative tweets. 67,022 (48%) of the tweets in our dataset had a negative sentiment score, 41,636 (30%) had a neutral sentiment score, and 30,352 (22%) of the tweets had a positive sentiment score. A random sample of the positive, neutral, and negative tweets is presented in Tables 1 to 3, with the time they were posted and their sentiment scores. We do not include account details to preserve the privacy of the individuals that posted them. The tweets were randomly selected using random numbers generated by the RandArray function in Microsoft Excel.

The positive tweets in Table 1 show that the algorithm had difficulty identifying sarcasm and had some positive-bias, i.e. tweets scored more positively than they were. For example, tweet numbers 3, 4, 5, 9, 17, and 20 are sarcastic negative tweets scored as positive. While tweet numbers 2, 7, 8, 10, 12, 13, 15, and 19 are not actually positive towards cruising. Genuinely positive tweet number 1 and 18 were about an *MS Westerdam* cruise that stayed virus free, which departed Hong Kong on February 1, 2020 and was prevented from docking in five countries before eventually docking successfully in Cambodia. The neutral and negative tweets in Tables 2 and 3 seem to have been scored more accurately.

4.4. Revised conceptual framework

A revised conceptual framework of the combination of the SARF and IIT is provided in Fig. 9 based on the results of our analysis. The biggest change is that the ripple effects from the spread of impact do not have a “other technologies” dimension like in the original framework, with the effects stopping at the industry level. The entire industry suffered economic reversal although some companies had more outbreaks on their ships than others as shown in Fig. 1. Aspects of the information flow, interpretation and response, and the information integration theory (IIT) that are noteworthy or new are highlighted in red. For example, the 24-h news cycle under the information volume attribute and social media sources under the IIT are relatively recent phenomenon that have now been incorporated into the conceptual model.

5. Discussion and conclusions

This study investigated the public perception towards cruising during the COVID-19 outbreaks on cruises in the early part of the COVID-19 pandemic. To answer the research question on the insight that can be derived from the analyzed tweets during the cruise ship COVID-19 outbreaks, the results show that there was an overwhelming negative sentiment in a majority of the tweets. While this finding was expected, it is still an important result with implications for the cruise industry. This study is in line with the results of previous research that has shown the influence of media coverage on public opinion and risk perceptions (Gene Zucker, 1978; Rowe et al., 2000; Smith, 2005), supporting also the assumptions of SARF that suggests that the spreading of information that involves risk amplifies its perception. The media amplification of the cruise COVID-19 outbreaks had the four attributes of the information flow, which increase memorability and risk perception (Kasperson et al., 1988). The first attribute was the massive volume of information flow on the incidents from the 24-h news cycle. The second was the degree of dispute element from a fast-spreading contagious disease that

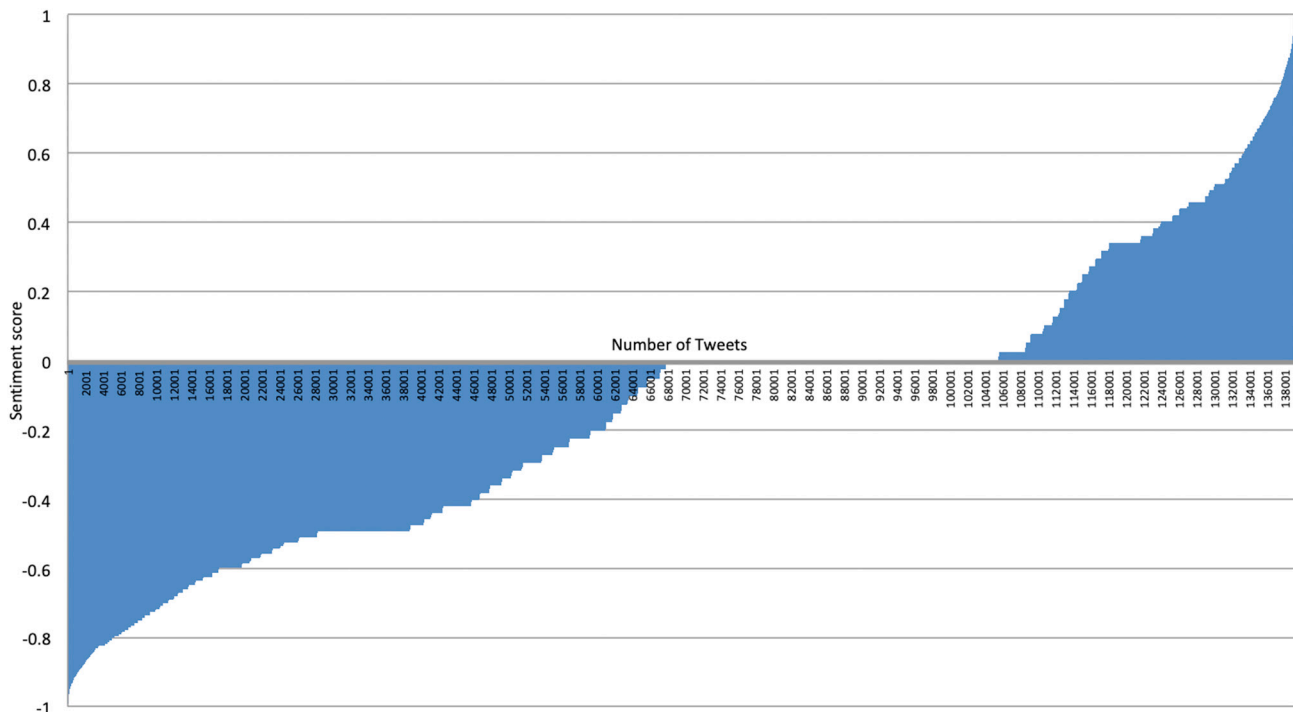


Fig. 8. Chart showing the proportion of positive, neutral, and negative tweets.

was poorly understood at the time, spreading quickly in the vulnerable environment of a cruise ship. The sensational headlines about the increasing number of cases and deaths from the outbreaks provided the element of dramatization. The symbolic connotations were usually negative in these stories, with intrinsically negative words, such as hell or prison, used to refer to ships with outbreaks or under quarantine. Under the attributes of the interpretation and response phase, the simplification of the risk under the heuristics and values boiled down to the risk of disease and death. There was an element of politicization of social group relationships with the three most engaged tweets as they were reactions to the rumor that cruise companies would be offered government bailout which started after the former president’s tweet about the cruise industry on March 12. There was unmistakable high signal value from an unknown risk of a deadly disease and the stigmatization of the cruise industry was obvious in the recurrence of words like Petri dish in referring to the industry’s ships. SARF also emphasizes the difficulty in changing risk perceptions once formed, causing perceptions that can endure far into the future (Kasperson et al., 1988). Hence, these factors underline the importance of this finding, as there is a possibility of an enduring perception of cruising as an undesirable or risky activity even after the threat of COVID-19 goes away. This finding is also consistent with the previous study, which found that cruiser and non-cruiser respondents had anxieties about cruising and were negative about taking a cruise in the future (Holland et al., 2021).

The results also show that criticisms directed towards the cruise industry usually referenced people’s previous objections to the cruise industry on various issues such as infectious disease outbreaks before the pandemic, environmental impact and sustainability, sailing under flags of convenience (FOC) to avoid tax and laws, size of cruise ships, crime incidents, and crew working conditions. This finding is consistent with the assumptions of IIT, which highlights that new information is added and integrated into existing beliefs and knowledge, influencing people’s attitudes and behavior. It also agrees with the literature on the impact of high volumes of information flow, which mobilizes latent fears and a recollection of previous issues, accidents, or failures (Kasperson et al., 1988). Thus, the high volumes of information through repeated stories and round-the-clock coverage of the COVID-19 outbreaks on cruise ships

triggered the recollection of previous concerns about cruising. Cruise researchers have discussed many of these issues at length before the pandemic (Klein, 2002, 2009, 2011, 2016a, 2016b; Papathanassis, 2016; Terry, 2017).

Our results contribute to previous studies showing the hierarchical dimension of the public conversation with the influence of elites, which is also exhibited on social media. The three most-engaged tweets by public personalities confirm this hierarchical nature, where elites shape public opinion as reported in the literature (Blumer, 1948). Tweets by public personalities can earn an outsized amount of engagement because of their societal prominence and a substantial number of followers. Furthermore, the fact that these tweets were by American personalities, in addition to several American-related entities appearing in the word cloud, shows that the analyzed tweets were very American-centric. This could be explained as evidence of strong American interest in cruising matters, although it could have also been affected by the fact that this study only analyzed English tweets. Besides, industry data shows the United States was the largest source of cruise passengers by far with 11.9 million passengers or approximately 40% of global cruise passengers in 2019 (CLIA, 2019, 2021). Overall, this shows the central importance of the American market to the cruise industry.

It is noteworthy that some of the criticized aspects of cruising reported in the results are a consequence of the mass-market cruise tourism business model. This business model uses cost reductions to enable mass-market cruises on increasingly larger ships (Vogel, 2017) which produce three times more greenhouse emissions than long haul planes (Lloret, Carreño, Carić, San, & Fleming, 2021; Mozuni & Jonas, 2016) and sail under FOCs, which frees the cruise lines from paying hefty taxes and many labor, environmental, and safety regulations (Terry, 2017), while externalizing environmental and social costs to the society (Klein, 2016b). Cost saving through FOC has also enabled the cruise industry to offer the affordable mass-market product to middle-class customers, and without it, ships would be smaller and cruises would be more expensive (Terry, 2017). However, despite these economic advantages, this business model has not been hugely successful without the subsidy afforded by the lucrative cruise onboard business (Vogel, 2017). An analysis of the finances of the biggest cruise operators

Table 1
Random sample of positive tweets.

	Time	Tweet	Sentiment Score
1	2/15/ 2020	Love it when it all works out good... Wandering ship becomes best cruise ever despite coronavirus fears https://t.co/db7FOK1e2O	0.9062
2	16:10 3/27/ 2020 23:22	.@IHG It would be really nice to get a refund for my reservations in June, seeing as the cruise I booked last August is now canceled. Are people really still visiting Seattle? #Coronavirus sucks but you don't have to!	0.0763
3	3/15/ 2020 21:44	To all you good Christians out there please say a prayer for the CRUISE INDUSTRY. They need ALL OUR OUR THOUGHTS and SUPPORT. Also WALL STREET, SAUDI ARABIA, and PUTIN. They've all suffered so much. #trump #trumpspeech #trumpspandemic #coronavirus #trumpvirus	0.6633
4	4/14/ 2020 14:16	@i9998217 @CruiseIndustry I think they'd be unsuitable for those purposes since cruise ships have proven themselves to be petri dishes for #Covid19. They'll make wonderful reefs! ðŸŽ	0.5719
5	2/7/ 2020 15:10	#pdknews Good news NYC/New Jersey, a cruise ship with 12 passengers who have the Coronavirus just pulled into port. https://t.co/R3dSYH0pEe	0.4404
6	4/12/ 2020 21:14	FYI followers this article offers a good explanation regarding FOC Flag Of Convenience Ships this is the Cruise Ship Industry this applies also to 99% of ships sailing around Australia on our coastal shipping trade, the same for all ships taking our exports O/S http://t.co/zvLFp0u9jJ	0.6633
7	4/17/ 2020 14:31	I will never, ever go on a cruise ship again. You could not pay me enough to endanger my life on these floating petri dishes. https://t.co/4p5pibjhY2	0.0762
8	2/5/ 2020 07:40	@TIME Reason number 10946 not to vacation on a cruise ship. #coronavirus #ncov #Japan	0.0772
9	4/16/ 2020 05:12	@MollyJongFast But Molly, cruise ships are a wonderful place for Americans to congregate and spread love and cheer and Covid-19 and...	0.9042
10	3/24/ 2020 15:26	@SenTedCruz @JohnCornyn @RepRWilliams cruise lines do not pay US taxes nor are they US corporations. DO NOT BAIL THEM OUT. http://t.co/3ZBtcJ9Jdz	0.0762
11	2/15/ 2020 12:55	Be thankful this Saturday morning that you are not stuck on a cruise ship. #CoronaVirus #DiamondPrincess https://t.co/yVnRHhFpQ1	0.6641
12	4/9/ 2020 06:23	@JohnnyJet Ya know, I wand much interested in cruises because of norovirus. Definitely not interested anymore after one Coronavirus outbreak.	0.7964
13	3/25/ 2020 02:57	Plus my cruise line is only giving "cruise credits" not refunds for a future cruise they will jack the price up on. #UGH #COVIDIOT45 https://t.co/DuOLYpHTyU	0.0943
14	2/7/ 2020 05:34	@DisneyCruise Are you taking any precautions regarding coronavirus on your ships? We are scheduled to sail in a few weeks. TIA Our family has our Flu vaccines already ðŸŠ	0.347
15	4/14/ 2020 14:01	Long before Coronavirus, you couldn't have paid me to take a cruise. Hopefully a infected legacy of the pandemic will mean others won't have to pay again either https://t.co/otYaO58Vfg	0.4215
16	2/11/ 2020 00:35	As a reminder, we will not have an episode tomorrow, since Jordan is going on a cruise. Let's hope he doesn't get coronavirus!	0.4404
17	4/18/ 2020 00:33	@smh Coronavirus and Cruise ships a perfect match. https://t.co/rrXwX2LwX2	0.5719
18	4/21/ 2020 05:19	The tale of The last cruise ship on Earth. "We became like a family - our guests and our crew together. The spirit has been beautiful."	0.7964

Table 1 (continued)

	Time	Tweet	Sentiment Score
		#GoodNews #WereAllInThisTogether #COVID19 https://t.co/4aioMAF37u https://t.co/jTA7O6bMTM	
19	4/2/ 2020 21:20	These "healthy" cruise ship passengers arriving in Ft. Lauderdale now have been exposed and are required to self-quarantine for 14 days once they get home. On the way home, however, they will potentially expose plenty of other travelers. #COVID19 #Coronavirus #Zaandam #Rotterdam https://t.co/ZVSVX8rqYK	0.2023
20	2/10/ 2020 17:03	At least the price of cruises are going down. And you wouldn't believe the deals on bat soup. Thanks #coronavirus https://t.co/mjwVveZxhl	0.4404

between 2001 and 2014 shows that their total revenues are becoming less profitable (Vogel, 2017) and it can be observed that the share prices of the big three had either stagnated (Royal Caribbean and Norwegian Cruise Line) or was declining (Carnival) before the pandemic (see Fig. 2). Cruise researchers have long questioned the increasing size of modern cruise ships (Klein, 2016a, 2016b; Papathanassis, 2016). For example, the world's largest cruise ship, Royal Caribbean's *Symphony of the Seas*, has 18 decks, measures 362 m, and can carry almost 9000 passengers and crew (CNN, 2018). Researchers have also linked the COVID-19 outbreaks with cruise ship size: "It is clear that cruise ships infected with COVID-19 are large ships" (Ito et al., 2020, p. 5).

The year 2020 started promisingly with the cruise industry preparing for a period of unprecedented boom, with 117 new ships on order by 2027 (Cruise Industry News, 2020). However, the COVID-19 pandemic has now reversed the industry's fortunes. But as the development of COVID-19 vaccines and antiviral drugs signals a path to the end of the pandemic; the cruise industry needs to do a lot of rethinking to make a successful recovery. The findings of this study and that of previous research (Holland et al., 2021) show that the outbreaks of COVID-19 on cruises and the ensuing media coverage has hurt confidence in this form of tourism and could hamper future growth if the negative perception persists. Reports of full bookings for future cruises do not contradict these findings, since these reported bookings are usually not always new bookings. For instance, in the quarter ending on August 31, 2020, Carnival Corporation filings show that only 55% of these bookings were new bookings, while the rest were future cruise credits (FCC) re-bookings from previously canceled cruises during the pandemic (Carnival, 2020). The cruise industry has a reputation for discounting prices enough to stimulate demand to fill their fixed capacities after external shocks like 9/11 or the 2008 financial crisis (Vogel, 2017), but this line of action could further reduce profitability.

Therefore, the cruise industry needs a new paradigm away from the pre-pandemic mass-market model with diminishing profitability and whose consequences are stoking negative perceptions of cruising towards more sustainable, environmentally friendly, and profitable business models. This would not be a simple task for the cruise industry and could be further complicated by the huge debt taken on by the cruise companies to survive the pandemic. For example, Carnival has raised \$23.6 billion through debt and equity so far during the pandemic (2021-04-23: Financial Times, 2021). However, it is difficult to see these challenges successfully resolved with the industry moving in the same direction as it was before the COVID-19 pandemic.

5.1. Theoretical implications

The theoretical contribution of this study is both the proposed conceptual model in Fig. 3 and the revised conceptual model in Fig. 9, combining SARF and IIT. Kasperon et al. (1988) provided a detailed framework, which is quite complex and seems highly suited to extreme events. For example, they listed social protest and disorder as part of the

Table 2
Random sample of neutral tweets.

	Time	Tweet	Sentiment Score
1	3/5/2020 18:16	Man, going to be tough refusing some of these cruise ship deals that will be popping up. #COVID19	0.0493
2	4/27/ 2020 01:34	Cleaning a floating petri dish: How is a cruise ship sanitized after a coronavirus outbreak? https://t.co/cyixhGrB38	0
3	2/14/ 2020 07:13	Well this seems like a very bad time to take a #Cruise #Coronavirus #COVID19 https://t.co/unVsTtCdxO	-0.0498
4	4/27/ 2020 04:11	Coronavirus watching you board a cruise ship https://t.co/9dnwf4Zol3 https://t.co/RcJ7CNUZto	0
5	3/5/2020 05:11	'Cluster' of 21 people on Princess Cruise ship heading towards Calif. show possible coronavirus symptoms: officials https://t.co/00uus5Jwme #FoxNews	0
6	2/5/2020 06:05	Quarantined on a cruise ship, food running out. #coronavirus https://t.co/vkAWZBmAIR	0
7	4/4/2020 19:16	I ain't cruising until 2022 https://t.co/NtMZa1mGjC	-0.0267
8	2/11/ 2020 06:00	Going on a cruise? Here's how the coronavirus will change your trip https://t.co/hYVCOx2Egt	0
9	4/27/ 2020 05:43	Coronavirus: How did Australia's Ruby Princess cruise debacle happen? https://t.co/5pFlnZ5WGX https://t.co/YSpCrXKfK	0
10	2/11/ 2020 06:53	Japan might test everyone on cruise ship for coronavirus https://t.co/PMkvBFcpLq via @CBSNews	0
11	4/27/ 2020 02:39	Two things not to do in a pandemic... book a cruise, download a tracking app... https://t.co/keMd4UzJJ7	0
12	3/25/ 2020 19:29	The size of cruise ships is mad. This pandemic hopefully will result in a lot of rethinking, not just about cruise ships. But travel in general. https://t.co/v3KFQjCbml	-0.0444
13	2/6/2020 15:33	Just saw an article about cruise ships being quarantined due to coronavirus and it's a great reminder that there's no reason to ever go on a cruise.	0.0344
14	4/26/ 2020 22:22	Can you imagine not being able to disembark from a cruise for more than 40 days? @fdilella spoke with @dan_domenech who has been stranded due to strict CDC guidelines, amid the Coronavirus pandemic. Here is his story: http://t.co/oGqsuAcq5N	0
15	4/26/ 2020 23:35	[Feed]Coronavirus journey: The 'last cruise ship on Earth' finally comes home https://t.co/3wH1wuYkzm	0
16	4/30/ 2020 03:43	Sixty-seven new cases of #Coronavirus were confirmed on the DiamondPrincess cruise ship, bring the total 285. The ship docked in Yokohama, Japan remains quarantined. http://t.co/BfncVKGIt0 #WednesdayWisdom	0
17	2/11/ 2020 07:15	American coronavirus patient describes "surreal" cruise experience - CBS News http://t.co/fase1Sk7T #cruise #travel	0
18	4/27/ 2020 02:48	@ABCWorldNews What about the guests or shall I say COVID-19 patients on that cruise ship? HmMMM.	0
19	2/11/ 2020 06:24	How a cruise ship turns into a coronavirus breeding ground https://t.co/HfCyHZHgWy https://t.co/J4fkKCbQd	0
20	2/5/2020 06:11	NBC News: 10 coronavirus cases confirmed from cruise ship quarantined in Japan. https://t.co/tjTmcV632f via @GoogleNews	0

group responses while sabotage terrorism is listed as a potential impact. These types of outcomes can only be anticipated during extraordinary events or circumstances. They also provided a highly simplified framework, which is very skeletal. We have adapted the simplified framework and combined it with the IIT in order to provide new and useful contexts

Table 3
Random sample of negative tweets.

	Time	Tweet	Sentiment Score
1	3/24/ 2020 11:09	Until cruise ships are entirely sustainable and powered by renewable energy they're utterly at odds with our climate change crisis, let alone the Coronavirus Cruises they've become. http://t.co/9dpR49UrDy	-0.6124
2	1/27/ 2020 23:29	My elderly mother is scheduled to depart this week on a 28 day cruise and ALL ports have cases of coronavirus. She called @hollandamerica to see if she could receive a refund or voucher. The answer was NO. #coronavirus #badcustomerservice	-0.4466
3	5/9/2020 22:42	imagine surviving coronavirus, taking a tropical cruise to celebrate, and then puking and shitting yourself to death in a "stateroom" the size of a closet because you got norovirus from the all you can eat dessert bar. Just let the plague ship industry die. https://t.co/jYoeiVDF9z	-0.8176
4	2/10/ 2020 18:54	@billburr So ummm. Ya know that whole sinking Cruise Ships idea? I think now would be a good time to start.. with the Coronavirus and all.	-0.4404
5	5/5/2020 09:07	Make that forever. Cruises are an environmental catastrophe on every dimension, fiscally irresponsible operating under flags of convenience if not connivance and a health hazard even in the best of times. https://t.co/0TsLNQrh12	-0.4767
6	4/23/ 2020 06:43	The cruise industry shouldn't recover. It's bad for the seas and the planet.	-0.3482
7	2/6/2020 01:20	You could not pay me enough money to go on a cruise. Coronavirus aside, these stories of ships losing power and everyone getting sick and waste all over the place. No way in hell. http://t.co/GOdXb95sFv	-0.9349
8	5/9/2020 17:20	.@NPR @KHNS FM There were already outbreaks of illness on these vessels before coronavirus. Now with a number of outbreaks in assorted US states traced back to cruises, and their off-shore registration to avoid taxes, I'm not sorry to see the industry decline.	-0.5232
9	5/5/2020 06:11	what if we stop taking cruises altogether since they're gross af? https://t.co/4FHUIGJFO	-0.6486
10	3/9/2020 23:51	Grand Princess Passengers horror on coronavirus cruise ship as people 'fight over rotten food' - Yahoo News Australia - That's a maritime emergency now they should be allowed to dock! https://t.co/BWntSc1POI	-0.8481
11	4/16/ 2020 15:49	Maybe I'm biased because going on cruise falls behind root canal for me, but I can't think of a worse, more disgusting collection of grossness than a cruise ship. Public restrooms are probably cleaner.	-0.7386
12	5/6/2020 11:51	@GeraldoRivera I've never been on a cruise.I always hated the idea of cruises especially since many of them were getting the norovirus. At this point, with the coronavirus, I am never ever going on a cruise ship.	-0.6369
13	4/13/ 2020 21:27	I have gone on cruises in the past, but you could not pay me to go on another one after this mess! #CruiseControl https://t.co/rUVEY91P2d	-0.5217
14	4/8/2020 07:14	#COVID19 BAN grotesque size of polluting cruise liners to save oceans. And now, they are floating hulks of the diseased and dying due to virus. Things turn into their opposites. http://t.co/RGbmVCChgX	-0.2808
15	4/16/ 2020 16:02	Someday we will all be saying, "Do you remember when we packed ourselves on disgusting petri dish cruise ships in rooms smaller than closets with no windows, where we got stomach viruses, drank cheap booze and	-0.1596

(continued on next page)

Table 3 (continued)

Time	Tweet	Sentiment Score
16	5/7/2020 14:04 ended up sea sick? What were we thinking? Glad that's over". Serveral cruise ships currently parked in our harbour, polluting the city with their tons of exhaust gases every day. On board: underpaid employees, threatened by a COVID19 outbreak, unable to get home. Despicable industry needs to change.	-0.6369
17	4/2/2020 18:38 Half of all #Covid_19 #coronavirus #pandemic cases in #Australia are linked to #cruiseships Floating petri dishes! Crews are not Australian, ships are not registered in Australia to avoid paying taxes. Get them out of our waters #scomo #ScottMorrison #LNP #auspol	-0.7274
18	5/4/2020 15:07 @RichieFed Cruise ships were enormous floating Petri dishes before COVID19. Cruises are for the newlywed & nearly dead.	-0.6486
19	3/24/2020 03:46 Read this thread, then listen to @CrimeJunkiePod episode about the death at sea, and then you will understand why I will never take a cruise ever. If you're not dying of some infectious disease, then you're being pushed off a boat or sold into human trafficking and no one cares. https://t.co/nAg2y8c1XN	-0.4767
20	3/28/2020 12:41 NO MASS CRUISES!! THEY THROW THEIR SEWAGE IN THE OCEAN! THEY ARE NOT REGISTERED IN THE US SO THEY DONT HAVE TO ABIDE BY OUR ENVIRO REGS!! https://t.co/yUb2HWt3sq	-0.296

to the conceptual framework that can be directly adopted or adapted in future studies on risk perception. The results offer additional support to the assumptions of the SARF and IIT, on the influence of integrating new information on people's actual beliefs and the influence of media coverage on public opinion and risk perceptions.

However, the monitoring of changes in consumer sentiment expressed on social media is a continuous process, as perceptions can change as industry-related events happen. Cruise researchers can monitor these changes in future research and use them together with other established research methodologies, like surveys, to understand consumer behavior and intentions in the industry. For example, the video of a cruise ship crashing into a dock that went viral (see Appendix) and the release of a documentary film on the COVID-19 outbreak on the *Diamond Princess* titled *The Last Cruise* on March 30, 2021 have also generated many social media comments on cruising in recent times.

5.2. Managerial implications

The practical contribution of this study is to provide insight into the public perception of cruising during the COVID-19 outbreaks on cruises using social media data. The rebuilding process after the pandemic provides an opportunity for the cruise industry to reinvent itself. One way the industry can achieve this is by doubling down on green credentials and observance of environmental regulations, and not simply by cost reductions and increasing ship size. These green efforts have to be genuine because consumers see through greenwashing and only genuine green behavior improves organizational reputation (de Jong, Huluba, & Beldad, 2020). There should be an emphasis on cleaner and greener ships for new ship orders rather than on increasingly larger vessels. Smaller ships that are more environmentally friendly and offer more intimate experiences could be prioritized. Even though seniors remain the largest demographic of cruisers, the average age of cruise passengers has been falling steadily (Dowling & Weeden, 2017). The industry needs to maintain this trend by attracting younger new-to-cruise passengers with its green credentials when they have it. These young consumers among the millennials and Gen Z have a reputation for driving sustainability, environmental, and ethical consciousness (Choudhary, 2020; Deloitte, 2020; Yeoman, 2008). They are also over-represented on social media (Perrin, 2015) and hence, with a louder voice to express their discontent on sustainability issues on social media, which gets picked up by their peers. After facing a much sterner test with COVID-19, cruise lines should now also endeavor to keep cruising safe from the routine outbreaks of other infectious diseases by preserving many of the COVID-19 health protocols like frequent handwashing, some measure of social distancing, increased ventilation, ultraviolet air filtration, additional medical facilities onboard, contactless apps for food-ordering, etc. In the aftermath of COVID-19, the cruise industry should vigorously look into alternative business models that would be sustainable and profitable in the long term. Finally, other areas of tourism can also benefit from monitoring the online conversations on social media when industry-related events happen.

5.3. Limitations

The restriction of the analyzed tweets to only those in English is an important limitation, since an analysis of tweets in all languages could have painted a more comprehensive picture. It is also possible some relevant tweets were not included in the analysis, as we based the data collection on the presence of keywords and some relevant tweets may not mention these keywords, especially when replying to a tweet that already provided context. As an example, there was a viral tweet (see Appendix), which replied to a news report about the planned

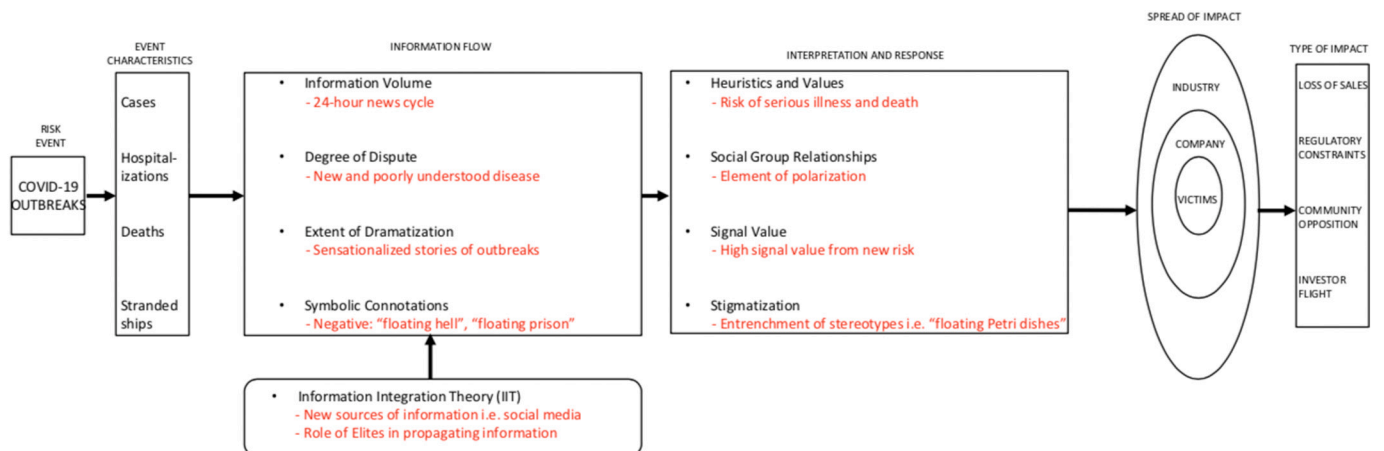


Fig. 9. Revised conceptual map of SARF and IIT for impact of COVID-19 outbreaks on the Cruise industry.

resumption of cruises by Carnival with the dancing coffin meme photoshopped with a Carnival cruise ship in place of the coffin to imply danger of death.

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Availability of data and material (data transparency)

The dataset of Twitter IDs used in this study is available online at <https://doi.org/10.5281/ZENODO.3819464>

CRediT authorship contribution statement

Babajide Abubakr Muritala: Conceptualization, Methodology,

Appendix A. Appendix

Data curation, Formal analysis, Visualization, Writing – original draft, Writing – review & editing. **Ana-Beatriz Hernández-Lara:** Conceptualization, Writing – review & editing. **Maria-Victoria Sánchez-Rebull:** Conceptualization, Writing – review & editing. **Alexandre Perera-Lluna:** Conceptualization, Data curation, Formal analysis.

Declaration of Competing Interest

The authors declare that they have no conflict of interest.

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Fig. A1. Viral tweet of cruise ship crashing into a dock in Venice (Source: Twitter (Jamie, 2020)).



Fig. A2. Dancing coffin meme with cruise ship (Source: Twitter (Bailey, 2020).

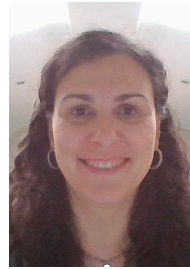
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