Chapter 12
Disaster Management Using Recent Technologies During COVID-19

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Abstract As we came across in earlier chapters, during the time of worldwide lockdown, various sectors like industry, healthcare, and agriculture are facing a lot of difficulty in meeting the basic needs of the people due to issues identified in supply chain management. Apart from addressing the discussed problems, governments have various other issues to address, such as enforcing the proper lockdown among the people; providing the citizens with basic necessities like food, groceries, and vegetables, from the retailers; enforcing and monitoring law and order during the lockdown period pertaining to areas like transportation, markets, shops, public gatherings, and medical facilities; and identification and treatment of people suffering from coronavirus attack. Apart from these general issues, there were some other challenges faced that attracted attention such as blocking of false messages generated, related to COVID-19, etc. The chapter aims at addressing these issues using various technologies like drones for monitoring activity, AI technology for planning and prediction in order to curtail the growth rate of coronavirus infections using algorithms, etc.

Keywords Spoofing of malicious messages · Drones · AI algorithm · Economic slowdown · COVID-19 · Technological era
12.1 Introduction

The lesson taught by COVID-19 disaster calls for a huge measure of attentiveness toward health organization. It is crucial in the country to tackle such disasters, which appeared all of a sudden and affected a huge number of people irrespective of geographic boundaries with tremendous pace and virulence. Acceptable readiness in health-related infrastructure is never wasteful, and same infrastructure can come handy in the future as well—whether natural or human-influenced pandemic [1]. Since COVID-19 is a contiguous infection, relevant reframing of health organizations may be required to tackle such disasters [2].

While deliberating natural disasters, apart from earthquakes, the other common natural disasters include cyclone, flood, drought, and Tsunami; early warning systems are already in place in India [3]. Issuance and dissemination of such early warnings in India are well institutionalized by the respective nodal agencies and National/State Disaster Management Agencies, For all kind of disasters its not possible to have preparations already available and on the same way all distasters can’t always be attentive [4].

For landslides, due to non-availability of credible statistics, forecast of its time of manifestation is challenging, and India is still not prepared with any efficient operational chronological forecast model for initial warning. For 60% of landslide-prone areas (2.55 lakh km²), India is now conscious about the spatial positions where forthocming landslides are likely to occur due to the attendance of a trigger, which in utmost cases is the sophisticated volume of torrential rainfall [5]. GSI, being the nodal agency for landslides, has already prepared and uploaded such geo-information on landslide susceptibility maps on its Bhukosh web portal to be used in 17 landslide-prone states [6].

Tehsil/district-level shelter homes are required to save human lives. One of the major consequences of COVID-19 is the possible protraction or hesitation, and preserving social distance (a basic requirement in case of COVID-19) would be an issue in such shelter homes [7].

This may result in an obvious space crisis in such shelter homes and may lead to additional expenses in obtaining and dealing with more number of provisional shelters. For arrangement, such parameters should continuously be taken into account [8].

It is always useful to accept the fact that the annual recurrence of such natural disasters due to heavy rainfall will remain; therefore, extra caution and satisfactory readiness must be ascertained in case of such natural disasters by all the concerned agencies.

Basically, this chapter is further divided in six sections including introduction, and Sect. 12.2 includes measures undertaken by the government to control COVID-19 like restriction of mass gathering, maintaining social distancing, and lockdown. Section 12.3 addresses issues faced due to lockdown like economic slowdown, country-based statistics about unemployment, and social impact of lockdown. Section 12.4 focuses on new technologies to help handle the pandemic. The impact of COVID-19 on financial sector, supply chain industry, transportation,
warehousing, inventory management, healthcare, and safety in offices is discussed. Section 12.5 addresses technologies that can be used to address issues like drones as surveillance camera, drones as broadcasting machine, and AI-based technologies like ML- and NLP-based solutions. Section 12.6 addresses the impact of research in dealing with the epidemic by call for papers and designing specify search engines and so.

### 12.2 Measures Undertaken by the Government to Control COVID-19

The new policies introduced by the government to control the pandemic are as follows [9, 10]:

1. **Restriction of mass gathering:** Various countries have implemented lockdown as a measure to control the widespread of coronavirus. The measures undertaken have resulted in closing of malls, market places, universities, and factories as well as travel restrictions and freeze on transport facilities, giving rise to various losses incurred upon sectors such as industry, retail markets, education, and tourism.

2. **Social distancing:** Post lockdown, social distancing has restricted the productivity of major sectors that are currently operating with 30% of operating staff; such companies are struggling in order to maintain their financial margins [11].

3. **Lockdown:** The complete lockdown called upon by the government has almost put a halt to the operation of various sectors apart from those operating over virtual or online platforms. This measure has said to have brought a major setback to the sectors operating in physical spaces but has favored those companies operating on virtual platforms due to the sudden shift of various sectors such as education, delivery, and purchase markets into online mode.

### 12.3 Issues Faced Due to Lockdown

The lockdown and various other policies implemented by the government have resulted in the following issues [12].

#### 12.3.1 Economic Slowdown

Taking an example of the 2008 Financial Crisis, COVID-19 put the same yet severe strain on the economy all over the world. Since the beginning of COVID-19, the fear of the contagion has taken the operational capability of the market to a
downtrend, eventually leading many countries to implement lockdown measures, which also affect the financial markets as well. Upcoming reports from WTO and other government and nongovernment agencies suggest and forecast the financial downturn of their respective economy [13].

Due to the economic crisis, the expected losses have touched one trillion USD all over the world, which has also impacted the investor psychology due to the spread of the virus. Loss of wealth has put the pressure on major investors to direct the investment from equity to safe products, i.e., bonds and government securities, due to which the heavy pull over equities has taken the market down to negative return [14]. The impact does not only affect the equities but also the commodity market. Since the COVID-19 spread, oil price has been heavily affected. On April 27, 2020, West Texas Intermediate (WTI) oil price benchmark index turns index closing at $−37.63 a barrel. Brent Crude reaches 18-year low to $20 a barrel, making a new high in US oil inventories [15].

The recession has been affecting the third-world countries, which is apparently due to heavy pressure on meeting the fiscal target and barely be able to run the economic cycle. To increase the debt and put more pressure on the balance sheet and to raise funds and broaden the fiscal deficit, major economies such as USA which was severely affected during the 2008 crisis has pumped $2.3 trillion into the economy to keep the liquidity in check. Unfortunately, this event is inevitable in nature and has been testing each and every government’s decision-making with respect to running the economy. However, it is yet to be ascertained the extent to which this crisis is going to test the world economy [16].

12.3.2 Unemployment

Another major factor that has been impacted due to COVID-19 is the unemployment rate and the value addition that has been created by it. Due to heavy lockdown, a large number of workforce have been out of job, and a large number of small-scale businesses have been affected for not being able to meet the working capital requirement, therefore leading them to shut down [17].

The unemployment rate in India has touched a record high of 27.11%. Considering the population in India, due to the unavailability of proper data with respect to the unorganized sector, the given number might be much higher, affecting the large part of small-scale businesses in the environment. Although not all businesses have been affected, the essential service sectors are still active, i.e., hospital and FMCG, pharmacies and electricity, water supply, etc. Although these sectors are facing pressure from both demand and supply side, operation capability is under control [14, 16].

At the moment, India is on the verge of crossing two million mark of COVID-19 cases, unfolding the large-scale movement of people from their work city to their home town and facing issues such as the unavailability of transport, food, and shelter. As part of fiscal measure, the Government has started providing the minimum wage of Rs. 500 to the citizens below the poverty line to meet their essential needs [18].
By considering the state of employment in developed countries, which has been facing/faced extreme rise in the COVID-19 cases, had to face the major push back in the employment sector. Figure 12.1 shows the rate of employment projected for 2019–2020 in comparison to 2018–2019.

Various countries facing the issue of unemployment due to COVID-19 are discussed as follows [18, 19]:

12.3.2.1 Italy

In Italy, the unemployment rate has dropped to 8.4% in March, touching the lowest of 9 years. Due to heavy lockdown and fear among the people for not going out, the job market has dropped sharply. Economists suggest that the situation could be worse and the unemployment rate could even drop to 10.5%. Eventually, it leads to become a contouring factor for unemployment in European Union.

12.3.2.2 European Countries

From years market recovery has been on a recovery mode since 2008 financial crisis, Has be curtailed by the economic disruption. The unemployment rate in the EU rose to 6.6% in April, subsequently biggest for several years, touching nearly 240,000. The Eurozone jobless rate rose to 7.3%. Approximately, 40 m of Europeans have enrolled for the furlough schemes, in which a part of their wages is paid by government (Fig. 12.2).
In the past 6 weeks, due to heavy layoffs by major small- and large-scale private industries, more than 30 m people have filed for unemployment benefits [20].

12.3.2.3 United States of America

The United States of America is one of the hardest hit countries due to the pandemic, with the COVID-19 cases touching nearly 25 million. Due to heavy restriction in the economic capital states such as New York and California, a large number of workforce have lost their job, with April and May being the toughest months. In the history of the country, unemployment rate crosses 14% and 13% mark in the month of April and May, respectively.

Being a major global player, countries that rely on them as their market have been severely affected. Figure 12.3 shows the unemployment report in the USA provided by the article [18, 19].

12.3.2.4 United Nations

The United Nations projected a worldwide loss of 25 million of job due to COVID-19 crisis. The International Labor Organization, which is a United Nations Institution, assesses the employment outlook of countries worldwide and puts forth urgent measures on a large scale based on three pillars.
Protecting worker in the workplace
Stimulating the economy and employment
Supporting jobs and income

Apart from these, fiscal and monetary measures have also been suggested for specific sectors. ILO reports provide different scenarios of how unemployment will be impacted due to coronavirus.

12.3.3 Social Issues

Living in the globalization era allows humans to connect with others in another part of the world, eventually helping to grow the various economic and noneconomic ecosystems. Alas, the COVID-19 effect has affected the chain of globalization on various levels, such as political, cultural, and social levels.

Issues such as social distancing with friends and family and closure of various entertainment outlets, parks, schools, colleges, and malls affected not only the social activity but also the academic aspect as well as put pressure on parents to guide their children in the period of crisis. The vulnerable section of the society even faces issues such as depression and anxiety [14, 21].
12.4 The New Technological Era

Financial repercussions have started to surface due to these turbulent times, and many economists forecast a profound downturn of unknown span. While some supply chains are spinning extremely firm to keep up, others such as “VW in automotive” are being forced to ramp down.

For supply chain planners, one downside to overcome to move forward is the dynamic called the “inventory bounce.” When demand reaches a new stable state which is lower than the earlier stable state, there must be a cut in manufacturing to tolerate the pipeline of stock to a lower new stable state level. At that point, manufacturing essentially increases a bit to match the new demand [10, 12].

In the previous major economic downturn 10 years ago, the inventory bounce fooled some upstream supply chains into assuming that demand was rebounding. The bullwhip effect started to have an effect and the bounce became more powerful and created enormous chaos and anguish among people.

12.4.1 Transportation

Apart from allowing the truck drivers and warehouse employees back to their job, logistics operators had to struggle in order to meet the working capital requirements and supply chain inefficiencies.

Fear of crowd infection has not only stopped the public gathering but also the public transport. Major cities such as Delhi and Mumbai have seen reduction in public transport usage of 20–30%. Despite the limited frequencies, due to no alternative there are instances of crowded vehicles which have been frequently observed. One of the major challenges with respect to transport, with relevance to the whole of the world, is the lack of enough research on building understanding about modality model by change [22].

There have been studies that put emphasis on the use of non-AC buses, which is being justified by the inference that viruses could be spread easily in indoor air conditioned areas.

A recent research conducted by the International Association of Public Transport (UITP) and the World Bank have found that over 67% of bus operators are in the task of providing essential services.

If considering the whole supply chain value system, there are many barriers which can have a greater influence on the supply chain network which consists of variables such as lack of labor, lack of availability of local transport, local law enforcement agencies, and slow movement [23].
12.4.2 Warehousing

According to Logistics Managers Index Report, both the transport and inventory level have taken a negative turn, and this pattern can go down as we move forward, since there have been disruption on the supply chain side. Hence, there is a need to evaluate and assess the situation of current warehouse and fulfillment center and make changes accordingly.

12.4.3 Inventory Management

The impact of COVID-19 has been felt throughout the supply chain, and there have been a lot of concerns for retailers on managing the inventory. Taking variables such as season and time decay, retailers and wholesalers need to build a short-term and a long-term strategy to meet the demand post-COVID.

Inventory management is not only limited to the supply that comes from China itself but also the disruption at the local level, and the supplier who buys their inputs from other’s parts of the country have also been heavily affected. During the lockdown, a lot of inventories have been closed, apart from mandates by a few state governments to keep the supply of essential goods and products unrestricted. These measures have allowed industries such as FMCG and Pharma to keep working without any disruption from the administrative side [24].

12.4.4 Officer Health and Safety

The local administration based upon the rural and urban municipality contributes heavily, providing major preventive measures despite the diversity prevailing in our country, where no single form of preventive model applicable in one region can fit over all divergent regions in India [22, 24].

Due to unpreparedness, initially COVID-19 has posed major challenges for different departments to make a robust policy with respect to implementing preventive measures. Hence, a coordinated effort by different public health institutions, such as ICMR and local state bodies, is essentially required.

12.5 Technologies to Address Various Issues

The COVID-19 epidemic that led to more than 661,000 deaths and infected more than 16.7 million people worldwide has forced us to rethink how governments, organizations, and societies around the world can work with minimum or without
any physical contact. Currently, the frontline warriors and heroes of the nation are typically the medical professionals, local police, private security guards, and few government officials exposing themselves to risk of infection caused due to COVID-19. In such cases technologies such as Artificial Intelligence, Big Data, GIS and Mapping, Location Technology, and autonomous machines currently play a major role as a weapon responding to the COVID-19 pandemic.

Few of such technologies are discussed in the following sections [25, 26].

12.5.1 Drones

In this battle against the imperceptible opponent, drones have been put to optimal use by authorities and people in numerous ways to prevent the spread of the coronavirus outbreak through maintaining and ensuring social distancing.

Below are few effective uses of drones to combat COVID-19.

12.5.1.1 Surveillance

A major policy adopted by authorities across the globe to prevent the spread of the virus is to implement and ensure that they are taking appropriate measures to avoid human contact. Most countries took measures such as:

- Closure of nonessential public places
- Ban on mass gatherings
- Ensuring social distancing to limit physical contact

However, there are various places where individuals are not mandated with the requirement to comply with the restrictions. Either knowingly or unknowingly or lack of awareness regarding what latest restrictions are, law enforcement authorities such as the local police or municipal authorities are currently using drones as shown in Fig. 12.4 in order to monitor human movement as well as unauthorized social gatherings, if any, that could cause threat to the society with infection spread. The introduction of drones at this time of major crisis has reduced the probability of risk caused due to infection to police officials and other staff, since it enables them to monitor the areas remotely [22, 26].

However, the use of drones for surveillance involves privacy and individual rights with respect to mainstream media as well as social media platforms.

12.5.1.2 Broadcast

- In addition to street surveillance, authorities are also using drones in order to broadcast various messages as well as important information regarding lockdown measures, especially in rural areas which lack open communication chan-
nels as shown in Fig. 12.5. Drones equipped with loudspeakers are currently serving as broadcast machines by making public announcements pertaining to various protocols to be followed during lockdown and post-lockdown such as keeping people indoors, taking necessary precautions, mandating social distancing, and enforcing the use of masks while stepping out [28]. China and many European countries are currently using drones for broadcasting messages to the public [22, 25].

### 12.5.2 AI-Based Technologies

The COVID-19 literature has at this time exposed an investigative evolution in much the same way as the disease’s diffusion. The NIH’s COVID-19 Portfolio, a website built as a repository of articles relating to coronavirus, can also track papers related to the SARS-CoV-2 coronavirus and the disease it causes, currently lists more than 28,000 articles, much beyond any researcher can read. The rapid growth of artificial intelligence (AI) tools may help researchers and clinicians in order to quickly work out through the literatures available by characteristically emphasizing the article most associated with their concentration area present within the literature [2, 26].
With the result of the amalgamation of influences, i.e., accessibility of a huge collection of significant articles, with explicitly the urgency of the epidemic itself, progressive research technology based on Natural-Language Processing (NLP) and Machine-Learning (ML) tools have used AI in order to find the studies that are most relevant to the user, including extra findings and analysis done over the result based on certain specific cases [29].

“Thinking beyond the current emergency situation caused due to the pandemic, these tools can help to bridge fields by making it easier to identify solutions from other disciplines” (quoted by Amalie Trewartha) [4, 19].

12.6 Various Other Uses of AI Technology During COVID-19

Currently, various tools are still under the improvement phase, where their effectiveness is mostly unverified. Hence they cannot be used to make medical or research pronouncements. Oren Etzioni, in Seattle, stated “Even using AI, a vaccine is not going to emerge full-blown.” But researchers and various AI developers hope that the new expertise would assist researchers to emphasize their efforts. Few of such tools discussed by the developers are as follows [30].
12.6.1 Call to Action

The White House Office of Science and Technology Policy invited the AI community in order to develop tools for mining the COVID-19 literature on 16 March. To get them started, the White House worked with numerous administrations to announce the COVID-19 Open Research Dataset (CORD-19), stipulating a pool of 13,000 full-text papers on SARS-CoV-2 and other coronaviruses as shown in Fig. 12.6. AI-2 formatted all such relevant files for easier parsing by algorithms and adds new papers regularly. The collection now has roughly 68,000 papers and 67,000 abstracts. Dozens of such tools have emerged thereafter [2, 14].

- To focus AI researchers’ efforts, the White House generated a set of questions to answer. Kaggle presents these questions there to dozens to its users and awards weekly a prize of US$1000 to the team that comes up with the best answers. Medical-student volunteers sort through the results and compile the best answers into a set of tables on a central page, which is currently acting as a continuously updated reference. Currently, it has a record of more than 1000 accounts having submitted the algorithms.

- José Morey, the chief medical-innovation officer currently working in Liberty Biosecurity, a research firm in Arlington, Virginia, used the resulting reference lists in order to draft, within a short span of a few days, a summarized risk factors for COVID-19 severity.

- “The CORD-19 data set is inadvertently proving to be a super-interesting pragmatic test” for AI-based literature analysis, as suggested by Anthony Goldbloom, chief executive of the website Kaggle, a Google subsidiary in San Francisco, California, which hosts machine-learning competitions.

- Goldbloom have further stated that competitors generally show the trait of using one of two AI methods. The first is an “old-school information retrieval method” that requires explicit rules that look for specific keywords in papers and analyze the text around them. The second uses deep neural networks, which is a type of machine-learning method, trained on large data sets in order to recognize text related to a question or topic.

12.6.2 Search Engines

A huge collection of tools exists in and outside the Kaggle competitions. For example, Google’s COVID-19 Research Explorer allows users to raise various related queries such as naming rapid molecular diagnostics for COVID-19. The tool thereafter puts forth a list of papers, with key passages highlighted.
Keith Hall, a computer scientist leading the project from New York City regarding the development of COVID-19 Research Explorer, was already working over a biomedical-research tool before the pandemic. When COVID-19 appeared, he went ahead to comment that the pandemic made it a little more obvious that he could work over providing a tool that may prove to be helpful for researchers to work with though it was not fully integrated with other Google products [30].

12.7 Conclusion

The chapter addressed the monetary impact of COVID-19 on various countries. It roughly discussed the issues like unemployment problem that is increasing in many developing countries and also its impact on other countries dependent on them for their economic upliftment. The chapter also highlighted various other issues faced by different sectors and the reason they need to change their mode of operation in order to meet their financial objectives. The chapter finally discussed the various AI-based technologies and how they can be used to regulate the day-to-day life while implementing the newly laid policies to fight the spread of COVID-19.
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