COVID-19 DATA INTELLIGENCE DECISION MAKING FOR DISASTERS MANAGEMENT

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Abstract

As the Coronavirus (COVID-19) expands its impact from China, expanding its catchment into surrounding regions and other countries, increased national and international measures are being taken to contain the outbreak. Humans are increasingly confronted with numerous forms of man-made and natural emergency situations. Emergency situations cannot be prevented, but they can be better managed. Successful management of emergency situations requires proper planning, guided response and well-coordinated efforts throughout the life cycle of emergency management. Literature suggests that emergency management efforts benefit from a well-integrated data-based emergency management information system. the latest advancements in the field of molecular and computational techniques and information and communication technologies (ICTs), artificial intelligence (AI) and Big Data can help in handling the huge, unprecedented amount of data derived from public health surveillance, real-time epidemic outbreaks monitoring, trend now-casting/forecasting, regular situation briefing and updating from governmental institutions and organisms, and health facility utilization information. This perspective paper, proposing networks should work towards enhancing standardization protocols for increased data sharing in the event of outbreaks or disasters, leading to better global understanding and management of the same. This study can be adapted to help organiztions facing with the new normal in their organization.

Keyword: COVID-19, Database, Intelligence, Decision Making, Disaster Management

INTRODUCTION

The novel Coronavirus outbreak, (previously known as the 2019-nCoV and later renamed COVID-19 during the writing of this manuscript) is leading to the closure of entire cities in China, and causing stringent measures to be taken in othersThe same is true in Hong Kong, Beijing and Hubei Province amongst surrounding areas, as precautionary measures are being emphasized to ensure that the spread of the virus is minimized, and complete and accurate information on the virus is being obtained (Buckley & 2020). While in distant di_erent continents, far from China where the virus was first reported, places are being placed on high alert. InWuhan, where the virus broke, schools, roads and markets have been shut down (Allam, 2020). However, the rate of spread of the virus and the uncertainties surrounding the entire situation has led theWorld Health Organization (WHO) on 30 January 2019 to declare the Coronavirus outbreak a 'Global Public Health Emergency'. WHO determined, however, not to declare the outbreak a 'Public Health Emergency of International Concern' (PHEIC) which is a higher level of declaration. A PHEIC is defined as "an extraordinary event which is determined to constitute a public health risk to other States through the international spread of disease and to potentially require a coordinated international response" whose scope may include: serious, sudden, unusual or unexpected; carries implications for public health beyond the a_ected State's national border; and may require immediate international action (WHO, 2020). Scientists from other regions were observed to gain access to information and are, subsequently, able to act in a much faster capacity; like in the case of scientists from the Virus Identification Laboratory based at Doherty Institute, Australia, who managed to grow a similar virus in the laboratory after accessing the data shared by the Chinese scientists (Nature, 2020). With the world having experienced some notable influenza pandemics in the past, a Global Initiative on Sharing All Influenza Data (GISAID) platform was established and was instrumental in the rapid sharing of information by the Chinese scientists regarding the emergence of the COVID-19 virus (Wang et. al., 2020).

The analysis of the first 72,314 cases of COVID-19 found in China in the 40 days between the first recognition of the outbreak of pneumonia with unknown etiology on 31 December 2019 and the end of the study period on 11 February 2020 shows that this novel coronavirus is highly contagious. It spread extremely quickly from one city to the rest of the country in only about 30 days. Moreover, even in the face of extreme response measures, such far-reaching effects have been achieved, including the complete shutdown and isolation of entire cities, the cancelation of Chinese New Year celebrations, the prohibition of attendance at school and work, the massive mobilization of health and public health personnel as well as military medical units, and the rapid construction of entire hospitals. The year 2020 expecting to mark the start of an exciting decade in medicine and science, with the development and maturation of a number of digital technologies that can be used to address major clinical problems and diseases. These digital technologies include Internet of Things (IoT) with next generation telecommunications networks; big data analytics; business intelligence; artificial intelligence (AI) that uses deep learning; and blockchain technology. They are highly interlinked: the spread of IoT (e.g. devices and tools) in hospitals and clinics facilitates the development of a highly interlinked digital ecosystem, enabling real-time data collection on a scale that could then be used by AI and deep learning systems to understand health trends, model risk associations and predict outcomes. This is enhanced by blockchain technology, a back-linked database with cryptographic protocols and a network of distributed computers across different organizations, integrating peer-to-peer networks to ensure that data is copied to multiple physical locations, with modified algorithms to ensure data is secure but traceable (Ting, Carin, Dzau, & Wong, 2020).

Disaster is defined as 'a social crisis situation, a deadly event, which is usually unexpected and unanticipated and causes human suffering. Miller (2004) lists the attributes of a disaster that occur suddenly, demands rapid reactions, creates uncertainty and stress, threatens the reputation of the organization and increases in intensity. Disaster management includes activities such as mitigation, risk reduction, prevention, preparedness, response and recovery. Disaster management is vital as it threatens organizational objectives and permanently impairs earning power. Prominent issues in disaster management are the need for a common platform to allow for a seamless flow of information and a lack of an integrated emergency support system (Dorasamy, Raman, & Kaliannan, 2013).

CRISIS MANAGEMENT INFORMATION SYSTEMS

Virus outbreaks in recent years have shown that, in the urban realm, data, including health data, can be sourced from diverse places. Presently, in the case of Coronavirus (COVID-19) outbreak, data is being collected from airports through screening and monitoring, through the use of smart sensors installed in airport infrastructures and from personnel working in those air/seaports. For instance, it has been reported that in the U.S.A., screening is being carried out at 20 di_erent airports to ensure that possible a_ected people are intercepted for quarantine at the point of entry. Beside airports, as reported by Buckley and May (2020), data is also being collected at bus terminals, market places (in Wuhan), subways, and also in health facilities where patients are taken for further medical attention. Such is prevalent especially in China, and other Asian regions where cases of the virus have been recorded and confirmed.

With the advent of the digital age and the plethora of Internet of Things (IoT) devices it brings, there has been a substantial rise in the amount of data gathered by these devices in di_erent sectors like transport, environment, entertainment, sport and health sectors, amongst others (Allam,Tegally, & Thondoo, 2019). To put this into perspective, it is believed that by the end of 2020, over 2314 exabytes (1 exabyte = 1 billion gigabytes) of data will be generated globally from the health sector. Stanford Medicine acknowledges that this increase, especially in the medical field, is witnessing a proportional increase due to the increase in sources of data that are not limited to hospital records (Standford Medicine, 2017). Rather, the increase is being underpinned by drawing upon a myriad and increasing number of IoT smart devices, that are projected to exponentially increase the global healthcare market to a value of more than USD $543.3 billion by 2025 [13]. However, while the potential for the data market is understood, such issues like privacy of information, data protection and sharing, and obligatory requirements of healthcare management and monitoring, among

In 1971, the OEP was assigned the task of monitoring a new form of crisis called the"Wage Price Freeze" (Turoff et al., 2004). This new role for the OEP included among others, to "monitor nationwide compliance, examine and determine requests for exemptions and prosecute violations" in relation to wage and price changes in the economy. This led to the advent of a flexible system called the Emergency Management Information System and Reference Index (EMISARI). EMISARI was a system designed to facilitate effective communication between people involved in monitoring the Wage Price Freeze situation. The system was designed to integrate people and data into a common platform that could be updated regularly by people who were non-technical administrators. The EMISARI system was flexible and enabled several hundreds of people to collaborate in responding to a crisis. (Turoff, 2004) presented complete design principles and guidelines for developing an EMIS. "EMISARI incorporated many of the features called for today under the current rubric of knowledge systems". The crux of this paper is 9 design premises, 5 components of DERMIS conceptual design, 8 general design principles and specification and 3 supporting design con- siderations and classifications. DERMIS is a perfect example to describe an EMIS.

Other literature classifies crisis management information systems as Emergency Information Systems (EIS) (Jennex, 2004). EIS is defined as any system that is used "by organisations to assist in responding to a crisis or disaster situation" further adds that an EIS should be designed to: support communication during crisis response; enable data and gathering analysis; and support decision-making. The documented vital observation with the use of EIS during the massive earthquake that hit Kobe, Japan, several years ago. Subsequently, other forms of Emergency Management Information Systems (Dorasamy, Raman, Kliannan, 2013) include the following:

- Sahana Disaster Management Systems for Tsunami (2004), by Sarvodaya.org during Tsunami (2004).
- Information Management System - IMASH for Hurricane Disasters.
- Digital Typhoon, a KMS to provide information for typhoons.
- PeopleFinder and ShelterFinder

- Strong Angel III (2006), United Nations Development Program.
- Tsunami Resource and Result Tracking Systems.
- Case Management Systems in Singapore used during SARS (Severe Acute Respiratory Syndrome).
- NIMS (National Incident Management Systems) in USA.
- DesInventar System, a historical disaster database and post- disaster damage data collection tool, a project by UNDP and countries such as Latin America, Orissa and South Africa are currently using this system.
- Google's Person Finder Tool (launched in 2010) that helped in registering and locating earthquake survivors in Japan (2011), Christchurch (2011) and Haiti (2010).

DIGITAL AND INTELLIGENT TRANSFORMATION

Artificial Intelligence (AI) and Big Data appear to have enormous potential for the management of COVID-19 and other emergencies, and their role is anticipated to increase in the future. AI and Big Data can be used to track the spread of the virus in real time, and plan and lift public health interventions accordingly, monitor their e_ectiveness, repurpose old compounds and discover new drugs, as well as identify potential vaccine candidates and enhance the response of communities and territories to the ongoing pandemic. These emerging approaches can be exploited together with classical surveillance: whilst the latter enables data analysis and interpretation, the former uncovers hidden trends and patterns, which can be used to build predictive models. COVID-19 pandemic has enhanced the need for intelligent services in both the supply and demand sides of the industry. Changes in consumer demand are the fundamental drivers of digital transformation. In the current scenario, customers have developed a renewed preference for contactless service supported by the digital platform and intelligent technology; these services are expected to continue after the pandemic. Several large-scale chain brands have hastened the digital transformation to sustain competitiveness in the post-pandemic world (China Hospitality Association, 2020).

The digital, intelligent, and contactless service will reduce interpersonal contact and the risk of crossinfection, and thus boost customer’s confidence in the service environment. The implementation of digital and intelligent technologies can also improve a operational efficiency and achieve significant cost reductions. The pandemic has also accelerated the ad hoc implementation of video conferencing, cloud collaboration, and teleworking. In the post-COVID-19 era, will be more agile and effective in attracting Generation-Y and Z customers and employees if they continue to implement digital and smart solutions (Valle, 2020). Given that the industry is a labor-intensive industry relying on standardized manual inputs and operations, the implementation of digital and intelligent technologies, specifically process automation, will automate a considerable proportion of repetitive administrative work and replace human labor. The digital and intelligent tools ensure uninterrupted operations on the business side and service provision on the customer side. Firms require an integrated managementmarketing- service digitalization plan and extend the loop from marketing to operation management and develop a digitalized operation system that connects the management scenarios with service scenarios throughout the lifecycle of an organization.

THE DISASTER MANAGEMENT

Theories from different disciplines shed light on the disaster management literature. The general disaster management literature is predominantly based on the engineer-oriented all-hazards theories (Lettieri et al., 2009). However, from the tourism and hospitality perspective, most disaster management studies are guided by management-oriented theories. For example, Jia et al. (2012) adopted the crisis management theory emphasizing on the proficient dissemination of information and communication between various stakeholders. Nguyen et al. (2017) used the collaborative planning theory to investigate hotel-stakeholders' attitude, consequences, and obstacles of collaboration. Sociopsychological theories were also applied in the disaster management literature in the context of hospitality and tourism. For instance, Wang and Wu (2018), by applying the theory of planned behavior, developed an iceberg model that presents the influences of underlying beliefs and psychological factors on crisis planning and implements actions with an emphasis on cultural diversity. Furthermore, inter-disciplinary system theories were also implemented. For example, Brown et al. (2017) developed an integrated disaster management framework of economic, social, human, physical, natural, and cultural capital using the complex adaptive systems theory. Similarly, Faulkner (2001) and Ritchie (2008) used the chaos theory to obtain a more complex and comprehensive understanding of disaster management in tourism encounter. This study adopts the chaos theory to address the complex nature of the disaster, turbulence in tourism encounter, and the dynamics of changes.

However, literature on management systems suggests that the designers of a particular system aimed at supporting disaster management, may not necessarily use the terms and theories in the context of Knowledge Management Systems (KMS). The inherent features of such systems do in real fact support the goals of a KMS for managing emergencies/disasters. In the realm of disaster/ emergency management information system, (Turoff, 2002; Turoff, Plotnick, White, & Hiltz, 2008) researches seem to be instrumental to all other research. Dealing with disaster situations such as earthquakes, terror threats and other forms of natural or man-made disasters are examples of complex and dynamic environments (Kotsman, 2004). The challenge for an organization is to develop a KMS that can easily adapt to change in dealing with uncertainties. Tiwana (2000) suggests several attributes that KMS should have in helping organizations deal with complex and dynamic environments. These include knowledge management systems that:

- Provide a shared knowledge space with 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.

CONCLUSION

The impacts of COVID-19 on industry, the importance of this study are that it develops a COVID-19 management framework comprising antipandemic phases, principles, strategies for disaster managemet. It also offers original insights into major trends of industry during the post-pandemic era, including the emergence of multi-business and multi-channels, product design and investment preference, digital and intelligent transformation, and market reshuffle. Based on the disaster management literature and the experience and trends of industry, the study aims to enable practitioners reeling under the pandemic to live better for today and plan well for tomorrow. This study can inspire globally to understand the disaster evolution scenarios, adopt effective anti-pandemic strategies, and strive for industry activation and revitalization. The COVID-19 management framework can be adopted for managing disasters in a broader context, which enhances the generalizability of this study. In this regard, the study provides scenarios and suggestions in the post-COVID-19 industry globally, which will shed light on industry transformation and upgradation of data intelligence decision making for disaster management.

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