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Impacts of COVID-19 on global tourism industry: A cross-regional comparison

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ABSTRACT

The tourism industry was one of the world's greatest markets; until the world met a pandemic in the 21st century, COVID-19. This study aims to present the reactions of travelers during the pandemic trends outlined by adopting text mining techniques. Between December 30, 2019–March 15, 2020, approximately 75,000 comments are retrieved from the TripAdvisor forums, and 23,515 cases from the US, Europe, and Asia forums are employed for analyses.

The results reveal that the tourism sector is easily affected by global crises. It is almost the same day that travelers decide to cancel or delay their trips, with the spread of the news. More in-depth analyses uncovered several topics consisted of comments on benefiting from travel insurance and refund due to the travel cancellations. Travel insurance has become a hot topic, which may be a way of reanimating the industry by offering travel packages, including travel insurance services.

1. Introduction

Traveling is the most entertaining way to meet strangers and explore new places if the route is free of illness, crime, and catastrophes. However, most of the time, with the right know-how, the risks can be minimized or mitigated, and the travel diaries fill up with unforgettable experiences. Epidemics and pandemics are two of the most frightening news for travelers or planners. In such cases, it may be difficult or impossible to avoid the disease. Besides, not only the travelers but also other people they contact during the journey are at risk. Passengers play a serious role in the transfer of epidemics or pandemics between locations (Hollingsworth, Ferguson, & Anderson, 2006). In recent months, the world is focused on epidemics due to the emergence of a new coronavirus.

New coronaviruses trigger epidemics and pandemics. The pathogens are highly infectious and mutate quickly. As a result, new, unexpected outbreaks can occur at any unexpected time. Coronaviruses are mostly transmitted from animals to humans. Severe acute respiratory syndrome (SARS) virus was probably transmitted from birds to humans in 2002. The Middle East Respiratory Syndrome (MERS) virus, discovered in 2012, was derived from camels (Al-Tawfiq, Zumla, & Memish, 2014). Infected people then pass the virus on to other people through droplets or smear infections.

The SARS epidemic in 2003 is a good starting point. It was also triggered by a coronavirus, so it is epidemiologically comparable. On the other hand, it also started in South Asia. Third, it was the first epidemic in the age of globalization and the Internet, which is why similar behavior can be expected today. Between November 2002 and June 2003, around 8000 people were infected with the SARS virus, almost two-thirds of them in the People's Republic of China and a fifth in Hong Kong (Mackey & Liang, 2012). There were also higher numbers of illnesses and deaths in Taiwan, Singapore, and Canada. Given the overall low number of infected people, the effects of SARS on the job offer and, thus, on production were limited. However, the indirect effects were noticeable. So tourists avoided the Southeast Asia region for a while in order not to run the risk of infection.

The first cases of previously unknown lung disease were reported in the Wuhan (Hubei province) region of China in December 2019, initially appeared in a market where live animals were traded. A new form of the coronavirus was identified as the causative agent and discovered in numerous patients with pneumonia. Its global spread is keeping the whole world in suspense. The novel coronavirus (CoV) is now called SARS-CoV-2, the infection COVID-19. “COVID” stands for “Corona Virus Disease” and 19 for the year of discovery. With around 80% of all confirmed cases, the province of Hubei remains the epicenter. Flights and train travel from the largest cities in this province have been canceled until further notice, roads are closed, and there is still a general obligation to wear a mask. In the meantime, the SARS-

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CoV-2 has also reached Europe and Switzerland. News from newspapers, radio, and television roll over every day with new figures on infections and deaths. On January 30, 2020, the World Health Organization (WHO) declared an international health emergency.[1]

At the end of January, almost 10,000 people were infected worldwide, more than 98% of them were in China, and almost three quarters were in the province of Hubei. In the days that followed, the number of infected people increased by an average of around 3000 per day. Cases outside of China also increased. According to the WHO, the virus has spread to 115 countries, and almost 4300 people have died in two months. COVID-19 is called a pandemic disease by WHO on March 11, 2020.[2]

In addition to the human suffering involved, larger-scale epidemics and pandemics also have economic effects. The direct consequence of this is that the sick people are absent at the workplace, meaning that the job offer is at least temporarily reduced. If the disease is associated with numerous deaths, it even drops in the long term. Indirect effects also result from the measures taken to contain the pandemic. For instance, one of the parents is unable to work when the schools get closed because children have to be looked after. Economic activity is also affected if entry and exit are restricted in the regions concerned. However, indirect effects can also arise from changes in behavior, for example, when consumers forego shopping or tourists avoid regions that appear to be risky to avoid the risk of infection. In the corona crisis, worldwide travel traffic has come to a standstill. Many countries prohibit foreigners from entering the country and close their external borders.

It is not possible to estimate the extent of the economic impact of the COVID-19 outbreak because the course and duration of the outbreak are still unknown, and both cannot be predicted, according to experts. However, economic deterioration is much more significant than the SARS outbreak, even in its current state.

In any case, the higher number of patients speaks for more significant direct effects. Currently (as of July 12, 2020), at almost 12,500,000, this is more than one thousand times as large as SARS, and it continues to increase significantly (Fig. 1). However, COVID-19 decreased the potential global labor force; this can be assumed still tenable in terms of the global employment potential. In the 1918 flu epidemic, between 25 and 35% of the population contracted the flu between September 1918 and January 1919.

In particular, the indirect effects of COVID-19 are likely to be considerably higher than with SARS. The governments have taken drastic measures to control the epidemic. The affected provinces were immediately sealed off from the rest of the countries or quarantine, and isolation rules started to be implemented. Besides, any form of a gathering of people is avoided. Many public and private institutions, including schools, restaurants, hotels, convention centers, have been temporarily closed.

The effects on global mobility are also higher than in the case of SARS because China is now more closely linked to the global economy than it was then. Production losses in China can, therefore, interrupt global value chains. Also, China plays a more significant role in tourism, which reacted particularly sensitively during the SARS epidemic. According to the World Tourism Organization (UNWTO), Chinese tourists spent the equivalent of $ 277 billion abroad in 2018; it is announced to be 21% of global travel spending by UNWTO.[3] Now, recent travel restrictions due to pandemic, not just the mobility of the Chinese tourist but also international mobility ceased to exist. The restrictions will hit tourism revenues, compellingly, since tourism is now a more significant economic factor than at the beginning of the millennium. In Thailand, e.g., tourism revenue accounted for around 11% of GDP in 2018; ten years ago, it was only 6%.[4]

Another channel of impact, which in principle already worked during the SARS epidemic, but which is likely to have become more critical, is the rapid dissemination of reports (and false reports) about the COVID-19 pandemic on social media. It may unsettle consumers even in countries that are only marginally affected by the pandemic and can also dampen economic activity there.

Risk communication can be regarded as a good start point to evaluate the change in the mobility plans of potential travelers and reveal a meaningful forecast for the tourism industry. Risk communication is intended to explain, educate, or warn about potential risks, but also denotes a process that is selective in several respects. This is due to several factors, such as the information-sharing social groups (politics, health workers, individuals), the technical dissemination processes, or the risk perception influenced by various factors (experience, background knowledge, interests, and attitudes) on the part of the information recipients. It should also be taken into account that different risk characteristics and the quality of the information transmitted have an impact on risk acceptance and thus, on the assessments regarding the impending extent of damage and its probability of occurrence (Penney, Snyder, Crooks, & Johnston, 2011).

The fear of COVID-19 led to significant uncertainty and chaotic conditions in many industries. The tourism industry has experienced sharply falling revenues and is an economic sector among those most severely affected by the pandemic. The shock affects both the demand side (restrictions on freedom of movement, border closings, guests' fear of infection) and the supply-side (closure of accommodation and catering establishments as well as leisure facilities used for tourism).

The study focuses on the very early period of the pandemic. The comments began to be recorded since the first COVID-19 case was recorded (in Wuhan) and ended four days after the declaration of the pandemic by WHO. This preliminary dataset (captures between December 30, 2019 – March 15, 2020) allowed the first approach of travelers to be examined before mobility came to a halt. Within the scope of this research, comments of users who made travel plans during the specified date range were examined using the TripAdvisor platform. 23,515 comments on the US, Asian, and European forums were analyzed using text mining techniques, and effects on the tourism industry were interpreted. These specifications allowed many original findings, and of the pandemic negatively affected the tourism industry instantly.

2. Literature review

The individual travel motifs of the potential travelers represent one of the decisive elements in the course of the travel decision (Bieger, 2008). However, due to the almost endless variety of possible travel destinations of modern tourism, potential travelers often make their choice for a destination, primarily depending on the perception of feeling safe and secure at the preferred destination. (Kuschel & Schröder, 2002).

Tourism as an open system is characterized by its high degree of networking with the environment. The numerous interactions with the various dimensions of the outside world not only influence the tourism system itself but also influences the environment. The environment as a whole can be divided into technological, socio-cultural, political, economic, and ecological dimensions. Due to the many interrelationships, tourism, with all its components, is very susceptible to changes in all dimensions of the environment (Haedrich, Kaspar, Klemm, &

[1] https://www.who.int/news-room/detail/30-01-2020-statement-on-the-second-meeting-of-the-international-health-regulations-(2005)-emergency-committee-regarding-the-outbreak-of-novel-coronavirus-(2019-ncov)

[2] https://www.who.int/dg/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19—11-march-2020

[3] https://luxe.digital/business/digital-luxury-reports/affluent-chinese-tourists/

[4] https://www2.deloitte.com/content/dam/Deloitte/th/Documents/about-deloitte/th-about-economic-outlook-1h-2019.pdf

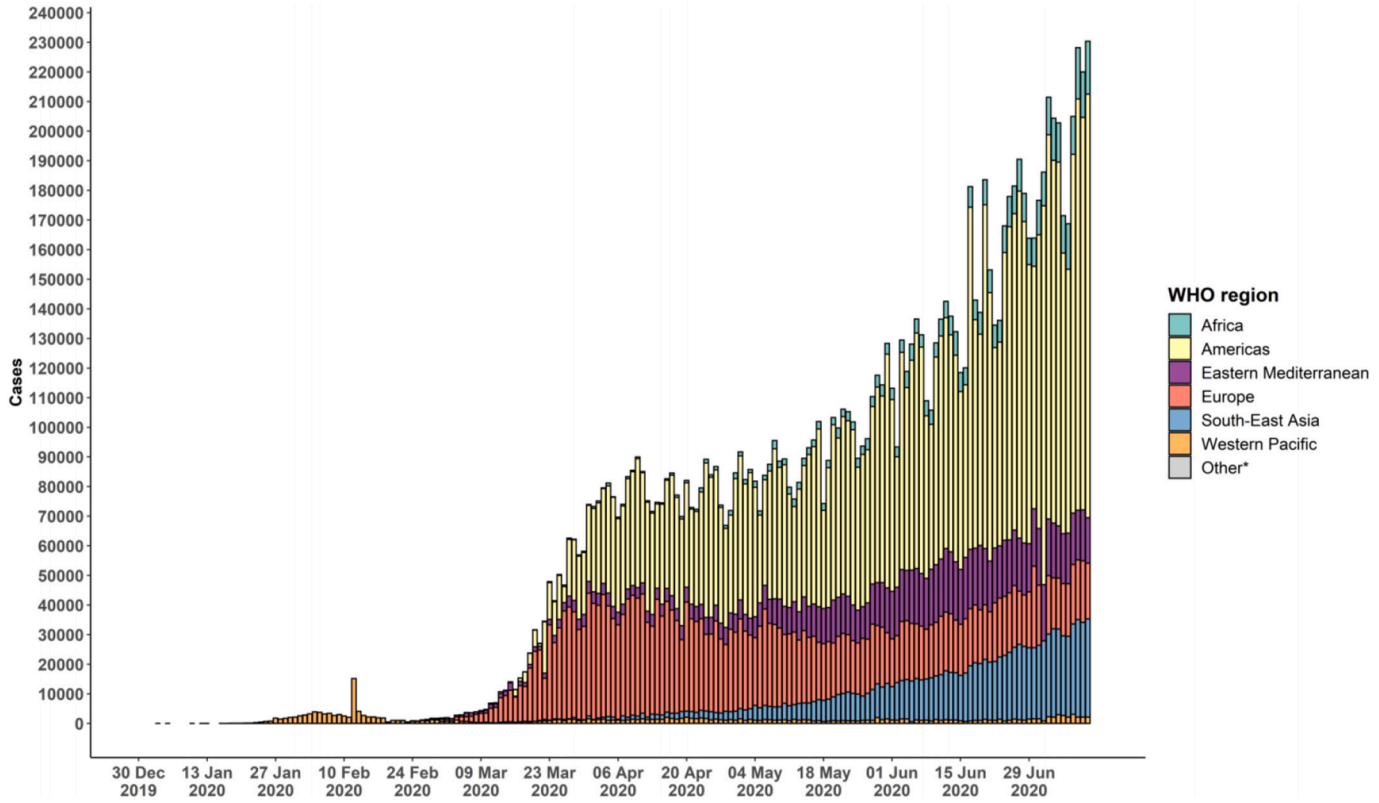

Fig. 1. Epidemic curve of confirmed COVID-19, by date of the report and WHO region, December 30 through July 12, 2020.
Source: Coronavirus disease 2019 (COVID-19) Situation Report – 174, retrieved from https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200712-covid-19-sitrep-174.pdf?sfvrsn=5d1c1b2c_2, on 13.07.2020

Kreilkamp, E. (Eds.)., 2010).

There are also a variety of external influences that can have a significant impact on traveler mobility. These potential external factors can be summarized in two main categories; the natural offer of the destination and the potential risk of crises based on the different environmental dimensions.

The consideration of the issue of the crisis and especially the aspects of crisis management has increased steadily in recent years due to the increased number and scope of the incidents recorded (Glaesser, 2005a). In particular, since the terrorist attacks of September 11, 2001, with its devastating effects, interest in this research area has increased (Ritchie, 2009). Dealing with crises is not uncommon for companies in the tourism industry since almost every tourism company is faced with extraordinary events over time (Dreyer, Dreyer, & Rütt, 2004), but the occurrence of tourist crises often leads to a loss of safety consequences. It can, therefore, have a substantial impact on the travel decision of the individual traveler and also on travel behavior as a whole (Dreyer, Dreyer, & Obieglo, 2010). Besides, although many of the crises that have occurred in recent years are not fundamentally new phenomena, their dimensions and dimensions are many times larger and longer-lasting than before, which makes a more in-depth investigation of the topic seem essential (Glaesser, 2005a).

Tourist crises are often separated according to different criteria for better understanding. The most common ways of distinguishing are the subdivision according to the geographical extent of the crisis and a distinction between endogenous and exogenous crises. The division, according to the spatial dimension, divides crises into geographical ranges locally, regionally, nationally, internationally, and globally. A local crisis, for example, is water damage in a resort or hotel, which is limited to this and does not have any more significant, connected consequences. The regional impact is already devastating. A striking example of this is a particular region that is affected by flooding. The civil war in Somalia can be cited as an example of a national crisis. It refers to the entire country of Somalia, but not to other neighboring countries. In contrast, the Kosovo crisis is described as international because it clearly defied the borders of individual countries and affected several countries directly (Dreyer et al., 2010). Finally, the terrorist attacks of 9/11 and the financial crisis of 2008 had a considerable impact on the global tourism industry due to the minimized number of tourist mobility.

Another differentiation option is that between endogenous and exogenously induced crises, which is particularly crucial for the further examination of the crisis since this makes an initial assessment of the underlying cause of the crisis. Endogenous causes arise within the organization and have their origin in humans or technology. These can, therefore, be relatively easily prevented or at least positively influenced by the company and are therefore not considered further in the ongoing chapter on external effects. Exogenous triggers, however, are deeply rooted in the circumstances of the external environment and are, therefore, outside the company's sphere of influence (Dreyer et al., 2010; Kuschel & Schröder, 2002).

The current crisis research is aware of an almost infinite number of possible causes of the crisis, and there are almost as many approaches to categorize them. The classifications given by various authors vary in particular concerning the number and specification of the categories of causes of the crisis. Based on Freyer, Glasser, and Kreilkamp, a separate subdivision is made below, which is based on the holistic approach of tourism science and thus takes into account the various environmental dimensions of the open tourism system. The categorization distinguishes the following six classes of risks: economic, socio-cultural, political, ecological, technical, and medical risks Freyer (2004), Glaesser (2005b), and Kreilkamp (2005).

This research focuses on medical risks, which can be evaluated through two main risk factors: the dangers which the individual

traveler can come into contact through his travel activity, and the epidemics, which can spread significantly easier and faster due to the mobility associated with modern, international tourism. Due to the continually evolving travel behavior, a steadily increasing number of people travel to increasingly distant and exotic destinations. Many third world countries and emerging countries are attractive travel destinations of modern tourism, which often do not meet the standards prevailing in the source countries of travelers concerning the hygienic and medical conditions on-site. Despite the relevant information of tour operators before the contract is concluded about health-related formalities, i.e., vaccination regulations, many tourists take insufficient prophylactic measures in advance of such trips to protect themselves from the medical risks of the destination areas.

In the destinations they travel to, they often come into contact with pathogens, bacteria, parasites, viruses that are not or no longer to be found in their home countries, so that their immune system, therefore, does not have an adequate defense against the diseases there (Sonnenberg & Wöhler, 2004). Common diseases that are associated with travel activities are considered differentiated according to the type of transmission options. These include fecal-oral infections such as traveler's diarrhea, typhoid, amoebic dysentery, hepatitis A, pathogens that are transmitted through body fluids (e.g., HIV / AIDS, hepatitis C) and drinking water (e.g., typhoid, cholera), droplets (e.g., SARS, flu viruses, tuberculosis) or aerosols (e.g., anthrax, fungal spores) (Spira, 2003). The choice of travel destination for many tourists is now also determined by the health and infection situation of the target countries and the costs of possible prevention.

The risk of actually getting one of the infections listed depends on the disease itself and also varies among destinations. Also, personal factors such as travel behavior, the previously taken prophylactic measures, age, the handling of food and beverages, and many other influences play an essential role in the likelihood of being infected with one of these diseases (Lück, 2004).

The most critical risk factor of a medical crisis is the risk of epidemics or pandemics spreading. Such rapidly spreading infections interact actively with the system of international tourism. On the one hand, tourism promotes the spread of epidemics around the world due to high mobility; however, the outbreak of an epidemic also influences tourism. This cycle becomes particularly evident when we referred to the SARS epidemic in 2003. Starting from a province in southern China, the virus was carried on to Hong Kong via a human host, from where they spread in the metropolis hotel continued. The infected hotel guests carried the disease further to their home countries such as Canada, Singapore, Taiwan, and countless others. After a relatively short time, as mentioned in the introduction, 8000 people worldwide were infected with the SARS virus in over 30 countries around the world. The WHO issued travel warnings to a variety of Asia and North America regions to curb the spread of the disease, but more than 800 people worldwide died from SARS.

The economic consequences of the epidemic were also fatal: According to estimates by the World Travel and Tourism Council (WTTC), the SARS epidemic caused sharp falls in the tourism GDP of numerous Asian countries affected. In China the GDP fell by 25%, in Vietnam by 15%, and in Hong Kong and Singapore by more than 40% of the previous year's values (Ritchie, 2009). This example shows the severe consequences that medical risks and epidemics, in particular, can have for international tourism.

The recent pandemic, COVID-19, figures out a pessimistic scenario for all industries but especially the tourism industry in terms of very low or no mobility. Because the virus is spreading rapidly outside of China, the economic impact will not only result from the decline in Chinese demand but also directly in the countries concerned. In the pessimistic scenario of the OECD, global GDP growth will decrease by 1.5% in 2020, and global trade volume will even decrease by 3.75%. Other predictions show even more dramatic effects (McKibbin & Fernando, 2020).

Tourism-related activities also have been negatively affected due to internal processes. The recent spread of the virus (with or without state quarantine measures) leads to a noticeable decline in so-called “social consumption”. The restrictions include restaurant visits, domestic tourism, visits to cultural events, trade fairs (Hoque, Shikha, Hasanat, Arif, & Hamid, 2020). Several prominent events have already been postponed or even canceled in many countries. Given the high number of cancellations, the airline industry has reduced the flight plans by almost half.

Hardly any other industry is as dependent on the development of intangible values as the tourism sector. Tourism spends are based on provision, short or long time plans, and sometimes on dreams. This fact illustrates the vulnerability of the tourism sector to adverse events. An incident can destroy these intangible assets in the long term.

In a short period, some researches have been conducted examining the tourism effects of COVID-19. The vast majority of these studies focus on regional impact analysis. Dinarto, Wanto, and Sebastian (2020) investigated the impact of the virus on Bintan's (an island in the Riau archipelago of Indonesia) tourism industry; Centeno and Marquez (2020) made their research on the loss of the tourism industry in the Philippines, Correa-Martínez et al. (2020) examined the spread of the virus in a ski area in Austria. Nepal (2020) focused on the impacts on Nepal in his commentary. Also, few studies are focusing on the global impacts of COVID-19 on the tourism industry. Gössling, Scott, and Hall (2020) evaluated the effect of global travel restrictions and stay at home behavior on tourism and projected global change; Niewiadomski (2020) commented on de-globalization and post-COVID-19 tourism industry, where Galvani, Lew, and Perez (2020) evaluated the sustainability of the industry.

To the best of our knowledge, this is the first study that aims to reveal the effects of COVID-19 on global tourism, in the light of travelers' comments. This study differs from current research in terms of data set, regional comparison, and date range that begins with the start date of the outbreak. Therefore, the data set, analysis method, timing, and findings reveal the importance and significance of this study.

3. Method

Three keywords (coronavirus, corona virus, COVID) were determined to compile the dataset of this research. Between December 30, 2019–March 15, 2020, all comments (cases) containing these keywords on TripAdvisor forums were recorded for text mining. The recording process was carried out using a specially developed API; comments on the Tripadvisor forums were automatically retrieved.

The concept of text mining, which is accepted as a specific type of data mining, can be defined as “the process of extracting hidden information from textual data” (Feldman & Sanger, 2007:1). From the perspective of Natural Language Processing (NLP), text mining can be defined as a partial understanding of natural language texts, visualizing texts in the information form, and making inferences within the framework of the information extracted from the text (Zhai & Massung, 2016). Fig. 2 shows the flow of the text mining process. As can be seen, text mining is an iterative process in which analyzes can be repeated with adjustments to achieve better results (Chakraborty, Pagolu, & Garla, 2013).

A basic text mining process begins with the collection of a textual data set. At this point, structured or semi-structured texts are obtained from sources such as documents, web pages, social media, user/consumer comments, etc. The collected text set is divided into the smallest units (token) with the support of natural language processing functions. Sentence elements are determined (part-of-speech-tagging), and then different forms of expressions are reduced around word roots (stemming) and/or original forms (lemmatization) (Akbıyık, 2019) (Fig. 2).

As of the text filtering stage, there is a cyclic iteration. Words or phrases that are not related to the subject examined in the obtained text set (stop words/exclusion list) or below a specific number/criterion are

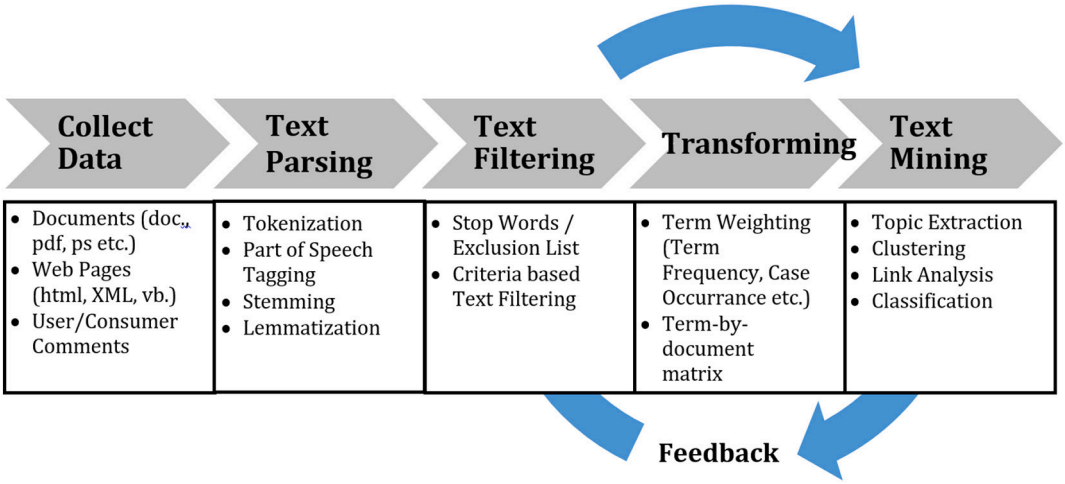

Fig. 2. Text mining process flow (Prepared based on Chakraborty et al., 2013:29).

filtered out of the text set at the filtering stage (Akbıyık, 2019). This process can be repeated by determining new criteria based on feedback as a result of problems and observations encountered during the text mining phase.

The data transformation phase is carried out to give the filtered text set a structured view. In this context, the words in the text set are weighted based on their cumulative use and frequency of occurrence in cases. At the end of the data conversion process, a term-by-document matrix is created, in which all the words in the text set represent a row, and documents (cases) represent a column.

At the last stage, topics and contents within the scope of information extraction (topic extraction) are determined. Words or phrases are clustered according to their distance from each other and the probability of occurrence. Link analysis is carried out in which the presence and power of one or more connections between two or more words or phrases are visually demonstrated. Documents or words are classified according to their categories or titles, and then class predictions of new inputs are made based on this classification. The process can be repeated by directing the findings and images obtained at this stage to text filtering as feedback and then to the data transformation stages.

4. Findings

4.1. Descriptive statistics

There are approximately 75,000 cases in the initial dataset. During the filtering process, duplicate records and comments posted outside specified dates were eliminated and excluded from the study. At the end of the sorting process, 32,122 unique cases were obtained. The vast majority of these cases are in the US, Europe, and Asia forums. Cases recorded from other regional forums were not included in the study since their representation power was low; in this context, only cases from the US, Europe, and Asia forums were analyzed. Within the scope of the research, 23,515 cases recorded between 01.01.2020–15.03.2020 were evaluated. Under these criteria, a total of 74,768 sentences containing 1,329,825 words were examined. Some of these words are not meaningful words by themselves; therefore, 844,253 words (e.g. “and”, “or”, “I”) were extracted as a result of the lemmatization process.

Most of the cases in the data set were retrieved from Asia forums. A total of 12,285 comments, containing the specified keywords, were made in Asia forums within the particular date range. Following the same criteria, 7002 cases were recorded in Europe region forums and 4228 cases in the US forums (Table 1).

In the graphic below, the changes in the number of comments by region are listed chronologically and the rise, peak, and fall areas for each region are visualized (see Appendix for the extended graph – until April 26, 2020).

Table 1
Case frequency per location.

Region	Frequency	Total percent
Asia	12,285	52,2%
EU	7002	29,8%
US	4228	18,0%
Total	23,515	100%

Developments in the pandemic should be taken into consideration while examining the data fluctuations to produce a significant picture revealing traveler reaction speed (Fig. 3).

Although news about COVID-19 began to spread earlier through unofficial sources, on December 31, 2019, Chinese authorities informed the Chinese WHO office that, from early December, several cases of pneumonia occurred in Wuhan City. Covid-19, not mentioned in European and US forums in the first weeks of the year, became a topic in regional forums as infections appeared, and the frequency of mention increased daily.

On January 11, the first death was reported by China. Subsequently, there has been a rapid increase in the number of comments made in Asian forums. The Thai WHO reported the first case of infection outside of China; after that, infections were reported in the US, Australia, Japan, South Korea, Thailand, Vietnam, Nepal, Singapore, and Taiwan in the week of January 20. Wuhan was quarantined on January 23, and the virus reached France on January 24.

In January, the number of comments in all forums tripled. The number of comments on European and US forums remained low because there were no deaths outside of Asia yet. Until February, this problem was seen only as a Chinese problem, and it was not understood that the epidemic would become pandemic. Asian forums contained questions/comments from those planning to travel to Asia. Travelers exchanged information about Asian security, travel restrictions, and protective measures. In European and US forums, those who planned to travel to cities with infections responded. Also, Chinese tourists asked whether there is a visa application at the destination. Chinese who plan to travel to Europe were afraid of being returned at the airport.

On the week of January 27, WHO declared a health emergency due to the increasing spread of Covid-19. There were approximately 7760 infected and 170 dead worldwide, with all deaths located in China. Some airlines, such as Lufthansa, canceled flights to China, and the Trump government restricted flights from China on January 31. During this period, high numbers of comments continued at the same level in

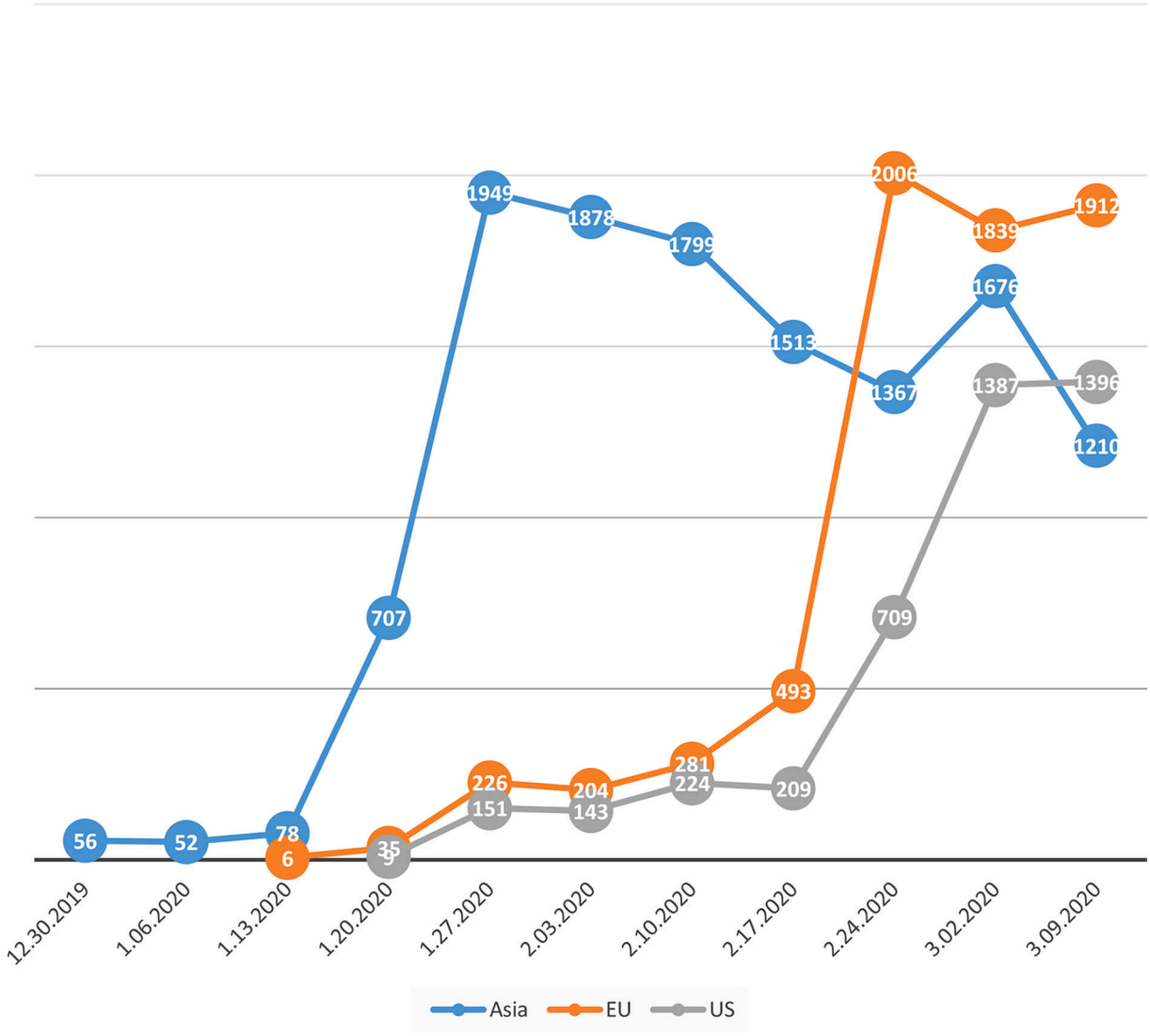

Fig. 3. Case frequency per review date.

all regions. During the first week of February, the first fatality outside of China was reported in the Philippines. A cruise ship was quarantined in Japan waters, and the number of infected people onboard increased. These developments kept Covid-19 on travelers' agenda.

In the week of February 24, the first death in the region occurred in Latin America, while in Europe, Italy confirmed that there were 800 infected cases on February 28. The first leap in the European forum was experienced during the week of February 24, when the first death in Europe was reported on February 15 and the second in the next week. On February 23, Italy set up restricted areas in Lombardy and Veneto to restrict spread. Also, new and suspected cases were reported in Croatia, Switzerland, Spain, Germany, and Poland. These developments caused thousands of travelers to experience security concerns. During that week, travelers looking for methods of safe travel started to ask questions about hotel/flight cancellations. At that point, travel insurance is the most discussed in forums. Travel to Europe is higher than other regions. At the end of February, the Covid-19 issue in the European forums overtook the Asian forums. By that time, South Korea was the second most affected country. An increasing number of suspected cases were being reported in Iran, and these developments caused a high number of comments in Asian forums (see Appendix for the extended graph – until April 26, 2020).

Changes observed in the chart and the developments in the pandemic are more harmonious than expected. Considering the pattern of events and cases, travelers responded very quickly to developments. This finding proves the fragility of the tourism industry. In the forums, ideas were exchanged on many topics, such as hotel/flight cancellation policies, reimbursement, safe destinations. Travelers, who learn very quickly about developments and steps to take, act before the industry develops a plan B.

4.2. Transformation

Following the descriptive analysis of the cases, further analyzes were conducted to examine the words and phrases. In the text formatting process, various restrictions have been applied in order not to include less frequently repeated and sparse words in the dataset. Five hundred words with the highest TF * IDF value are listed in the word analysis; the words are required to be contained in at least 100 cases and to be repeated at least 200 times. A word cloud was prepared to contain the words in the list generated after formatting, with a frequency of 1000 and above.

Word cloud represents the word frequency within the cases. The words used in the word cloud are not just chosen randomly but are created by automated text analysis. The words with greater prominence, which appear with higher frequency in the text, are visualized in

Fig. 4. Word cloud.

larger fonts. The tool thus serves different purposes, such as highlighting essential terms or generating attention and can be practical when it comes to not only spicing up a presentation visually but also creating an introduction to the topic. Word cloud enables us to examine the big picture of frequent words with one hand (Fig. 4).

Since word frequency analysis includes statistics on individual tokens, words may not generate a meaningful big picture even if they have a significant frequency. In this research, the most frequently repeated words are basic ones and also give insight into the thematic structure of the dataset. When the figure is examined, respectively, PEOPLE, TRAVEL, VIRUS, DAY, CASE, TIME, CANCEL, and TRIP stand out. All of these words have a frequency of over 3000. Therefore, even this limited number of tokens may indicate that most of the users tend to cancel their travels. The words FLIGHT, WEEK, CORONAVIRUS, CHINA, POST, COUNTRY, and GOOD were repeated in the frequency range of 2000–3000.

Word cloud is the initial schematic proof of the agenda of travelers and the trends in the forums. Further analyses prove the strength of the words indicated in the word cloud as the words are powered by their frequency of occurrence.

Text analysis may end up with only basic words, and it can be difficult to deduce and to evaluate the results. Phrase extraction enables a more accurate understanding compared to word frequency analysis, although it remains lower in frequency. In order to provide a more detailed insight into the data set, phrases containing at least two and at most five words were extracted and examined. The phrases listed in the phrase extraction analysis were required to be repeated in at least 50 cases, and as a result, 155 expressions matching the criterion were listed. The table above lists the top 50 most frequently repeated phrases. As expected, CORONA VIRUS is at the top of the list; the phrase was repeated 725 times in 658 cases (Table 2).

TRAVEL INSURANCE stands out as the second most frequently repeated phrase. This phrase refers to protecting travelers from trip cancellation to flight delays and ensuring assistance for medical emergency or baggage loss. However, when the cases containing CREDIT CARD, FULL REFUND, and TRAVEL AGENCY were examined, it was observed that the comments were about the refund of all or some part of the payments, and change or cancellation of travel plans. The evaluation of the phrases with high co-occurrence frequency indicated that people are in search of insurance or refund solutions during the crisis. Also, the cases containing CREDIT CARD mention that tourism expenses made with credit cards of specified banks are refunded; additionally, the ways to apply for refund are described.

After the COVID-19 experience, travelers, who are not accustomed to take the probable crises into account and to prepare alternative plans, will probably include the travel insurance in their plans. It is foreseen that travel insurance sales will increase when this global crisis ends. Travel agencies can minimize travelers' reservations about long-term planning by offering affordable travel insurance options to their customers. Following the pandemic, the easiest factor in restoring tourism statistics may be travel insurance options, the importance of which is now understood by consumers.

Following the list are pandemic protection measures such as WEAR MASK, FACE MASK, HAND SANITIZER.

CRUISE SHIP mostly refers to the quarantined cruise ships. The comments mentioning the cruises were about the risky situation of the cruises, the evacuation of the passengers, the number of deaths, and infected people on cruises. Although the most frequently mentioned cruise was the “Diamond Princess”, the comments containing the “World Dream” and the “Westerdam” cruises were also encountered. Diamond Princess had been quarantined off the coast of Japan for two weeks in January due to the coronavirus with 3700 people on board. More than 700 people were tested positive for the pathogen, at least six of them died. Diamond Princess quickly became a symbol of the epidemic. A cruise ship with more than 1800 passengers and 1800 crew members is also moored in Hong Kong. The virus was found in three people who had traveled with the World Dream in January. The Westerdam completed the first odyssey with 1450 passengers. The cruise was banned from docking in Japan, Taiwan, Guam, Philippines, and Thailand, although there was no suspicion of a viral infection. It was only Cambodia that allowed docking in the port of Sihanoukville. However, the disembarkation was hindered: an 83-year-old was wrongly tested positive, almost a thousand guests and crew members had to stay on board and be checked.

As in word analysis, suspicions about the safe journey and tendencies towards cancellation of travel plans come to the fore among expressions. SAFE TO TRAVEL, TRAVEL PLAN, TRAVEL RESTRICTION, TRAVEL BAN, CANCEL MY TRIP, and CANCEL OUR TRIP phrases refer to COVID-19 concerns and cancellation of travel plans.

Named entity extraction reveals frequencies related to the specific names in the data set. The list contains the name of locations with a frequency of 300 or more. The list of extracted names uncovers the

Table 2
Extracted phrases.

	Frequency	No. Cases	% Cases	Length	TF · IDF
CORONA VIRUS	725	658	2,80%	2	1126,0
TRAVEL INSURANCE	450	398	1,69%	2	797,2
WEAR MASK	415	364	1,55%	2	751,3
CONFIRM CASE	410	364	1,55%	2	742,2
FACE MASK	235	201	0,85%	2	486,0
HAND SANITIZER	230	208	0,88%	2	472,3
GOOD LUCK	227	222	0,94%	2	459,7
WEAR A MASK	216	189	0,80%	3	452,5
CRUISE SHIP	200	167	0,71%	2	429,7
HIGH RISK	194	177	0,75%	2	411,9
STAY HOME	172	157	0,67%	2	374,2
WASH YOUR HAND	166	157	0,67%	3	361,1
CHINESE TOURIST	164	148	0,63%	2	361,0
SAFE TO TRAVEL	157	154	0,65%	3	342,9
TRAVEL PLAN	155	146	0,62%	2	342,1
IMMUNE SYSTEM	151	142	0,60%	2	335,1
CREDIT CARD	138	104	0,44%	2	324,9
FULL REFUND	138	123	0,52%	2	314,8
TRAVEL RESTRICTION	138	124	0,53%	2	314,4
TRAVEL BAN	137	127	0,54%	2	310,7
TEST POSITIVE	133	123	0,52%	2	303,4
CURRENT SITUATION	122	119	0,51%	2	280,1
BUSINESS AS USUAL	117	115	0,49%	3	270,30
CANCEL MY TRIP	117	116	0,49%	3	269,9
TOILET PAPER	116	96	0,41%	2	277,1
CATCH THE VIRUS	115	106	0,45%	3	269,8
FINGER CROSS	112	111	0,47%	2	260,5
DEATH RATE	110	82	0,35%	2	270,3
STAY AT HOME	108	104	0,44%	3	254,3
TRAVEL FORUM	108	106	0,45%	2	253,4
PUBLIC HEALTH	107	98	0,42%	2	254,7
GOOD TIME	105	101	0,43%	2	248,5
PUBLIC TRANSPORT	103	102	0,43%	2	243,04
CORONAVIRUS OUTBREAK	100	97	0,41%	2	238,5
TRAVEL ADVISORY	99	88	0,37%	2	240,3
CANCEL OUR TRIP	95	94	0,40%	3	227,8
INCUBATION PERIOD	90	83	0,35%	2	220,7
MORTALITY RATE	88	72	0,31%	2	221,2
TRIP PLAN	86	86	0,37%	2	209,6
CASE HAVE CORONAVIRUS	85	83	0,35%	3	208,4
HEALTH ISSUE	84	81	0,34%	2	206,9
PEOPLE WEAR MASK	84	79	0,34%	3	207,8
PEOPLE DIE	83	75	0,32%	2	207,2
TRAVEL AGENT	82	72	0,31%	2	206,1
VIRUS SPREAD	78	75	0,32%	2	194,7
CANCEL THE TRIP	77	76	0,32%	3	191,8
INSURANCE COMPANY	76	74	0,31%	2	190,2
CANCEL FLIGHT	75	71	0,30%	2	189,0
CONTRACT THE VIRUS	74	70	0,30%	3	186,9
DECIDE TO CANCEL	74	74	0,31%	3	185,2

significant relation among the pandemic spreading route, COVID-19 case number ranking of countries, and the order of listed locations (Table 3).

Statistics show that users mentioned the most about China in their comments as expected. Italy, which is listed among the locations in the Asia region, has become the most mentioned country in the comments after China as it is one of the fastest increasing centers of COVID-19 cases in Europe. In the continuation of the list, Asian countries struggling with the epidemic come to the fore since the first phase of the virus emerged and spread rapidly. Despite their geographic proximity to China, especially Singapore, Japan, Thailand, Vietnam, Hong Kong, and South Korea, strive to slow the spread of COVID-19. There are two main reasons why these locations are frequently included in the comments. The first one is the travelers who plan to visit these regions are curious about the bad news and ask questions to the people who are already there. The second cause is some travelers mention that they had already canceled or plan to cancel their trip to these locations. The

Table 3
Extracted named entities.

Locations	Total
China	2116
Italy	1252
Singapore	1177
Japan	970
UK	962
Thailand	709
Vietnam	555
Hong Kong	474
Wuhan	472
Bali	438
London	435
Tokyo	408
Rome	392
France	364
Paris	361
Korea	350
Europe	342

Asian extracted names are on the agenda, mostly because of their region.

Hong Kong, with the impact of the SARS epidemic experience in which 299 people died throughout the country in 2003, became one of the countries that quickly introduced measures such as travel restriction and school closure after the coronavirus spread. Hong Kong is one of the stop points for those traveling to the Asia region. In the comments, whether the virus emerging in China is seen in Hong Kong, whether there are Hong Kong among travel restrictions or destination suggestions are mentioned. It is worrying that Hong Kong citizens who will switch to the mainland because of the New Year will also spread the virus to the region. Therefore, concerns are observed about traveling to the region. Also, users state that planes flying to that region increase the risk of contamination, so they plan to cancel even connecting flights from there.

Singapore, which is the country with the highest incidence of COVID-19 outside China with 58 cases in mid-February, has become one of the countries that can limit the spread of the disease. To date, 78 of more than 160 people who have had positive results have managed to recover. In Singapore, which adopts a strategy based on isolating people from each other, the penalty for not following the rules is determined as 10 thousand dollars or six months in prison. Although South Korea is an Asian country with the highest number of coronaviruses after China, it was able to slow down its spread rate at the beginning of March. These developments and measures taken by countries are asked or explained in the comments of travelers.

The fact that the words UK and London are at the top of the list can be explained by the different COVID-19 action plans of the UK government. According to the news about the lockdown policies across Europe, the UK acted relatively slowly in terms of closing schools and workplaces. Herd immunity, namely community immunity, was declared as the primary weapon against the virus. The comments containing the UK and/or London indicate that the herd immunity perspective frightened some of the travelers, and they considered delaying or canceling their travel plans to the UK region and London with concern for contamination. Also, the government's statement that they are expecting 80% transmission caused users to get more anxious.

Comments and concerns regarding Rome, France, and Paris locations have increased since the first case that resulted in death outside of Asia was experienced in Paris. On February 14, an 80-year-old Chinese tourist died in a hospital in Paris. This case is the fourth death caused by the virus outside China, which has caused the death of 1500 people, most in Hubei cities.

Table 4
Extracted topics.

	Name	Keywords	Freq	Cases	% Cases
1	CANCEL THE TRIP; MARCH	TRIP; MARCH; APRIL; PLAN; CANCEL; WEEK; MID; FLIGHT; AGO; DAY	19,607	9597	40,81%
2	STAY HOME; HIGH RISK	HOME; RISK; HIGH; STAY; QUARANTINE; RETURN; HEALTH; DAY; FAMILY; CHANCE; LOW; CATCH; WEEK	17,428	9154	38,93%
3	TEST POSITIVE; PATIENT	TEST; POSITIVE; PATIENT; HOSPITAL; SYMPTOM; MEDICAL; FEVER; GOOD; CARE FEVER; SYMPTOM; COLD; COUGH; TEMPERATURE; COMMON; CHECK; QUARANTINE; SHOW; DAY; ARRIVAL	14,122	7984	33,95%
4	FULL REFUND; TICKET	REFUND; TICKET; REFUNDABLE; AIRLINE; FEE; FLIGHT; BOOKING; BOOK; CANCEL; HOTEL; CANCELLATION; FULL; PURCHASE; PAY; CHANGE	16,136	7356	31,28%
5	FLU; PEOPLE DIE	FLU; DIE; COMMON; KILL; YEAR; SEASON; PEOPLE; DEATH; COLD; YOUNG; RATE; HEALTHY; MILLION; HIGH	12,847	6874	29,23%
6	WEBSITE; OFFICIAL	WEBSITE; OFFICIAL; INFORMATION; HEALTH; SOURCE; CDC; LINK; CORONAVIRUS; NEWS; STATE; PAGE; CLOSURE; PUBLIC; LEVEL	10,665	6474	27,53%
7	VISA ON ARRIVAL; CHINESE TOURIST	VISA; CHINESE; CHINA; SUSPEND; ENTRY; MAINLAND; ARRIVAL; TOURIST; NATIONAL; BAN; TOUR; FLIGHT; GROUP; BORDER	10,890	6131	26,07%
8	TRAVEL INSURANCE	INSURANCE; COVER; TRAVEL; POLICY; EPIDEMIC; PURCHASE; COMPANY; CANCELLATION; MEDICAL; WARNING CREDIT; CARD; COMPANY; PAY	10,520	5920	25,18%
9	CONFIRMED CASE; DEATH RATE	CASE; CONFIRM; DEATH; NUMBER; REPORT; POPULATION; MILLION; RATE; LOW; INFECT	9628	5297	22,53%
10	LOSE THE MONEY; SPEND	MONEY; LOSE; SPEND; HOTEL; TOUR; CANCEL; GROUP	7479	4883	20,77%
11	WEAR A MASK	MASK; WEAR; FACE; PEOPLE	8178	4794	20,39%
12	CORONA VIRUS	VIRUS; CORONA; SPREAD; CATCH; OUTBREAK	7242	4455	18,95%
13	RESTAURANT; OPEN	RESTAURANT; OPEN; CLOSE; SHOP; BAR; ATTRACTION; MUSEUM; SCHOOL; CLOSURE; TOURIST; BUSINESS; USUAL; FOOD; EAT	7751	4393	18,68%
14	TRAIN STATION; TOUR GUIDE	TRAIN; STATION; GUIDE; BUS; TOUR; GROUP; CROWD	2920	1938	8,24%
15	MAKE A DECISION	MAKE; DECISION; SENSE; COMMON; PERSONAL	3515	2507	10,66%
16	HAND WASH	HAND; WASH; SANITIZER; TOUCH; WIPE; FACE; CLEAN; HYGIENE; PRECAUTION	3769	2042	8,68%
17	CRUISE SHIP	SHIP; CRUISE; PASSENGER	1303	791	3,36%

4.3. Text mining

Data mining techniques help to understand topics travelers discussed in their comments containing Covid-19. In order to reveal the thematic structure of the cases and to reveal a clearer insight into the big picture, topic extraction was performed. Below are the results of the topic extraction analysis and seventeen topics automatically clustered and named via WordStat.

When the topics and keywords are examined, a significant structure emerges. The clustered keywords are highly related to each other, and the topics, which are named automatically by the software, are also in harmony with the main structure (Table 4).

The first topic, which has the highest frequency and case distribution in the context of case occurrence among groups, is about canceling travels. In 40.81% of the cases, travelers comment on canceling their travel or flights. It is evident that tourism will be one of the most affected industries by the COVID-19 pandemic. However, this analysis offers insight into the speed and size of the effect.

The second topic was compiled from keywords such as staying at home, risky being out of risk, and quarantine applications in order to reduce spread and contamination. Similarly, seven more themes (3, 5, 6, 9, 10, 11, 12) deal with current news, cases, statistics, official announcements, and methods of protection about the outbreak.

When other topics are examined, the comments of users about the conditions of benefiting from travel insurance, refund, and reimbursement come to the fore due to the travel cancellations that are evident in the first topic. Travelers are looking for ways to make their travel cancellations with minimal losses. For example, under the travel insurance topic, it was mentioned that some banks' credit cards give a full refund for canceled travel expenses. It is observed that travelers are in search of refund policies and application methods.

All the listed topics were analyzed according to the forum location and date of comments. In these analyses, the rate per 10,000 words was taken into account. Thus, the number of comments differing on location and date basis has been normalized and prevented from affecting the analysis result. It has been observed that the topic named as VISA ON ARRIVAL; CHINESE TOURIST demonstrate significant difference concerning locations and dates. Although this topic is mentioned in every region, most of the discussions were in Asia forums, and fewest were in US forums. The reason why the theme is mostly spoken in Asia forums is investigated by examining the referring cases (the cases containing the keywords in this topic). It is generally seen that the travelers in the Asia region have discussions about whether a visa query is made during their entry into other countries. In particular, Chinese travelers are concerned about the visa on arrival practices of the countries on their routes and beware of not being able to enter the countries.

On the other hand, this issue was discussed by the EU and US citizens in other forums. Citizens declared their worry about Chinese tourists or groups of tourists entering their home countries. It was argued that this mobility accelerates the spread of viruses to countries, and restrictions and travel bans should be implemented as soon as possible. Comments under this topic were most observed in January, and as time went on, the number of comments decreased. The number of cases, which decreased in February, continued to decrease in March. International mobility was already significantly limited during these periods, and with the spread of the epidemic to Europe, the issue began to cease to be a curiosity for travelers.

The topic, RESTAURANT; OPEN, contains many places to visit but also contains the keywords OPEN and CLOSED at the same time. The dendrogram analysis was used to provide more insight into the structure of the theme. In dendrogram analysis, repetition is taken into consideration, and 100 clusters are listed in the agglomeration order. Link analysis was used to analyze and visualize the relationship between clustered expressions.

In the dendrogram notation, it was observed that particular words were clustered together, similar to the topic extraction analysis. When the link analysis of the cluster was examined, the relationships in the figure were determined. Accordingly, it is seen that the areas that are listed as open in the comments are restaurants, bars, and shops. The museum, school, and activity centers are closed. The reason for the activity centers to be associated with both CLOSED and OPEN is because travelers ask whether these areas are open or closed (Fig. 5).

Content differences of the comments were examined by region, but mergers and divergences were visualized through a correspondence plot to obtain a more in-depth analysis. The frequency of extracted phrases by locations was transformed into a crosstab and then to a correspondence plot. The figure indicates that Asia forums differ in terms of discussing on visa on arrival issues. This finding also

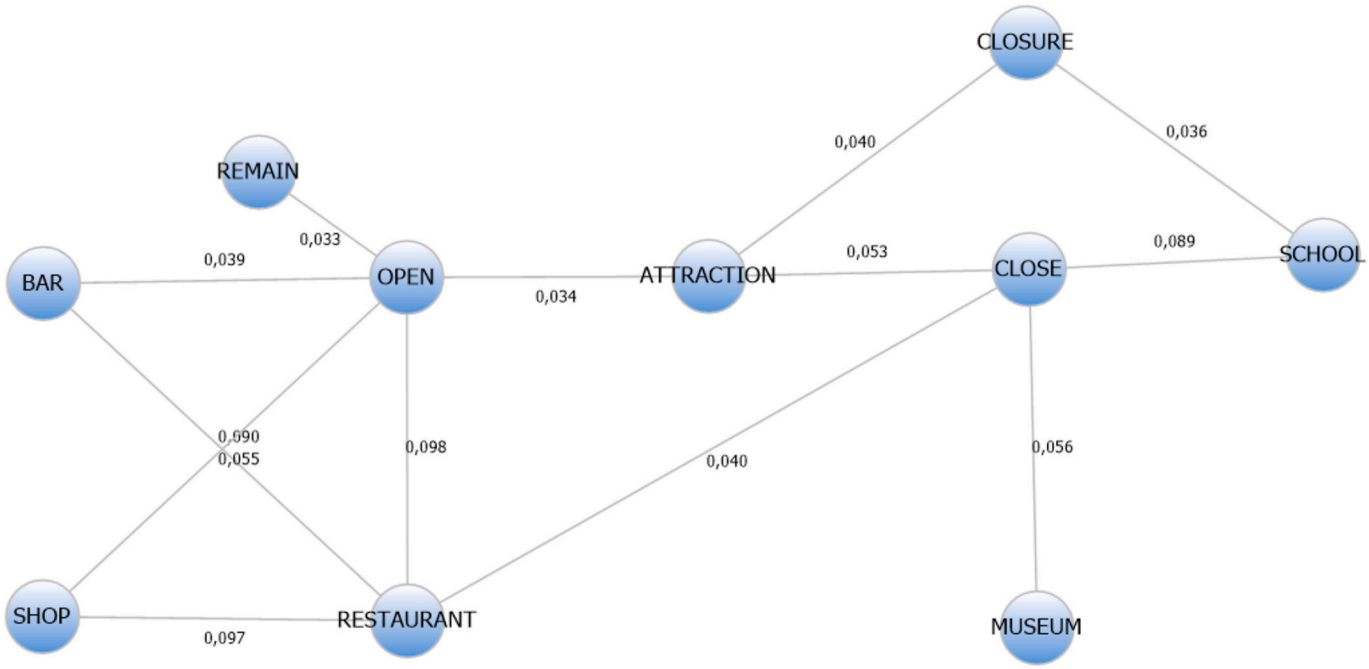

Fig. 5. Link analysis.

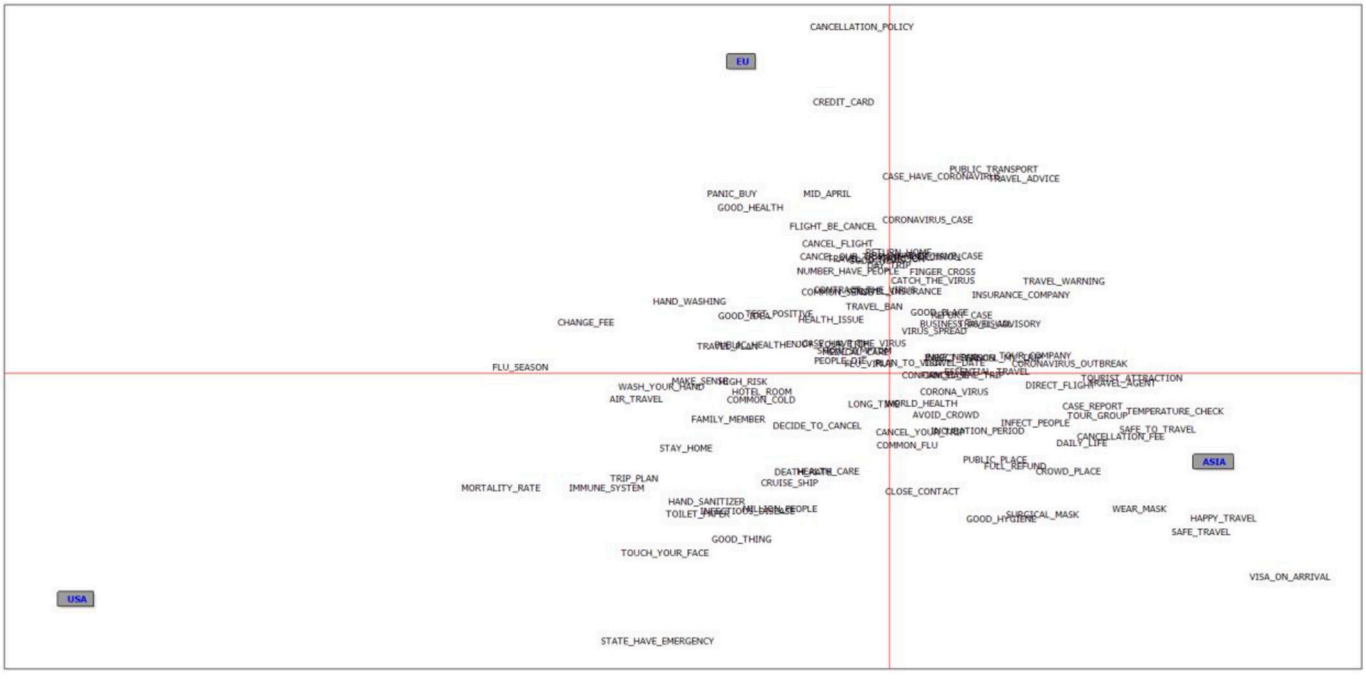

Fig. 6. Correspondance plot.

manifested itself in the topic extraction analysis. Safe travel (used for the ones who “must” visit this region for business trips), tour groups, crowded areas, and precautions that can be taken, such as and wearing masks seen mostly in the Asia forums (Fig. 6).

The US has taken a position that is more distant to the phrase intensity than other location forums. This finding indicates that the statements that are more frequently found in the US forums are also spoken in other forums, and in this context, no particular divergence is observed. The number of comments on precautions and cleaning warnings in the US region is higher than in other country forums. The reason for this can be explained as the fact that the US does not see the epidemic as a severe threat as of the date of data collection and only discuss basic protection methods. Statements regarding the cancellation policy and getting a refund to credit cards were mostly observed in comments on Europe forums. Travelers in Europe tend to cancel their travel to the Asia region. For this reason, users ask questions about cancellation policies, or those who have experienced cancellation give advice and guidance. The agenda for insurance companies and travel warnings have been discussed with similar frequency in the forums of Asia and Europe regions.

5. Conclusion

The cultural and social change of the modern service and industrial

society, as well as technical and economic innovations, especially in the transport system, led to enormous changes in the tourist demand side. However, other factors, such as the increased geopolitical stability and the opening of many national borders, are reasons for an all-round increase in international tourism (Franklin, 2003; Weaver, 1998). Despite a decline in growth rates, tourism was one of the world's fastest-growing markets; until the world met a new brand pandemic in the 21st century.

This study aimed to present the decisions and reactions of individual tourism actors, tourists because of the pandemic trends outlined. Specifically, this study focused on revealing the effects of the COVID-19 pandemic on global tourism in the light of the comments of travelers and travel planners. The forums on the world's largest travel platform (tripadvisor.com) have been examined. Between December 30, 2019–March 15, 2020, all comments (cases) containing the three specified keywords (coronavirus, corona virus, COVID) on TripAdvisor forums were recorded for text mining. The recording process was carried out using a specially developed API; approximately 75,000 comments were retrieved automatically from the Tripadvisor forums.

This research adopted text mining techniques to evaluate a large data set consisting of 23,515 unique cases after several sorting, filtering, and refining processes. Comments posted on TripAdvisor forums of the US, Europe, and Asia regions were analyzed. Within the scope of the research, a total of 74,768 sentences containing 1,329,825 words were employed for evaluation.

The results of this research reveal that the tourism sector is very sensitive and easily affected by global crises. The crisis that started with the emergence of COVID-19 became the focal point of travelers, even when it was still in local dimensions. It is almost the same day that travelers make a decision to cancel or delay their trips, with the spread of the news. With the announcement of the COVID-19 case as a pandemic, travelers decided to cancel the trips immediately and started to discuss travel assurance issues.

The most frequently repeated words within the cases were, respectively, PEOPLE, TRAVEL, VIRUS, DAY, CASE, TIME, CANCEL, and TRIP. All of these words had a frequency of over 3000. Therefore, even this limited number of tokens indicated that most of the users tend to cancel their trips.

In order to reveal the thematic structure of the cases and to reveal a clearer insight into the big picture, topic extraction was performed. The cancellation of travel plans was first on the agenda of travelers, from the keywords; cancellation of trips was mentioned in 40.81% of the cases. It is evident that tourism will be one of the most affected industries by the COVID-19 pandemic. However, this analysis offered insight into the speed and size of the effect.

These findings are indicative of the sudden entry of the tourism sector into a bottleneck. Although it is not clear when major crises such as epidemic, pandemic, natural disaster, terrorism will occur, it is quite difficult and costly to be ready for them. The B plan of the tourism sector can be attracting tourists from different locations, highlighting different attractions, presenting influencers as brand faces, and increasing location reputation. However, in global crises, all of these plans lose their meaning and effectiveness.

Another negative aspect of these crises is that it takes time for travelers to return to their old mobility even after the crisis has ended. People are affected by the environment of fear, anxiety, and insecurity for a long time and they become accustomed to staying still and local. This trend further extends the tourism industry's reinstatement time.

Phrase extraction revealed that TRAVEL INSURANCE scored as the second most frequently repeated phrase after CORONA VIRUS. Travel insurance refers to protecting travelers from trip cancellation to flight delays and ensuring assistance for medical emergency or baggage loss. The evaluation of the phrases with high co-occurrence frequency indicated that people were anxious and in search of insurance or refund solutions during the crisis. Also, the cases containing CREDIT CARD mentioned banks' specific return practices; additionally, the ways to apply for refund are described. Conformably topic extraction uncovered several topics consisted of comments on benefiting from travel insurance, refund, and reimbursement due to the travel cancellations. Travelers were looking for ways to make their travel cancellations with minimal financial losses.

Within this context, one of the striking findings that emerged within the scope of this study is that the travelers grasped the importance of travel insurance. Travel insurance has become a hot topic in all forums, especially in the Europe and Asia forums, after the announcement of the pandemic. Travelers who did not take into account the possibility of crises and risks occurring and ruining their travel plan, and did not need to invest in travel insurance, sought different ways for refund.

5.1. Implications

The travel industry already faced difficulties. Many companies mastered the challenges of digitization and were successful in the changing environment. However, the magnitude of the consequences of Covid-19 is not comparable to previous crises.

Important information reaches millions of people instantly, thanks to the Internet, which has many benefits and some disadvantages. Technological advances make it compulsory to keep abreast of the VUCA (volatility, uncertainty, complexity, and ambiguity) world. In this study, these generalizations are critical for the tourism industry, as supported by the date range and statistical analyzes. Travelers react to sudden changes and tourism businesses need more time to prepare plan B. Players in the tourism sector must conduct accurate risk analysis and develop appropriate crisis management policies to survive.

The study implies that the tourism industry is greatly affected by the outbreak, as expected. Also, the findings provide original clues in terms of necessary steps that should be taken to reanimate the industry. Comments indicate that travel insurance would be on the list of must-haves from now on. Tourism companies that would include this option in their travel packages for free or at small prices would be preferred. Travelers should make sure their plans are safe and protected to temp to invest in the tourism industry. In this context, travel insurance and the possibility of change of date or location without paying a fee difference can encourage travelers to make future travel plans and ensure tourist mobility.

Flexibility and agility are two critical features needed in the tourism industry. In the future, it is expected that the need for mobility, consumption, and freedom will remain high, but a reflection will shape it on the local context. Along with efforts to normalize, the tourism sector needs to provide confidence to travelers against the risks. Updates to the travel insurance, refund, and plan change policies are required so that enterprises can serve with full reliability and flexibility.

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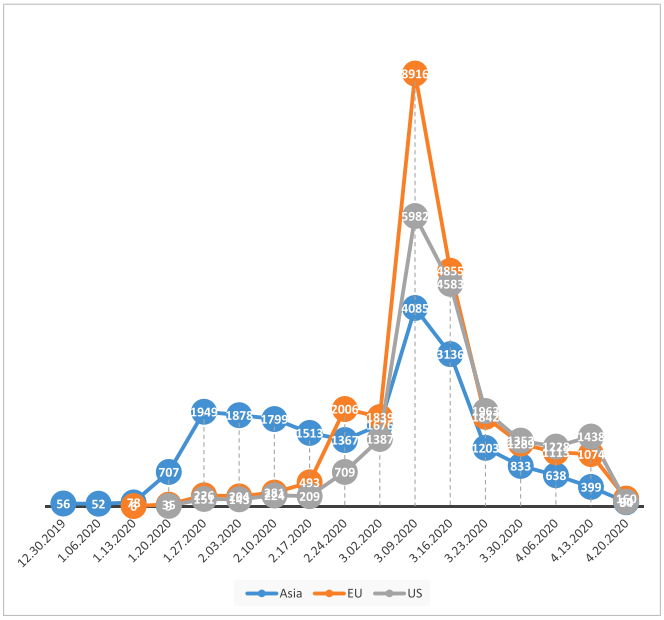
Appendix A. Particle velocity in the dilute region

The updated dataset consists of 107,232 unique cases, recorded between December 30, 2019, and April 26, 2020. The majority of the cases

(n = 65,261) are recorded in Europe, the US, and Asia forums.

In the graphic below, the changes in the number of comments by region are listed chronologically and the rise, peak, and fall areas for each region are visualized.



One of the remarkable points in the chart is that all forums reached their peak in the week of March 9, when Italy became a restricted zone, and the government decided to extend the restrictions on freedom of movement across the country due to the pandemic. During the same week, more countries (Spain, Austria, Germany) banned the entry of people from countries severely affected by Covid-19. People from Europe were no longer allowed to enter the US. WHO declared Covid-19 a pandemic on March 12. The peak week was when the most critical decisions regarding the pandemic were taken.

As the outbreak spread rapidly and numbers of cases and deaths increased, various measures were taken. Many countries closed their borders completely. National and international events, including the Olympics, were postponed. Toward the end of April, the number of discussions of this issue in all forums deceased.

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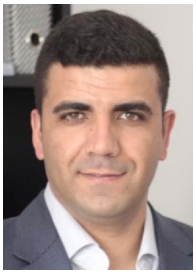

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