'ULŪM ISLĀMIYYAH THE MALAYSIAN JOURNAL OF ISLAMIC SCIENCES
VOL.33 S4 (2021) ISSN:1675-5936 | eISSN:2289-4799

# Covid-19 Decision Making Intelligence during Disasters Management

Anita Binti Ismail *[1], Rosmah Binti Mat Isa [2], Farah Laili Muda @ Ismail [3]. Ainulashikin Binti Marzuki [4], Nurzi Juana Binti Mohd Zaizi [5], Nur Fatin Nabila Binti Mohd Rafei Heng [6] & Sakinah Binti Ahmad [7]

[1,3,4] Faculty of Economics and Muamalat, Universiti Sains Islam Malaysia, Bandar Baru Nilai, 71800 Nilai, Negeri Sembilan, Malaysia

[2] Fakulti Ekonomi dan Pengurusan, Universiti Kebangsaan Malaysia, 43600 UKM Bangi, Selangor, Malaysia

[5,6] Faculty of Science and Technology, Universiti Sains Islam Malaysia, Bandar Baru Nilai, 71800 Nilai, Negeri Sembilan, Malaysia

[5,6] Faculty of major Language Studis, Universiti Sains Islam Malaysia, Bandar Baru Nilai, 71800 Nilai, Negeri Sembilan, Malaysia

## Abstract

As the coronavirus (COVID-19) spreads from China to neighbouring areas and beyond, increased national and international efforts are underway to contain the epidemic. Humanity is increasingly confronted with a diverse array of man-made and natural disasters. While emergency circumstances cannot be avoided, they may be managed more efficiently. Effective emergency management requires thorough planning, informed reaction, and well-coordinated actions throughout the emergency management life cycle. According to the literature, data-driven emergency management information systems that are well-integrated help in disaster management operations. Recent advances in molecular and computational techniques, as well as in information and communication technologies (ICTs), artificial intelligence (AI), and Big Data, can assist in managing the massive, unprecedented amount of data generated by public health surveillance, real-time

Manuscript Received Date: 08/10/21 Manuscript Acceptance Date: 5/12/21 Manuscript Published Date: 25/12/21



DOI: 10.33102/uij.vol33noS4.433



Universiti Sains Islam Malaysia
uijournal.usim.edu.my

epidemic outbreak monitoring, trend nowcasting/forecasting, routine situation briefing and updating from governmental institutions and organisms, and health facility utilisation. This study could be tailored to assist organisations in adapting to their new normal.

**Keywords:** *COVID-19, Database, Intelligence, Decision Making, Disaster Management*

## 1.0 Introduction

The new Coronavirus epidemic (formerly known as 2019-nCoV and renamed COVID-19) has forced the closure of entire cities in China and the imposition of stringent controls in others. The same is true in Hong Kong, Beijing, and Hubei Province, among other adjacent regions, where preventative measures are being emphasised to contain the disease's spread and gather accurate and complete information about the virus. While nations worldwide, including those not directly affected by the virus, are on high alert. Schools, highways, and businesses have been closed in Wuhan, where the virus first surfaced. The World Health Organization (WHO) declared the Coronavirus pandemic a "Global Public Health Emergency" on January 30, 2019, citing the virus's rapid spread and the current state of ambiguity. On the other hand, the WHO chose not to declare the epidemic a Public Health Emergency of International Concern (PHEIC), a more serious designation. A PHEIC is defined as "an extraordinary event that is determined to pose a public health risk to other States through the international spread of disease and may necessitate a coordinated international response" and must meet the following criteria: it must be serious, sudden, unusual, or unexpected; it must have public health implications beyond the affected State's national border; and it must necessitate immediate international action. Other scientists have been observed gaining access to data and acting much more quickly as a result; for example, scientists at the Doherty Institute's Virus Identification Laboratory were able to grow a similar virus in the laboratory after gaining access to the Chinese scientists' data. With the world having previously experienced numerous notable influenza pandemics, the Global Initiative on Sharing All Influenza Data (GISAID) platform was established, and it was instrumental in Chinese scientists quickly sharing information about the emergence of the COVID-19 virus.

The initial 72,314 COVID-19 cases discovered in China between December 31, 2019, and February 11, 2020 indicate that this new coronavirus is extremely contagious. It spread quickly, taking less than 30 days from one city to the rest of the country. Furthermore, such far-reaching effects have been achieved despite extreme response measures, such as city-wide closures and isolation, cancellation of Chinese New Year celebrations, prohibition of attendance at school and work, massive mobilisation of health and public health personnel, as well as military medical units, and rapid construction of entire hospitals. With the advancement and maturation of several digital technologies capable of treating significant clinical issues and diseases, the year 2020 is expected to usher in an exciting decade of medicine and research. The Internet of Things (IoT) and next-generation telecommunications networks are among these digital technologies, as are big data analytics, business intelligence, artificial intelligence (AI) with deep learning, and blockchain technology. They are inextricably linked: adoption of IoT (e.g., devices and tools) in hospitals and clinics enables the establishment of a highly connected digital ecosystem, allowing for the collection of massive amounts of real-time data that can be used by AI and deep learning systems to understand health trends, model risk associations, and predict outcomes. Blockchain technology, which combines a back-linked database with cryptographic protocols, and a network of distributed computers across multiple organisations, integrating peer-to-peer networks to ensure data is replicated in multiple physical locations and using modified algorithms to ensure data is secure but traceable, contributes to this goal (Ting, Carin, Dzau, & Wong, 2020).

A disaster is defined as "a societal calamity, an unforeseeable and catastrophic occurrence that results in human misery." Miller (2004) defines a disaster as one that strikes rapidly, needs rapid action, generates uncertainty and stress, jeopardises an organization's reputation, and develops in severity. Disaster management includes mitigation, risk reduction, prevention, readiness, response, and recovery. Disaster management is critical because disasters jeopardise corporate objectives and permanently impair earning capability. Two significant challenges in disaster management are the absence of an integrated emergency assistance system and the requirement for a shared platform to facilitate the seamless flow of information (Dorasamy, Raman, & Kaliannan, 2013). This paper proposes that networks work to improve protocol standardisation to facilitate data exchange in the event of outbreaks or disasters, resulting in a more global understanding and management of the same.

## 2.0 Crisis Management Information Systems

In recent years, virus outbreaks have demonstrated that data, including health data, can be collected from a variety of sources in the urban environment. Data is now being collected from airports through screening and monitoring, using smart sensors implanted in airport infrastructures and from people working in such air/seaports, in the context of the Coronavirus (COVID-19) outbreak. According to reports, screening is taking place at 20 different airports across the United States to ensure that any potentially affected individuals are apprehended and quarantined at the point of entry. Data is also collected at bus terminals, markets (in Wuhan), subways, and health institutes where patients are transported for additional medical care, according to Buckley and May. (2020). This is especially true in China and other Asian countries where the virus has been identified and confirmed.

With the digital era and its plethora of Internet of Things (IoT) devices, the amount of data collected by these devices has increased dramatically in a variety of sectors, including transportation, environment, entertainment, sport, and health, to name a few (Allam, Tegally, & Thondoo, 2019). To put this in perspective, by the end of 2020, the health industry is expected to generate around 2314 exabytes (1 exabyte = 1 billion gigabytes) of data. This growth, according to Stanford Medicine, is due to the expansion of data sources outside of hospital records, particularly in the medical sector (Standford Medicine, 2017). Rather, an increasing number of Internet of Things (IoT) smart devices is driving the expansion, with the global healthcare market expected to grow to $543.3 billion by 2025.

The Office of Emergency Response (OEP) was tasked in 1971 with keeping track of a new type of crisis known as the "Wage Price Freeze" (Turoff et al., 2004). The OEP's expanded responsibilities in relation to wage and price changes in the economy included "monitoring countrywide conformance, analysing and determining applications for exemptions, and punishing offenders," among other things. As a result, a customised system called the Emergency Management Information System and Reference Index was created (EMISARI). EMISARI was created to help those in charge of monitoring the Wage Price Freeze situation communicate more effectively. The system was created with the goal of uniting people and data on a single platform that non-technical administrators could update on a regular basis. The EMISARI system was flexible, allowing hundreds of people to work together in the event of a disaster. Turoff (2004) gave a comprehensive overview of all design concepts and guidelines for creating an EMIS. "Many of the elements that are now required under the umbrella of knowledge systems were incorporated into EMISARI." 9 design premises, 5 DERMIS conceptual design components, 8 fundamental design concepts and requirements, and 3 supporting design considerations and classifications are the main features of this work. DERMIS is a fantastic EMIS example.

Emergency information systems (EIS) is another name for crisis management information systems that has been used in the literature (Jennex, 2004). "Any system used by organisations to assist in the response to a crisis or catastrophe scenario," according to the definition of an EIS. It should also be designed to aid decision-making by facilitating communication during a crisis response, allowing for data collection and analysis. During the large earthquake that devastated Kobe, Japan, a few years ago, the use of EIS was cited as a critical observation. Other types of Emergency Management Information Systems include: (Dorasamy, Raman, Kliannan, 2013):

- Sarvodaya.org's Sahana Disaster Management Systems for Tsunami (2004) during the Tsunami (2004).
- Information Management System for Hurricane Disasters (IMASH) is a disaster management system for hurricanes.
- Digital Typhoon, a Knowledge Management Systems (KMS) that provides typhoon information.
- People Finder and Shelter Finder are two websites that can help you find people and places to stay
- United Nations Development Program, Strong Angel III (2006).
- Resource and Result Tracking Systems for Tsunamis.

- During the Severe Acute Respiratory Syndrome (SARS) outbreak in Singapore, case management systems were implemented.
- National Incident Management Systems (NIMS) in the United States.
- The UNDP's DesInventar System is a historical catastrophe database and post-disaster damage data gathering tool that is now in use in Latin America, Orissa, and South Africa.
- In Japan (2011), Christchurch (2011), and Haiti (2011), Google's Person Finder Tool (introduced in 2010) assisted in registering and identifying earthquake survivors (2010).

## 3.0 Digital and Intelligent Transformation

AI and Big Data appear to have a lot of promise for dealing with COVID-19 and other emergencies, and their importance is only going to grow in the future. AI and Big Data can be used to track the virus's spread in real time, plan and scale up public health interventions as needed, track their efficacy, repurpose existing compounds and discover new ones, find potential vaccine candidates, and improve communities' and territories' responses to the ongoing pandemic. These new techniques can be combined with traditional surveillance: the latter allows for data analysis and interpretation, while the former identifies hidden trends and patterns that can be used to build predictive models. On both the supply and demand sides of the business, the COVID-19 outbreak has increased demand for intelligent services. Changes in customer demand are the primary drivers of digital transformation. Customers have developed a new taste for contactless services supported by a digital platform and advanced technology in the current context, and these services are expected to last beyond the pandemic. Some large-scale chain businesses have accelerated their digital transformation to maintain their competitive edge in the post-pandemic era (China Hospitality Association, 2020).

The digital, intelligent, and contactless service will increase customers' trust in the service environment by reducing human interaction and the risk of cross infection. Furthermore, the implementation of digital and intelligent technologies may aid in improving operational efficiency and drastically reducing costs. The pandemic has also accelerated the use of video conferencing, cloud computing, collaboration, and ad hoc teleworking. Businesses will become more adaptable and effective at recruiting Generation Y and Z consumers and workers if they continue to build digital and smart solutions beyond COVID-19 (Valle, 2020). Given the sector's labor-intensive nature and reliance on standardised manual inputs and operations, digital and cognitive technologies, particularly process automation, will automate and replace a significant portion of repetitive administrative work. On the business side, digital and intelligent technologies ensure that operations are not disrupted, and that the client's service needs are met. Businesses must develop a digitalized operation system that integrates management and service scenarios throughout the organization's lifecycle, as well as an integrated management marketing service digitalization strategy that closes the marketing-operations management loop.

The internet of things (IoT) and next-generation telecommunications networks (e.g., 5G); big data analytics; artificial intelligence (AI) with deep learning; and blockchain technology are examples of digital technologies (Ting, Carin, Dzau, & Wong, 2020). They are inextricably linked: the widespread use of IoT (e.g., devices and instruments) in hospitals and clinics allows for the development of a highly connected digital ecosystem, which allows for large-scale real-time data collection that AI and deep learning systems can use to understand healthcare trends, model risk associations, and predict outcomes. To begin, the Internet of Things allows public health experts to gather data in order to track the COVID-19 epidemic. Second, big data allows for viral activity modelling and recommendations from healthcare officials in particular nations on how to best prepare for an outbreak. Finally, digital technology has the potential to improve public health education and communication dramatically. In Singapore, the government has worked with WhatsApp (a Facebook company) to provide real information on COVID-19 and government programmes to the general public. Healthcare organisations are already using social media platforms such as Facebook and Twitter to disseminate'real-time' information and respond to public concerns. Moreover, a number of facial recognition businesses (including SenseTime and Sunell) have used thermal imaging-enabled face recognition to identify people with high temperatures at various screening points around China. Fourth, AI and deep learning can help in COVID-19 identification and diagnosis. The development of accurate and low-cost COVID-19 diagnostic assays is challenging.

## 4.0 The Disaster Management

The literature on disaster management is illuminated by theories from a variety of domains. The majority of disaster management literature is based on all-hazards theories developed by engineers (Lettieri et al., 2009). The majority of disaster management research, on the other hand, is motivated by tourism and hospitality management concepts. For example, Jia et al. (2012) applied crisis management theory, emphasising the importance of effective information transmission and communication among various stakeholders. Nguyen et al. (2017) investigated the attitudes, outcomes, and impediments to cooperation among hotel stakeholders using the collaborative planning theory. In the context of hospitality and tourism, sociopsychological theories have also been applied to disaster management literature. For example, Wang and Wu (2018) developed an iceberg model based on planned behaviour theory that emphasises the impact of underlying beliefs and psychological factors on crisis planning and action, with a focus on cultural diversity. Theoretical models of inter-disciplinary systems were also used. Brown et al. (2017), for example, developed an integrated disaster management paradigm for economic, social, human, physical, natural, and cultural capital using complex adaptive systems theory. For example, chaos theory was used by Faulkner (2001) and Ritchie (2008) to develop a more nuanced and comprehensive understanding of disaster management in the tourism industry. The complexity of the tragedy, the turbulence experienced by tourists, and the dynamics of change are all investigated using chaos theory in this study.

The literature on management systems, on the other hand, reveals that the designers of a specific system intended to assist in disaster management may not always use the language and theories associated with Knowledge Management Systems (KMS). In reality, such systems' inherent characteristics support the goals of a KMS for emergency/disaster management. Researchers appear to be critical in the field of disaster/emergency management information systems (Turoff, 2002; Turoff, Plotnick, White, & Hiltz, 2008). Complex and dynamic ecosystems are used to combat natural and man-made disasters such as earthquakes and terrorist threats (Kotsman, 2004). An organization's challenge is to develop a knowledge management system that is easily adaptable to change in the face of uncertainty. Tiwana (2000) proposes six criteria that a KMS should have to help organisations navigate complicated and changing environments. These include knowledge management systems that can perform the following functions:

- Provide a shared knowledge space with the use of consistent and well-defined vocabulary.
- Model and explicitly represent knowledge.
- Permit collaborative efforts between employees.
- Allow reusable knowledge.
- Empower employees based on a knowledge sharing culture.

## 5.0 Conclusion

COVID-19 has a substantial impact on industry since it creates a COVID-19 management framework with anti-pandemic phases, principles, and catastrophe management procedures. It also offers new perspectives on key industry changes in the post-pandemic era, such as the expansion of numerous companies and channels, product design and investment choices, digital and intelligent transformation, and market disruption. The research, which is based on crisis management literature as well as industry experience and trends, aims to help practitioners dealing with the epidemic live well now while also planning. This research can inspire individuals across the world to better comprehend crisis circumstances, create effective anti-pandemic strategies, and strive toward industrial regeneration and activation. The COVID-19 management paradigm may be used for a wider spectrum of catastrophes, broadening the study's applicability. In this respect, the paper contains scenarios and suggestions for the worldwide post-COVID-19 sector, which will shed light on industrial transformation and disaster management decision-making capacities utilising data intelligence.

---

**Acknowledgement**

This article is a part of Research undertaken by the researchers under the USIM Research Grant (PPPI/COVID19_0120/FEM/051000/13220). The Authors would like to thank the University for the Grant received.

## References

Allam, Z.; Tegally, H.; Thondoo, M. (2019). Redefining the use of big data in urban health for increased liveability in smart cities. Smart Cities, 2, 259–268.

Brown N., Rovins J., Feldmann-Jensen S., Orchiston C. (2017). Exploring disaster resilience within the hotel sector: A systematic review of literature. International Journal of Disaster Risk Reduction. 22:362–370.

Buckley, C.; May, T. E_(2020) ects of Coronavirus Begin Echoing Far from Wuhan Epicenter. Available online: https://www.nytimes.com/2020/01/25/world/asia/china-wuhan-coronavirus.html

China Hospitality Association. (2020). The Impact of COVID-19 on China's lodging Industry.http://www.xinhuanet.com/food/2020-03/02/c_1125652997.htm

Faulkner B. (2001) Towards a framework for tourism disaster management. Tourism Management. 22(2):135–147.

Grand View Research. (2020). Iot in Healthcare Market Worth $534.3 Billion by 2025 | Carg 19.9%. Available online: https://www.grandviewresearch.com/press-release/global-iot-in-healthcare-market

Jia Z., Shi Y., Jia Y., Li D. (2012). A framework of knowledge management systems for tourism crisis management. Procedia Engineering. 29:138–143.

Kostman, J.T., (2004). 20 rules for effective communication in a crisis, Disaster Recov. J. 17 (2) 20.

Lettieri E., Masella C., Radaelli G. (2009). Disaster management: Findings from a systematic review. Disaster Prevention and Management. 117–136.

Nguyen D., Imamura F., Iuchi K. (2017). Public-private collaboration for disaster risk management: A case study of hotels in Matsushima, Japan. Tourism Management. 61:129–140.

Ritchie B. (2008). Tourism disaster planning and management: From response and recovery to reduction and readiness. Current Issues in Tourism. 11(4):315–348.

Stanford Medicine. (2017). Harnessing the Power of Data in Health; Stanford Medicine: Stanford, CA, USA.

Ting, D. S. W., Carin, L., Dzau, V., & Wong, T. Y. (2020). Digital technology and COVID-19. *Nature medicine*, *26*(4), 459-461.

Tiwana (2002). The Knowledge Management Toolkit, Prentice Hall, United States, 2000. U. Frank, A Multi-layer Architecture for Knowledge Management Systems, Thomson Learning, London, UK.

Turoff. (2002). Past and future emergency response information systems, Commun. ACM 45 (4) (2002) 29–32.

Turoff, L. Plotnick, C. White, S.R. Hiltz (2008) Dynamic emergency response management for large scale decision making in extreme events, Pro- ceedings of the 5th International

Valle A.S.D. Global Journey Consulting. (2020). The tourism industry and the impact of COVID-19 scenarios and proposals.Https://Worldshoppingtourism.Com/Downloads/GJC_THE_TOURISM_INDUSTRY_AND_THE_IMPACT_OF_COVID_19.Pdf .

Wang J., Wu X. (2018). Top-down or outside-in? Culturally diverse approaches to hotel crisis planning. Journal of Hospitality and Tourism Management. 36:76–84.