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The Deployment of Smart City in Addressing Covid-19 InMalaysia

Mohd Rozaimy Ridzuan[1]*, Noor Amira Syazwani Abd Rahman[2], SoonYew, Ju[3], NurHidayahtul Nabihah Manas[4] & Lai Kuan, Kong[5]

[1,2,3]Faculty of Administrative Science and Policy Studies, Universiti Teknologi MARA(UiTM) Cawangan Pahang, Kampus Raub, Pahang, Malaysia

[4]Tunku Abdul Rahman University College, Pahang Branch, Malaysia

[5]Faculty of Business and Management, Universiti Teknologi MARA (UiTM) CawanganPahang, Kampus Raub, 27600, Raub, Pahang, Malaysia

*Corresponding Author

E-mail Address: rozaimy@uitm.edu.my

Abstract

There have been severe effects on millions of people's lives and socio-economics since COVID-19 spread to numerous cities worldwide in late 2019. So far in the pandemic's history,many communities have depended on innovative solutions to control the virus's spread and improve their reaction capabilities in the pandemic's history. The World Health Organization (WHO) and the Centers for Disease Control and Prevention (CDC) have also recognized the importance of such solutions. Unanswered questions remain on whether the smart city initiatives contribute significantly to prevent the spread of COVID-19. Hence, this paper examines how smart city solutions have helped Malaysia combat the pandemic. This paper wasbased on a content analysis highlighting actual applications of smart technologies in Malaysiato address the COVID-19 pandemic. It is hoped that this study will aid in understanding the function of smart cities in reacting to public health emergencies and contribute to the advancement of this research field.

Keywords: *Artificial intelligence (AI), COVID-19, Internet of things (IoT), Smart city*

1. Introduction

Globally, urbanization has accelerated in recent years as a result of population growth and increased demand. It is also worth noting that the fourth industrial revolution has boosted development in every industry, including urbanization. In preparation for this new revolution, the notion of a smart city has been developed (Nasir, Azri, Ujang, & Majid, 2020). According to Lekamge and Marasinghe (2013), a city is called smart if it has a contemporary transportation and communication infrastructure, practises sustainable economic growth, and is capable of prudent resource management. Alawadhi and Scholl (2013) defined smart city as if it can address crime, urban sprawl, traffic congestion, pollution, red tape, and waste management issues.

However, in late 2019, the COVID-19 outbreak spread across numerous cities worldwide, wreaking havoc on millions of people's lives and socioeconomic well-being. Sharifi, Khavarian-Garmsir and Kummitha, (2021) argue that the pandemic occurred at a watershed moment in history, as smart solutions and technologies were pervasive in many cities. Adopting smart solutions and technologies can assist the government in anticipating pandemic patterns, facilitating an integrated and timely response, minimizing or postponing virus transmission, helping overburdened sectors, minimizing supply chain disruption, ensuring the continuity of essential services, and offering solutions for optimizing city operations (Sharifi et al., 2021).

This pandemic offers an unparalleled chance to test smart city solutions enabled by technologies such as ICTs, the Internet of Things (IoT), and artificial intelligence (AI), in addition to cloud computing (Bhattacharya et al., 2021). With the help of MIMOS, the Malaysian government has devised a roadmap for the development of smart cities since 2014. Although Malaysia has a few smart city projects, they are still in their infancy (Cheng & Cheah, 2020).

Yang and Chong (2021) noted that it is debatable whether smart city projects play a substantial part in the COVID-19 prevention and control process. Hence, this paper will investigate how smart city strategies and technologies have helped Malaysia combat the pandemic. Seven sections in this paper cover the following topics: Introduction, The concept of smart city, Smart city and Covid-19 containment measures, Research Methodology, Smart city in Malaysia, Smart city's role in reducing the impact of Covid-19 in Malaysia and Conclusion.

2. The Concept of Smart City

Due to recent breakthroughs in ICT, such as Web 2.0, Cloud Computing and Sensor Networking, large amounts of information can now be acquired, organized, and processed more efficiently. A city's systems can be monitored, controlled, and improved using this technology to enhance the efficiency of municipal services. A city's stakeholders can also benefit by becoming more aware and involved (Angelidou, 2017).

It is essential to coordinate policy execution, management and new technologies to avoid and control pandemics (Yang & Chong, 2021). Regarding COVID-19 pandemic prevention and control, relevant technologies and projects have been applied to the pandemic prevention and control activities, represented as smart cities (Inn, 2020). Since there is no standard definition of smart city that applies to all cities worldwide due to varied economies, legislation and cultural components, each country needs to develop their smart city model based on the needs and requirements of the inhabitants (Yau, et al., 2018).

IBM defines a smart city as applying information and communication technology to sense, analyze, and integrate the vital information of entire systems in running cities. As such, smart cities can respond to various demands, such as those relating to basic needs such as food and shelter to environmental protection to public safety to city services, and industrial and commercial operations (Qin, Li, & Zhao, 2010). It is defined by Yong and Chong (2021) as the application of diverse information technologies and new concepts to connect, integrate, optimize, or enhance inhabitants' quality of life through urban administration and operation.

According to Qin et al. (2010), a smart city is built on the foundation of a comprehensive digital city, enabling visual and quantifiable urban administration and operations. The concept is to equip numerous things with sensors to build the Internet of Things and to integrate the Internet of Things via supercomputers and cloud computing. China has made significant progress in information technology. The country possesses specific research and development infrastructure and industrial capacity in sensor technology, network technology, physical networking technology, and intelligent information processing technology (Su, Li, & Fu, 2011).

The term "smart city" can refer to various things, including smart homes, smart transportation, and smart medical services, to mention a few. Sensor devices, such as radio frequency identification devices, infrared sensors, global positioning systems, and laser scanners can be connected with the Internet to create the Internet of Things (Han & Lim, 2010).

A smart home can make it easier for individuals to operate their lighting and electrical equipment and get intelligent notifications of home alarm signals by implementing smart home technology (Su et al., 2011). A smart traffic management system that includes adaptive signal control systems (automated control of traffic lights based on flow time) and urban traffic management can be implemented in any city to change its traditional transportation system (Su et al., 2011). Medical services will benefit from smart cities as well. With its high potential for use in smart medical treatment, the Internet of Things can help hospitals achieve smart medical care and intelligent management of medical materials, as well as support the digital collection, processing, storage, transmission, and sharing of internal medical information, equipment information, drug information, personnel information, and management information. Furthermore, it can meet the needs of intelligent management and supervision in medical information, medical equipment and supplies, intelligent management and supervision of public health, and a variety of other issues, such as a lack of support for health care platforms, a low overall level of medical services, and medical safety hazards (Xue, 2010).

The original goal of smart city building was to provide urban dwellers with a more convenient way of life, more efficient urban administration, and a more integrated urban information system (Joss, Cook, & Dayot, 2017). E-government, medical services, smart communities, geographic information systems, and other facets of urban life are all part of creating smart cities (Mollalo, Vahedi, & Rivera, 2020). Some smart city projects can aid in the real-time sharing of information, reducing face-to-face interaction between individuals and improving the government's response to the pandemic and the allocation of medical resources. As a result, smart city projects have been undertaken in the fight against COVID-19 in response to the urgent needs of pandemic prevention and control efforts (Yang & Chong, 2021).

3. Smart city and Covid-19 Containment Measures

Many communities have depended on smart solutions to contain the spread of the virus and improve their response capacities since the early days of the pandemic (Yang & Chong, 2021). Furthermore, the World Health Organization (WHO) and the US Centers for Disease Control and Prevention (CDC) have acknowledged the importance of such solutions (Chamola, Hassija, Gupta, & Guizani, 2020). Naseem, Akhund, Arshad, and Ibrahim, (2020) discovered

that AI-enabled systems effectively identify, monitor, and trace COVID-19 cases in a fast and accurate manner.

It has been a great success for cities like Singapore and China that have adopted smart technologies (Jaiswal, Agarwal, & Negi, 2020). With the help of these technologies, they could stop the virus from spreading and avoid or postpone peak times, resulting in higher performance and lower death rates. Physical contact should be avoided, and social distance should be maintained to prevent the transmission of the disease. Tracking and tracing procedures are used to guarantee that infected individuals observe quarantine regulations (Sharifi & Khavarian-Garmsir, 2020).

It is possible that additional factors, such as national smart city development policies or the hosting of significant sport or other events, influenced investment in smart technologies. Many of these communities have repurposed existing smart city infrastructure to increase response capabilities during this pandemic (Sharifi & Khavarian-Garmsir, 2020). Sportswear gadgets are sometimes put to new uses by cities, such as remote health monitoring and modelling the spread of disease (Senbekov et al., 2020). Smartwatches and biometric wristbands allow people to track vital signals such as body temperature and breathing (Mishra et al., 2020). Individuals with symptoms can be detected using smart technologies, such as drones equipped with thermal cameras or smartphone apps, which can then be sent a warning to those who do not follow emergency protocols and those who may be in their area. Apart from that, such technologies can also advise individuals of restricted places and infectious hotspots that should be avoided (Ferretti et al., 2020).

Artificial intelligence-based technologies have been created based on body temperature and typical respiratory symptoms, including coughing and sneezing (Chamola et al., 2020). Deep learning algorithms have facilitated widespread surveillance in China, the United States, the United Kingdom, and Italy. People near potentially infected individuals and those who exhibit symptoms and do not wear a mask, do not comply with lockdown procedures or ignore social distancing norms in public locations such as streets and metro stations are alerted by these systems (Kitchin, 2020).

Smart technology has been used in high-risk areas, such as hospitals and airports, to replace human workers. Robots outfitted with ultraviolet C (UVC) radiation technology have been utilized to clean and disinfect things and places in India, the United States, and Denmark (Jaiswal et al., 2020). Automatic trucks have been employed in nations like China to carry food and medical supplies to hospitals. Thus, cross-infection risks have been reduced.

Cities like Hong Kong and Rio de Janeiro, which were reasonably well-prepared for the pandemic, could contain it rather well. Because Hong Kong was one of the major cities affected by SARS in 2003, it was mentally and practically prepared for COVID-19. A couple of initiatives in Hong Kong's planning and preparation efforts, according to Cartledge (2020),are responsible for the city's ability to contain the virus.

After observing the first positive case, border control must be implemented promptly, with land and marine borders closed within seven days. Besides, smart technology will create an effective testing system and track infected people and those who have come into touch with them. Rio de Janeiro is another successful example of a city that made considerable expenditures in technology development to prepare for the 2016 Summer Olympics. During

the Olympics, urban control and command centres built for security purposes were repurposed during the epidemic to aid in surveillance, tracing, and tracking infected persons. It also enabled real-time monitoring of changing urban dynamics and the development of suitable procedures in response to changing conditions to ensure a quick return to normalcy (Muse, Martins, Hojda, Abreu, & Almeida, 2020).

Cooperation amongst sectors is critical for a rapid reaction and recovery, as demonstrated in China, South Korea, and Singapore. Such collaboration can be facilitated by smart solutions (Sakellarides, 2020; Cai et al., 2020). For example, the construction of a multi-department information monitoring and sharing platform in Shanghai has facilitated collaboration among many departments, hospitals, and institutions, contributing to integrated management (Cai et al., 2020).

An "Epidemic Investigation Support System" (EISS) system has been developed in South Korea to allow integrated urban management in response to the pandemic by analyzing COVID-19 data (Park et al., 2020). The EISS technology has enabled integrated and smooth communication across many institutions. Traditional communication techniques rely on bureaucratic processes for data collecting and sharing, which necessitate many people and cause delays. The EISS system, on the other hand, enables real-time inter-institutional communication and information exchange while paying close attention to security concerns. In comparison to the manual way, this system will reduce the time required for data processing. Because the database is fully encrypted, the effects of possible security issues will be minimized (Park et al., 2020).

4. Research Methodology

This qualitative study analyzed several articles that discussed the actual uses of smart technologies to combat the COVID-19 pandemic in cities. This study also employs an inductive method for qualitative content analysis. This method involves contemporaneous data collection/extraction and analysis as well as incremental discussion. This was followed by an in-depth article inspection and extensive content analysis of the pertinent articles in the first stage. All journal articles, conference papers/proceedings, and news pieces from reliable sources were considered for inclusion. Every single resource was published in English, no matter where it was. Scopus and Web of Science are used with Google Scholar to track down published publications that suit this article's topic.

5. Smart City in Malaysia

With its 1996 Multimedia Super Corridor, Malaysia programme and subsequent efforts to create research universities and integrate them with cities, Malaysia have a long history of smart city development under its belt (Yigitcanlar & Sarimin, 2015). Malaysia's new smart city framework aspires to make its cities and societies smarter (Lim, Malek, Yussoff, & Yigitcanlar, 2021). Malaysia has joined the smart city bandwagon with the recent move to declare and promote Iskandar Malaysia as the pioneer smart city in the country (Adnan, Hamzah, Dali, Daud, & Alias, 2016). In 2012, Iskandar Malaysia was declared as a pilot Smart City project for Malaysia (IRDA, 2013). The Smart City framework for Iskandar Malaysia is based on the

three main dimensions of sustainable development, namely economy, environment and social (Adnan et al., 2016).

Smart cities are part of Malaysia's innovation and knowledge economy strategy, and Cyberjaya is part of that strategy. When world-class multimedia firms, professionals, and students flock to this city, it is predicted to become a global ICT hub (Nordin, 2012). Putrajaya has also been proposed for Malaysia's Smart City to transform the garden city into the green. Several plans have been developed to make Putrajaya a smart city. Putrajaya will become a smart city if seven domains are prioritized. Smart transformation and mobility, smart home and environment, smart government services, smart infrastructure and utilities, smart safety and security, smart economics, and smart community are among the seven domains. Putrajaya will become a smart city using an intelligent traffic management system by adopting smart transportation and mobility. Putrajaya residents' safety is ensured through smart homes and surroundings, including IOTs such as WiFi, CCTV, and RFID (Ibrahim, Asri, & Jamel, 2019).

According to the Malaysian Ministry of Science, the country's national IoT strategic roadmap is expected to invest approximately US$2.49 billion by 2020 (Shan, Pei, & Tinany, 2015). The Greater Kuala Lumpur initiative aims to transform the city into smart cities based on IoT technologies (Yau et al., 2016). This is due to implementing smart cities projects in 2016–2020 under the 11th Malaysia Plan. Cities including Kuala Lumpur, Johor, Selangor, and Putrajaya have started to deploy an IoT network (Sue, 2019). IoT, cloud computing, big data analytics and spatial geographic information integration were all incorporated into the smart city planning of these initiatives to achieve their goals. Malaysia launched its intelligent transport system blueprint (2017-2022) to modernize its current transportation system, with big data analytics at the centre of the system, with smart mobility being a crucial component of its smart cities goal.

6. The Role of Smart City in Addressing COVID-19 in Malaysia

Smart City has been implemented in Malaysia to combat COVID-19. IoT was a unique technology that demonstrated its importance and potential in preventing the spread of the virus in the country at large. Thanks to its scalability and automated nature, an excellent instrument for managing the COVID-19 pandemic could be the Internet of Things (Al-Ogaili et al., 2020).

Besides, the government also introduces Hotspot Identification for Dynamic Engagement (HIDE) to curb the pandemic. HIDE is a Big Data analysis and artificial intelligence (AI) system that predicts whether a location will be a hot spot for COVID-19 transmission within seven days (Latifah, 2021). The HIDE early warning system can avoid establishing new COVID-19 clusters if authorities, property owners, and the general public quickly identify identified places. The purpose of publishing this list of sites is to assist the community in making good travel preparations and judgments before visiting a venue or premises to prevent the risk of COVID-19 infection. It can also be used as a guide for premises owners or operators to take proactive measures to avoid and protect their particular facilities from becoming a centre of COVID-19 virus transmission (Ilah, 2021).

It is a good thing that the Malaysian Institute of Automotive, Robotics and IoT (MARii) is ready to utilize various innovative technologies to combat COVID-19's proliferation. Several smart platforms have been built by a technology agency within the Ministry of International

Trade and Industry to reduce the spread of COVID-19. The MARii Center for Simulation and Analysis (MARSAC) has developed a predictive modelling and simulation platform to forecast infection patterns and identify high-risk locations. Additionally, MARii has developed the ImmuSAFE COVID+biociple test kit, which uses serology to determine whether an individual has an early infection and protective antibodies in their body, regardless of whether they show symptoms or not (AstroAwani, 2021).

At the 10th D-8 Virtual Summit, Tan Sri Muhyiddin Yassin, the 8th Malaysian Prime Minister, said Malaysia was actively developing IoT-based businesses such as e-commerce, big data analytics, artificial intelligence (AI), blockchain, and automation. That, according to him, underscores the urgency of digital inclusion (Bernama, 2021b).

As a result of the COVID-19 pandemic, institutions must work together to accelerate the development of technology. DF Automation & Robotics Sdn Bhd, Universiti Teknologi Malaysia (UTM), Hospital Canselor Tuanku Muhriz UKM (HCTM) have successfully developed an autonomous robot named Robot Makcik Kiah 19 (MCK19). Under COVID-19 monitoring, the MCK19 can aid a physician or nurse deliver food or medications to a patient's room. The robot uses Internet of Things (IoT) technology, which can be accessed from any computer, tablet, or smartphone with an Internet connection (Ministry of Science, Technology and Innovation (MOSTI), 2021). The robot's LCD screen will soon be able to be utilized for teleconferences between doctors and patients.

Besides, there is an application called MySejahtera that Malaysia has developed to assist the government in dealing with this pandemic. MySejahtera has assisted the Ministry of Health to locate COVID-19 cases through contact tracing, in which the district health office analyses the MySejahtera database. The software can also track users close to a COVID-19 patient (Kaos Jr, 2020). However, the Ministry of Domestic Trade and Consumer Affairs (KPDNHEP) revealed that many customers are still utilizing record books than the MySejahtera application when accessing business premises (Utusan Malaysia, 2021).

The Malaysian government also makes use of drones for surveillance and monitoring. Drones equipped with cameras and loudspeakers are viewed as a critical tool in the battle against disease to stop the spread of COVID19 (Kharpal, 2020). As an auditory communication technology, loudspeakers alert people about mass gatherings. Over seven villages in Sungai Lui, Hulu Langat Selangor, the Malaysian police have used drones to execute surveillance and monitoring missions during the Enhanced Movement Control Order (EMCO) (Mokhtar, 2020). Law enforcement was able to monitor sites in their various jurisdiction regions without risk of direct contact because of the safety element of radio-controlled (RC) drones. Human engagement can be hazardous to human health because it increases the risk of cross-infection. Drones provide this capability without requiring human connection (Al-Ogaili et al., 2020).

Based on the explanation above, it is believed that smart cities in Malaysia can assist the Malaysian government in controlling the spread of the COVID-19 pandemic. Like the majority of governments around the world, Malaysia has unveiled its Smart City Framework and its smart city policy, strategy, and implementation plan. However, critics claim that the framework falls short of outlining the implementation procedure (Ahmad Ibrahim, 2021).

Ahmad Ibrahim (2021) went on to say that, based on global progress, our cities have a long way to go to catch up. According to the data acquired, Malaysia has many smart cities,

each with its unique goals and objectives. This has resulted in all smart cities failing to strive towards national IoT goals, resulting in duplication of development efforts (Cheng & Cheah, 2020). Norhizam Abdul Kadir, the MDEC Infotech Division Vice President stated that while all smart city projects in Malaysia operate independently, alliances are required for Malaysia to progress. Malaysia will need two to five years to develop technology ready for deployment in Malaysia's Smart City. Malaysia requires more time and effort to advance its technology to compete with other countries. Collaboration between the business and public sectors is needed (Cheng & Cheah, 2020). In contrast to South Korea, Malaysia has no legislation or regulations allowing federal, state or local governments to acquire personal data and improve public security (Inn, 2020).

Although the development of smart cities in Malaysia has been slower than in Singapore and Indonesia (Cheng and Cheah, 2020), the government has made smart cities a priority to improve society's standard of living. The Rancangan Malaysia Ke-12 (RMKe-12) has proposed a plan to make Malaysian cities into smart cities. Tun Dr Mahathir, Malaysia's ex-Prime Minister, believes that smart cities will improve public safety and the Malaysian standard of living. He went on to say that efforts will be made to expand 5G technology, create a cashless society, improve public transportation, deploy drones, build more efficient buildings, and manage smart solid waste.

According to Datuk Mohd Anuar Maidin, the Director-General of the Town and Country Planning Department (PLANMalaysia), the IESE Cities Motion Index 2019 ranked London as the world's smartest city (ranked first with an index score of 100 per cent), while Kuala Lumpur ranked 100th with a score of 52.83 per cent. He hoped that Malaysian smart city scores would soon reach sixty to seventy per cent (Bernama, 2019). Because the core infrastructure for smart governance is still being established in Malaysia, the AI-enabled smart surveillance system may not be an immediately available option for monitoring and mitigating COVID-19 (Inn, 2020).

Datuk Seri Mustapa Mohamed, Minister in the Prime Minister's Department (Economic), Malaysia, hopes to develop at least five smart cities by 2025 (Moh, 2021). Malaysia and the United Kingdom (UK) have jointly published the "Smart City Handbook: Malaysia" to promote collaboration and partnership in developing smart cities between the two countries. The booklet includes an overview of Malaysia's smart city scene and notable UK smart city projects and expertise. The book also suggests how and where the UK companies might help Malaysia manage and solve fundamental difficulties in developing smart and sustainable cities. Kuala Lumpur, Johor, Putrajaya, Penang, and Kota Kinabalu had launched several smart city initiatives, some in collaboration with foreign countries such as the United Kingdom and international organizations such as The United Nations Human Settlements Programme (UN-Habitat), and Mott MacDonald as a delivery partner (Bernama, 2021).

7. Conclusion

Malaysia is still moving forward with its smart city effort, but changes to the plan are needed to improve the efficiency and efficacy of execution. As previously said, Malaysia began its quest to construct smart city projects in the 1990s. The government had developed many public policies linked to this initiative to transform cities into smart cities. Several smart city

projects in Cyberjaya, Putrajaya, Selangor, Malacca, Penang, Sabah, and Sarawak provide evidence. Smart Traffic Analytics and Recognition System, Air Quality Index Sensors, Wireless Energy Management, Smart Transportation Information System, Smart-Lokap, and other smart city initiatives are among them.

However, more outstanding efforts must be made to ensure that smart city projects significantly help the government mitigate the COVID-19 pandemic. In this instance, internet coverage and speed must be increased to maximum levels to stimulate the use of technology in cities. 5G is one technology that has been singled out for its help to pandemic control. Indeed, it has played a critical role in combating the pandemic in cities where it operates, including Beijing, Shanghai, and Bangkok (Siriwardhana, Gür, Ylianttila, & Liyanage, 2020). 5G infrastructure significantly increases the efficiency, speed, and flexibility of pandemic-related interventions such as telemedicine, supply chain management, self-isolation, monitoring and enables the rapid implementation of health services (Siriwardhana et al., 2020; Allam, & Jones, 2021).

The preceding discussion also revealed some residents' lack of readiness to use the MySejahtera application. Malaysia must ensure that communities have the necessary educational and awareness tools to adopt the application. Furthermore, the use of technology to combat the COVID-19 epidemic must be extended to rural and semi-rural areas. Implementation activities that develop outside metropolitan regions would provide more accurate assessments of the situation to find suspected isolated instances in rural and semi-urban areas (Al-Ogaili et al., 2020).

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