

Chapter 2

Smart Governance and COVID-19 Control in Wuhan, China



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Abstract In dealing with the global COVID-19 pandemic, China has achieved reasonable success in governing COVID-19 within two months with the help of technologies. This study specifically focuses on how these massive technologies have been implemented to facilitate the smart governance of COVID-19 in Wuhan, China. By discursively analyzing existing data from multiple sources, the results obtained in this chapter show that the real ‘smartness’ of the smart governance of COVID-19 in Wuhan is the innovative use of technologies to develop different types of governance approaches to control COVID-19 in an effective and targeted way. As the pandemic continues to evolve worldwide, lessons learned from Wuhan, China can be beneficial to other countries in different institutional contexts to build their own, context-specific governance for controlling the pandemic.

Keywords Pandemic · SARS-CoV-2 · ICT · Smart governance · Contextualization

2.1 Introduction

In December 2019, the coronavirus (i.e., SARS-CoV-2; COVID-19) broke out in Wuhan, China. Facing with this unexpected, atypical, and damaging disease, a range of methods and means have been employed by the Chinese government and the Chinese society to contain the spread of the virus. Within two months after the initial outbreak, China has achieved reasonable success in containing the coronavirus (The State Council Information Office 2020). As COVID-19 continues to spread around the world, many discussions have been initiated on how China has succeeded in

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governing and controlling the pandemic and what insights the global community can learn from this. Two groups of discussions are identified.

First, international news reports specifically looked into the measures and actions taken by the Chinese government to control the coronavirus (Normile 2020; Jie 2020). As these reports show, China adopted extreme centralized governance measures to cut all channels (e.g., tourism, public places, public transport and entertainment) for containing the transmission of the coronavirus (Lau et al. 2020; Lin 2020). For instance, commonly informed governance measures consist of new hospitals building, full lockdown and quarantine, social distancing, strict surveillance for suspected and infected COVID-19 cases, and isolating the infected from others (Cai et al. 2020; Mozur et al. 2020; Lau et al. 2020).

Second, scientific literature focused on the governance mechanisms targeted at controlling the coronavirus (Mei 2020; Altakarli 2020; Lau et al. 2020; Lin 2020). Some research summarizes China's model to govern the COVID-19 epidemic as a public health emergency governance approach (Ning et al. 2020; Cao et al. 2020; Altakarli 2020). Within this approach, a leadership system—the Epidemic Prevention and Control Headquarters System (EPCHS)—was established at all Chinese administrative levels to promote a whole-of-government response to this pandemic (Ning et al. 2020; Mei 2020). Different social resources, social organizations and individuals were then mobilized to provide necessary supports (e.g., medical staff, hospital equipment, medical supplies, healthcare solutions, etc.) to control COVID-19 in Wuhan (Taghrir et al. 2020; Chan et al. 2020). Other studies focused more on the massive application of information and communication technology (ICT) to build containment measures and prevent the transmission of the pandemic (Pan 2020; He et al. 2020; Shaw et al. 2020). For instance, Kummitha (2020) concludes China's technological response to control the transmission of the pandemic as a technology-driven approach. In this process, big data, urban data analytics and artificial intelligence (AI) were widely used to govern the transmission of COVID-19 in Wuhan as follows: tracking and diagnosing COVID-19 cases, identifying a potential pharmacological treatment, quick and effective pandemic alerts, public health surveillance, real-time epidemic outbreaks monitoring, etc. (Bragazzi et al. 2020). It is worth mentioning that these initial studies improve our knowledge and understanding of the governance of COVID-19. Nevertheless, there exist apparent limitations.

First, the governance approaches summarized in the literature or news reports are explained either from a technological perspective or from a societal actor view. However, the interactions between actors and technology in creating 'smart' governance approaches to combat COVID-19 are hardly considered. Second, recent observations show that the response to COVID-19 in Wuhan has also witnessed the emergent, pop-up form of massive ICT-enabled, self-organized collaboration, characterized by large-scale, connected, and distributed interactions among citizens and digital altruism (Xinhua 2020; Wang 2020). Meijer et al. (2019) conceptualize this emerging innovative form of governance as open governance. However, few studies have recognized the existence of this newly arising governance approach and its potential and effectiveness in governing the COVID-19 pandemic.

Against this backdrop, this chapter concentrates on the socio-technical developments of smart governance for COVID-19 control in Wuhan, China. Based on the recently emerging conceptualization of smart governance (Jiang 2021), we were able to demonstrate how different types of smart governance can be established to contain COVID-19 in China. The purpose of this chapter is to present a comprehensive picture of the smart governance of COVID-19 control in China. Besides, this chapter also intends to offer useful insights obtained from China for other countries to contain COVID-19 in their respective societal contexts. To do so, Sect. 2.2 focuses on challenges of COVID-19 and explains the potential of smart governance for COVID-19 control. Section 2.3 introduces the methodology. Section 2.4 presents the results of the smart governance of COVID-19 in Wuhan. Section 2.5 ends with conclusions and lessons learned.

2.2 Smart Governance and COVID-19 Control

2.2.1 COVID-19 Challenges and Control

According to medical research, COVID-19 can cause serious health problems such as fatigue, loss of smell, shortness of breath and even death (Riggioni et al. 2020). It can also have severe socio-economic impacts such as interruptions in the global supply chain, unemployment, less consumption, gendered effects, social safety, mental health, etc. (Atkeson 2020).

To respond, effective governance approaches are expected to be developed and delivered within a very short time span to address this threat (Taghrir et al. 2020; Janssen and van der Voort 2020). Here, we define “governance” broadly, as consisting of the entire system of public, private and semi-public and individual actors that jointly solve an issue (Treib 2007). In the face of COVID-19, the government for instance is required to publish infections data through public health platforms and handle relevant issues such as testing and contact tracing to control the transmission of the coronavirus (He et al. 2020). For non-state actors such as private companies and citizens, it is vital for them to comply with the rules and measures that can effectively prevent transmission (Kummitha 2020). In addition, the importance of developing and deploying digital public health technologies for pandemic control has received much attention (Shaw et al. 2020; He et al. 2020). For instance, Bragazzi et al. (2020) show that AI technologies can be applied to identify, track, and forecast infected people through big data analytics and enhance public security via improved face recognition and high temperature detection. Chan et al. (2020) highlight that smart and powerful devices can also contribute to diagnosing the virus and facilitating virtual communication to reduce human-to-human physical contact. Therefore, technology is deemed as an inseparable part of the governance strategy aiming to contain COVID-19.

Except for the discussions above, some studies highlight the importance of implementing massive ICTs to build innovative, ‘smart’ governance approaches to handle COVID-19. For instance, Altakarli (2020) urges that we should focus on a high level of collective action with the help of smart technologies in containing the transmission of COVID-19. Bragazzi et al. (2020) praise the role of mobile and web-based applications in enhancing government rationality and informed decision-making for controlling the pandemic. In the next subsection, we will focus on how types of smart governance approaches can be built with the help of ICT to contain COVID-19.

2.2.2 *Smart Governance for COVID-19*

Meijer (2016:73) argues that smart governance “*is about using new technologies to develop innovative governance arrangements*”, aimed at obtaining better outcomes. Based on an intensive literature review, Meijer and Bolívar (2016) identify four ideal-typical conceptualizations of smart governance: (1) government of a smart city, (2) smart decision-making, (3) smart administration and (4) smart urban collaboration. These conceptualizations reflect the different roles of urban actors (i.e., state, market and citizens) in governance processes and the different types of technological functions (e.g., informing, communicating, analyzing, designing, visualization) being applied to support governance processes and/or handle concerned (urban) issues (Jiang et al. 2020). Except for the four types of smart governance, Meijer et al. (2019) more recently identified a new, innovative form of smart governance, labeled as open governance. Building upon the emerging, rich interactions in cities that are facilitated by new ICTs, open governance is argued to be able to manage crises or natural disasters with ‘pop-up’, emergent collective actions. In the following subsections, we further explain these smart governance approaches.

2.2.2.1 **Government of a Smart City**

In this conceptualization, smart governance is considered as the governance of a smart city. For instance, Nam (2012) claims that smart governance is about implementing smart technologies (e.g., cloud technologies, internet of things (IoTs), AI and data analytics) to promote smart city initiatives. In this process, governments play a central role in policy-making and implementing technologies to make a city smarter. Then, the technological value—the acceptance, adoption, and application of technology itself is treated as value—is stressed. This type of value follows from the study of diffusion and adoption of innovations that the adoption and dissemination of a technology in a population is itself an illustration of its added value for the person who uses or operates that technology (Meijer and Thaens 2018). In this chapter, the so-called ‘government of a smart city’ approach to governing the COVID-19 period is the efforts made by government to deploy new ICTs to find potential solutions to combat this pandemic.

2.2.2.2 Smart Decision-Making

According to UNESCAP (2007), smart governance is about using technologies to improve “the process of decision-making and the process by which decisions are implemented (or not implemented)”. In this conceptualization, different sorts of data, facts and details concerning public management gathered through sensors or sensor networks from a variety of sources can help increase government’s rationality and improve their overall capabilities for smart decision-making (Ju et al. 2018). Then, the instrumental value of technology is emphasized in this process to help the participants to obtain their particular goals or purposes. For instance, by using AI tools and urban data analytics, the distribution of suspected and infected COVID-19 cases can be located and mapped for further targeted actions taken by governments (Shi et al. 2020).

2.2.2.3 Smart Administration

Alawadhi and Scholl (2016:2953) argue that smart governance is about “reshaping administrative structures and processes across multiple local government agencies and departments” by using ICT. In this approach, it is required to restructure the internal organization of government with the help of technological innovations, aimed at enhancing the efficiency, quality and sustainability of government services. Then, the collaborative value of technologies—facilitating the exchange of information and knowledge between different governmental divisions—is highlighted. For instance, the capabilities of local governments worldwide in providing public services during the COVID-19 pandemic are improved by employing integrated government information management systems (OECD 2020).

2.2.2.4 Smart Urban Collaboration

Kourtit et al. (2012) claim that to maximize the operation of cities, more ICT-enabled collaborative governance structures engaging different stakeholders should be put forward. In this process, smart governance requires a higher level of government transformation—that is, the state, market and civil society should communicate with each other and work together to achieve specific goals. Then, emphasis is not only put on the collaborative value but also on the symbolic value—“the technology provides legitimacy to the process of innovation because of the idea that technology helps us to create a better future” (Meijer and Thaens 2018:368). As for COVID-19 control, smart technologies such as public websites and social media can establish various collaborative platforms for actively engaging its residents and sharing COVID-19 information and policy measures for collective actions.

2.2.2.5 Open Governance

Open governance acknowledges the emergent—pop-up—character of new collaborations and presents an understanding of massive individualized, ICT-enabled collaboration in cities (Meijer et al. 2019). Crisis management is usually the empirical domain in which open governance results in interesting practices. Meijer et al. (2019) determine five core elements of the open governance paradigm, namely radical openness, citizen-centricity, connected intelligence, digital altruism, and crowdsourced deliberation. In this process, the relations between citizens rather than their contacts with the government are at the heart of open governance. More specifically, governments—and other platform providers—can facilitate these interactions rather than focusing on interactions between citizens and government. Technology in this process acts as collaboration infrastructure that allow different stakeholders, especially voluntary citizens, to offer public services in a co-production model. In terms of COVID-19 control, the co-production model highlights the volunteering role of citizens in effectively producing knowledge and solutions to reduce the impact of COVID-19 through various connections and radically deconcentrated forms of technological intelligence.

In this chapter, the five mentioned types of smart governance are applied to study the smart governance of COVID-19 in Wuhan, China. In the next section, we will introduce the methods used to gather and analyze the relevant data.

2.3 Methodology

2.3.1 Data Selection

First, a literature survey was conducted to identify the approaches to smart governance of COVID-19 in Wuhan, as part of Wuhan's response to COVID-19 has been well documented in recent academic literature. The retrieval was conducted in July 2020 and updated in September 2020. Only peer-reviewed academic journal articles were taken into account since this allows us to take in high-quality research. Then, we limited the search to determine those articles published or accepted in the year 2020. Both English and Chinese journal articles were considered as it provides us a more comprehensive view of the efforts made to govern COVID-19 in Wuhan. By using the Scopus database, a total of 28 English articles from an ICT-enabled governance perspective were identified and used in this paper. The Chinese articles were searched in the China Academic Journals Full-text Database (CJFD)—one of the most important online academic databases in China (Jiang et al. 2019). This database offers leading journals of natural and social science in China due to its strict academic standards and rigorous selection. At last, a total of 19 Chinese articles were identified and used in this paper.

Second, digital news archives, policy documents, index systems and websites were also investigated. Keywords (i.e., smart governance of COVID-19, ICT-enabled governance and COVID-19, technology and COVID-19) were searched in the Google and Baidu search engines to gather the English and Chinese documents. The search was also restricted to those online documents and reports published in 2020. By using a snowball sampling method, we were able to obtain all potentially relevant documents useful for illustrating the smart governance of COVID-19 in China.

Third, nine citizens living in Wuhan were also invited to participate in semi-structured interviews over the course of four months, from May to August 2020. The reason for conducting these interviews is that these participants have personally experienced the process of Wuhan's prevention and control of COVID-19, so they are able to offer first-hand information that supplements the web-based data.

2.3.2 Analysis

Discourse analysis was introduced to analyze and explain the collected data. Discourse analysis aims to understand how discourse is implicated in relations of wider power structures and social and cultural contexts (Fairclough 2001). By using coding techniques and referring to the five types of smart governance: (1) government of a smart city, (2) smart decision-making, (3) smart administration, (4) smart urban collaboration and (5) open governance, we were able to identify the units of analysis (i.e., role of actors and functions of technologies in this chapter) within their semantic contexts. According to Petrina (1998), the units of analysis act as empirical evidence of the latent meaning interpreted in discourse analysis. Thus, we further use the coded units as discourses to understand the different meaning of smart governance in containing COVID-19 in Wuhan.

2.4 Results

This section presents results obtained from the analysis of the smart governance of COVID-19 in Wuhan. We specifically focus on how the five types of smart governance were applied in practice.

2.4.1 Government of a Smart City

Given the supposition of *feichang shiqi* (i.e., extraordinary times), reports showed that the Chinese government implemented unconventional and precautionary measures regarding the combatting of COVID-19 (e.g., closure of public transport, travel restrictions, quarantine, and shutting down all non-essential companies and schools)

(The State Council Information Office 2020). In this process, the role of cutting-edge technologies in enabling the implementation of China's containment measures has been acknowledged by the Chinese authorities (Kummitha 2020). The policy documents collected indicated that many ICTs were employed to govern COVID-19 in Wuhan (i.e., government of a smart city) (The State Council Information Office 2020). For instance, to provide reminders and information about daily confirmed new COVID-19 cases, COVID-19 protective measures, and COVID-19 control orders and rules, the Chinese authorities have upgraded networks, apps and platforms like subway and train station announcements, television broadcasts, social media, and smartphones alerts (Park 2020; Ning et al. 2020).

Then, in an early stage, an explosion in the number of severely ill patients requiring treatment in the Intensive Care Unit (ICU) has put the healthcare system under unprecedented pressure. To respond, technologies have been massively applied to enhance the capability of hospitals and reduce the patient load in Wuhan. One example is the newly built Huoshenshan and Leishenshan Hospitals offering 2,600 beds in total (Cai et al. 2020). Equipped with central oxygen supply systems, negative pressure systems, ventilation systems and air purifiers, the two hospitals offer solid hardware and software basis for effective working of these hospitals.

Then, the robot nurses designed and developed by private companies were also proposed as a policy instrument to combat against COVID-19 in Wuhan. For instance, collaborative partnerships were formed between CloudMinds tech company, China Mobile and Wuhan Wunchang Smart Field Hospital to build a field hospital staffed by robots (O'Meara 2020). In this hospital, some robots provided patients with food, drinks and medicine and recovery information, while others cleaned floors and sprayed disinfectant. Then, the temperature, blood oxygen, heart rate levels of patients can also be observed and checked in real-time by using smart rings and bracelets that synced with CloudMinds' AI platform. Within this process, technologies have been crucial for supporting the understaffed medical professions and minimizes the chances of cross infection.

2.4.2 Smart Decision-Making

Then, practices showed that by making use of connected applications and AI systems to collect real-time and transparent data and information, smart decisions were able to be made by the Wuhan authorities in terms of whether interventions should be applied for preventing violation of containment rules. One measure was the use of combined facial recognition platform and street infra-red camera system to assist in real-time control and surveillance for coronavirus disease (AITakarli 2020). In this process, the authorities would offer the information to implementation teams for further involvement and actions if they identify individuals showing high temperature or COVID-19 symptoms or detect individuals walking publicly without wearing face masks. Another measure was the adoption of drones and robots equipped with AI technologies to decrease the possibility of exposing people to COVID-19 (Shi et al.

2020). Enabled by five high-resolution cameras and infra-red thermometers, these self-driving robots and remote-controlled drones were able to detect and scan people's temperature within a radius of five metres simultaneously (Weekes 2020). Whenever a person with fever had been detected and/or without wearing a mask, the authority would be alerted or warned by the information management systems to exert regular orders or social distancing.

Then, to identify those staying at home but potentially affected by COVID-19, Iflytek, a Chinese AI company that specializes in automatic speech recognition, has collaborated with the Wuhan government to develop a medical calling robot (Tang et al. 2020). With the help of AI voice assistant that can make 900 phone calls in one minute, the systems can identify potentially affected people in Wuhan and help medical personnel and nurses to deliver further health care and treatment in the most efficient manner.

Furthermore, new technology-based tracking systems were also exploited by the Chinese authorities to combat COVID-19. For instance, big data and mobile technology were combined to establish a color-based health code (or QR code) system. The QR code system was developed to categorize individuals' health status into three color groups—green, yellow or red (Mozur et al. 2020). By linking the the system to individuals' biometric data (e.g., temperature) and contact and travel history, officials can track and monitor people's movement, check their health status and make real-time decision about whether people need to be quarantined.

The shapshot of the smart decision-making process in Wuhan showed that in the context of an usually unexpected occasion requiring immediate action, the deployment of ICTs can help government make better choices and accelerate their emergence response times greatly.

2.4.3 Smart Administration

The literature gathered also indicated that smart administration platforms were adopted by the Chinese government for COVID-19 control. Within this smart approach, technologies facilitated a mode for transforming governmental internal structures and opening up their datasets to become more transparent and gain better service provision and more valid public policy. One example was the application of the interoperable health information systems to improve the working-together processes within and across different levels of governments and hospitals (Ning et al. 2020). Once a COVID-19 case is suspected and confirmed, the responsible doctor is requested to report the case electronically, where statistics will be generated for the total number in each area. Then, each province submits its overall report to the National Health Commission to generate daily reports for the newly suspected, diagnosed, and asymptomatic cases and deaths. Another example was the open government health service platforms (i.e., the Wuhan Manicipal Health Commission Website) used to release daily case report and offer other detailed information such as availability of testing stations, places that infected people visited,

and availability of face masks.¹ Via these websites, local residents can have access to up-to-date information about local COVID-19 control actions.

In addition, the Government Internal Information Management System in Wuhan was used to bring together and coordinate the different government divisions (Peng et al. 2020; Yu and Li 2020). By identifying and encouraging those industries that can offer basic necessities, Wuhan effectively kept the economy running during the peak crisis period. Then, Wuhan Government Service Platform was also employed to offer public services concerning financing, consultation, insurance, etc., aimed at helping those micro, small, and medium-sized enterprises (MSMEs) in crisis.²

2.4.4 Smart Urban Collaboration

Practices indicated that the application of social media and web-based platforms facilitated the rise of smart collaborations between different stakeholders (i.e., state, market and civil society) to control the coronavirus. For example, with the help of WeChat public account platform, a large amount of useful information concerning the latest situation of the pandemic and personal prevention measures was published by the state-owned media to the general public (Lu and Zhang 2020). Ordinary people can use functions such as the WeChat circle of friends and groups to gather, integrate, and disseminate the information of confirmed cases and suspected contiguous people, facilitate a shared understanding of the situation and follow up-to-date control measures and rules.

Current practices also revealed that smart urban collaboration networks have been widely set up to improve the hospital capacities. For instance, by using the recently well-established industrial internet in early 2020, more than 3,000 Chinese companies were able to build a well-aligned, start-to-finish and modular manufacturing chain to produce protective clothing, face masks, disinfectants and medical supplies (Lau 2020). Then, nationwide healthcare facilities also collaborated with large internet companies such as Tencent and Alibaba to create online healthcare platforms like Dingxiangyuan that can provide the public with remote medical services (Aikman and Chan 2020). By using these platforms, ordinary people were able to consult with online doctors, carry out self-examination and decide whether they should remain at home or go to a hospital for further medical checks. These platforms not only effectively alleviate the demand for hospitals by reducing caregiver workloads and non-essential hospital visits, but also prevented the likelihood of cross-infection.

Furthermore, collaborations between government and private companies have enabled around 276 million full-time students to restart their studies through online platforms (Lau 2020). For instance, large internet companies such as China Mobile, Alibaba and Tencent worked with the Chinese government to create various online learning, e-learning, and distance learning environments for students, including

¹<http://wjw.wuhan.gov.cn/>.

²<http://home.wuhan.gov.cn/>.

video message, video conference and remote consultation. Then, hundreds of industrial internet-based online educational platforms (e.g., Wangyi Open Course) also provided free-of-charge, individual live streaming services and shared their massive open online courses (Lau 2020).

It should be noted that during the quarantine period in Wuhan, already-vulnerable groups including the elderly, children, people with disabilities and pregnant women were confronted with severe problems in terms of safeguarding basic necessities and being even more prone to COVID-19 (Gabster et al. 2020; Choi et al. 2020). Then, voluntary citizens and community workers used various WeChat groups to have access to those vulnerable people who need help.

2.4.5 *Open Governance*

Interviews with Wuhan citizens also indicated that open governance has been developed to improve the hospital capacities in China. Analyses showed that after the outbreak of COVID-19 in Wuhan, many local commerce chambers, citizens and local hospitals in Wuhan worked, in a deliberate and intentional way, with overseas individuals and business owners to supply critically needed medical equipment and facilities. For instance, by creating various WeChat groups, people could exchange open government data and other open data where there is a serious need for medical supplies such as rubber gloves, goggles, thermometers, medical masks, protective suits, disinfectants, and hand lotions. Since real-time information can be updated in WeChat groups, voluntary people were able to receive important information for decision-making on primary needs and can help others by offering the latest information on local situations. As one interviewee said:

I was one of the volunteers in the WeChat Group of Volunteers Supporting Wuhan. My job is to voluntarily pick up medical staff to and from work for free...one of my friends went to the community to help prevent and control fever patients...by receiving message from WeChat groups, he was able to deliver medical supplies to those needed [R6].

It should also be noted that social media-based open governance identified in Wuhan is inclusive and involves opinions, ideas and suggestions on a more representative and broader scale. For instance, people in Wechat groups can invite new participants to join them at any time if needed. The new-comers are able either to generate new data and combine these with open government data in a way that new ideas and insights are produced to control COVID-19 or to spread the information concerning COVID-19 to as wide an audience as possible.

Wechat offers us a very convenient way to build networks and targeted groups. It is a very cost-effective, easy-to-use and intelligent tool for people to collect and share information...People can be easily invited to join the groups and contribute their ideas and knowledge...however, if you feel disturbed, you can withdraw from the groups if you want...everything is completely voluntary... [R3].

It revealed that this emergent, pop-up “ad hoc” organization includes different individual, institutional, organizational actors all using open data and co-produced knowledge to control the pandemic for all people concerned. Instead of relying on centralized leadership and top-down organizational structures, a range of individual and market interplays facilitated by deconcentrated forms of intelligence (e.g., social media networks and web-based digital platforms) contributed to the establishment of self-organization offering timely access to magnification of data input and response feedback loops in terms of COVID-19 control.

Our Wechat group includes different kinds of people...It was led by self-selected participants...Although we just know a few members in the group, we are voluntarily working hard to help Wuhan...we have a warm feel [R3].

The analyses showed that the deconcentrated forms of intelligence brings the required connections. By applying these large-scale, connected, and distributed data and knowledge interactions, more multiple, deliberative and impartial participation and collaboration have been enabled for all sectors of the society to handle the COVID-19 crisis in Wuhan. Even though present literature and news reports seldom recognized its existence and potential, it was indeed a convincing supplementary type to currently existing smart governance approaches.

2.5 Conclusions and Recommendations

Since China has achieved a major strategic success in controlling the current COVID-19 pandemic, this study specifically focused on the smart governance of COVID-19 in Wuhan. The analysis of this chapter revealed that different types of smart governance have been developed and used in Wuhan to contain COVID-19. In this process, various stakeholders (e.g., the government, the private sector and civil society) either worked together or voluntarily participated in the smart governance of COVID-19. Then, ICT showed its transformative role in supporting the COVID-19 governance process and handling the problems faced. In brief, the analysis indicated that the smartness of smart governance for COVID-19 in Wuhan is the innovative use of ICT to develop effective governance institutions to handle the COVID-19 pandemic.

Based on our analysis, we provide some lessons that China offers for other countries to contain COVID-19.

First, we should acknowledge the potential of newly developed technologies (e.g., computational techniques, social media, AI and big data) in developing innovative smart governance approaches to govern the COVID-19 pandemic. As Janssen and van der Voort (2020) assert, smart technologies enhance the COVID-19 governance processes by gathering, exchanging and analyzing data to solve problems without relying much on human intervention and by improving coordination and interactions between stakeholders for collective actions. The analysis of this chapter has revealed that smart ICTs have proved their potential for governing COVID-19 in Wuhan. More specifically, massive technologies have been used to improve social

organizations and governmental administration intended for a changed human relation with improved capacities to handle the emergency. Based on this, it is highly recommended to acknowledge the importance of technology in creating innovative governance approaches to control the COVID-19 pandemic.

Second, there is a strong need for different actors (i.e., state, market and civil society) to work together and improve the social and human capital that would assist in creating and implementing smart governance approaches to get COVID-19 under control. The study indicated that cooperations between government and high-tech companies were crucial for developing and implementing technology in China. Then, with the help of various digital community communication and management systems, volunteer teams of residents within communities actively delivered services to those needed. What is worth mentioning is the appearance of open governance as a dedicated type of smart governance in governing COVID-19. Enabled by various social media, networks and platforms, new emerging, pop-up forms of technology-enabled data-sharing, mass digital altruism, and self-organization practices beyond government were able to occur across a wide range of actors. From this perspective, we highlight that more collaborations and partnerships with meaningful commitments to human health security are needed to handle current fragmentation in COVID-19 governance.

Third, smart governance of COVID-19 should be more pragmatic to contextualize itself in embedded situations and produces adaptative governance solutions. Although at the national scale a whole-of-government and a technology-driven approach were employed to govern COVID-19 in China, the meaning of smart governance, at the local scale, differed considerably. For instance, the detailed enquiry into the governance of COVID-19 in Wuhan indicated various smart models for governance collaborations. This implies that the reason should be understood that a smart governance approach is treated as the best solution to that situation. More specially, handling the pandemic requires the proposed smart governance approaches to be tailored to local specificities and local environments and to be addressed in a targeted way.

Finally, the translation of China's lessons in smart governance of COVID-19 into other countries should consider contextual differences (e.g., economy, politics, culture, level of technological development, etc.) between regions and/or countries. For instance, although digital contact tracing applications implied a powerful strategy to control COVID-19 in China, massive collection of private data and lax attitude towards privacy protection in the private sector could lead to an erosion of privacy rights and hurt public trust in digital technologies (Bengio et al. 2020). Then, in Western democracies, because of the influence of "the individual freedom and rights conferred to individuals, the privacy protection laws enacted and the human-driven approaches adopted in smart cities" (Kummitha 2020:5), technologies to control COVID-19 often need to be deployed in different ways than in China. Therefore, we emphasize that only when the importance of contextual differences between regions and/or countries in influencing the meaning of governance were well recognized and considered can real smart governance for controlling the worldwide COVID-19 pandemic be built.

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