MEKONG INSTITUTE

Study on China's Way of Utilization of Technology to Tackle COVID-19 Pandemic

SUMMARY REPORT

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This study was conducted with the support from the People's Republic of China. Mekong Institute took the leading role in pursuing and accomplishing this study.

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Mekong Institute
123 Mittraphap Road
Muang District, Khon Kaen 40002
Thailand
+66 (0) 43 202 411
information@mekonginstitute.org
www.mekonginstitute.org

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ACRONYMS

AI	Artificial Intelligence
China	People's Republic of China
CNNIC	China Internet Network Information Center
CT	Computed Tomography
DJI	Shenzhen Da Jiang-Innovations Technology Co., Ltd.
IT	Information Technology
MI	Mekong Institute
LMC	Lancang-Mekong Cooperation
R&D	Research and Development
3S	Remote Sensing (RS), Global Position System (GPS) and Geographic Information System (GIS)
UVA	Unmanned Aerial Vehicle
WHO	World Health Organization

ABSTRACT

As the most influential and devastating "black swan event"[1], COVID-19 outbreak on international scale has stricken almost every country in the world so severely. Faced with this unprecedented challenge, China has rallied support from the entire nation, fully utilized the latest technologies and exerted coordination of people from all walks of life. China waded through the adversities and won the victory against COVID-19 pandemic and then continued its efforts in the post corona era and contributed generously to international community. This study aims to understand current situation of the utilization of technology in China to tackle the COVID-19 pandemic to define the good practices and share the good practices which is applicable to other countries in Lancang-Mekong Region and recommendations or strategies for the post-COVID-19 new normal.

The project makes a depth research on three types of technologies deployed in China, specifically big data, artificial intelligence (AI) and unmanned aerial vehicle (UAV) by interviewing with a private business start-up Shukun Technology and Shanghai QR code research and development team under the auspices of Shanghai Municipal government as well as DJI, a technology company. From the three cases, it is highly recommended that strong foundation of information infrastructure construction and close coordination of different departments be in position as preliminary steps for future technology application. Equally important is lifting the awareness of ordinary people to follow the technological guidance of government, meanwhile authorities are supposed to embrace technology for bettering lives of people and advancing digitalization of cities. It is not so much technological force as the discipline and high coordination from the whole nation that made success the pandemic fight. With regard to media, this study investigates into news articles concerning utilizing technology and making quantitative analysis of data. Additionally, fifteen people from various sectors as representatives accepted interviews for this survey. Despite of the above efforts, there are limitations such as not diving into other categories of technology, more quantitative research is expected to be done in the future research. Constrains of the study indicate the direction of future research program.

1 Black Swan Event–Coronavirus.https://www.linkedin.com/pulse/black-swan-event-coronavirus-ronald-bishop?articleId=6649003303537557504

GENERAL VIEW

Introduction

As we know, countries across the globe have been tackling with the COVID-19 pandemic since the year 2020. Not only has this unexpected public health emergency posed grave threats and daunting challenges to human life and health of the people among all the countries in the world, but also it has reshaped the international landscape. China has taken the most comprehensive, rigorous and thorough measures and established a mechanism to coordinate medium to long-term efforts on pandemic control, as well as economic and social development. In December 27[2], the unknown cases of pneumonia were reported in Wuhan, Hubei Province. China acted promptly during the initial period (December 27, 2019 to January 19, 2020[2]) to conduct investigations and informed World Health Organization (WHO) and other countries in the world. It took about one-month time (January 20 to February 20, 2020[2]) for China to primarily control the spread of the virus, two-month time (by March 17, 2020[2]) for the number of daily reported new cases falling to single digit, and approximately three-month time (by April 28, 2020[2]) to achieve the decisive victory in the battle to defend Hubei Province and its capital city Wuhan. Afterwards, China has stepped into a period of regular prevention and control with sporadic cases raising in some different regions. With swift response by all levels of governments and organizations, China has contained the virus effectively and Chinese people are able to enjoy free gathering with friends, traveling to other parts of the country and dining with relatives and friends in restaurants, which seemed to be a luxury wish several months ago. This owes to China implementing the strictest control measures, rallying support of the entire nation, and deploying of latest technology during diagnostic, therapeutic and general monitoring process.

2 The State Council Information Office of the People's Republic of China. Full Text: Fighting COVID-19: China in Action. http://www.scio.gov.cn/zfbps/32832/Document/1681809/1681809.htm

GETTY IMAGES

According to a guidance released by the Ministry of Industry and Information Technology of China, provinces, autonomous regions and municipalities should fully leverage the support of Science and Technology in COVID-19 prevention and control, as well as resumption of work[3]. Communities, public administrative bodies, and governments at different levels were advised to adopt a science-based approach and take targeted measures by applying technologies, such as Internet, big data, cloud computing and artificial intelligence for pandemic monitoring, virus and patient tracing, and people flow management. Supply and demand management, efficient production, allocation and recycling of medical supplies were ensured. Information Technology (IT) technology businesses joined forces with medical and research organizations in order to find solutions for speeding up virus detection and COVID-19 diagnosis, accelerating research and development of vaccines, as well as enhancing prevention and treatment measures. Enterprises were suggested to make full use of the Internet and establish an online and offline management network for pandemic prevention and control. Besides, online shopping, logistics and online entertainment services were provided to ensure the quality of people's daily lives. After initially containing the virus, technologies played a key role in the resumption of work. Companies, schools and governments used remote systems for conducting daily office works, holding conferences and joining online classes for students. Unmanned production and remote operation were realized in manufacturing industries through AI and internet. Big data was widely used for predicting risks and comprehensive pandemic monitoring. Technology exerted pivotal influence in our battle against COVID-19, while the pandemic promoted the revolution and development of the latest technology and it continues to be the main driving force in the post corona era.

3 Central People's Government of PRC. Notice of Utilizing New Technologies to Assist Pandemic Control and Resumption of Work [ER/OL]. http://www.gov.cn/zhengce/zhengceku/2020-02/19/content_5480843.htm

Meanwhile, Governments adopted a digital approach in its response efforts, specifically in conducting epidemiological investigation, contact tracing, warning scheme for community management, distance medication and etc. However, those data collected has been cautiously managed. In March 2020, China has released *Information Security Technology—Personal Information Security Specification,* which clearly regulate the application of using personal data. Personal information can only be utilized by adhering to minimal necessary principle and act in accordance with laws. Only in a few circumstances, such as public security, public health, events concerning major public interests and other urgent tasks, such personal information can be collected without prior authorization. People are informed of privacy policy when they fill in forms, specific information is collected with the consent of individuals. In the process of utilizing big data, different levels of governments and departments are prudent in monitoring individual information. All the data collected and simply combined together from different departments, such as Department of Transportation, Bureau of Public Security, telecommunication operators, and etc., and no extra surveillance has been done on individuals. The combination of personal data is for the purpose of pandemic control, all the information has been strictly processed by the government and the revealing of personal information has been minimized. For example, three colors of QR code just show places of different risks that people have visited without showing any further information.

China's success containment of COVID-19 not only credited to the latest technologies but also nationwide discipline and unity, strong coordination and execution, blanket health inspections, and many more to be remembered. Governments hosted daily multiple press conferences, released real-time updates of infection numbers. It is no exaggeration to say that these measures may help prevent hundreds of thousands new infections. UN Secretary-General Antonio Guterres once hailed "China is making efforts for humanity"[4].

Objectives

According to the latest statistics, there are over 168 million confirmed cases and over 3.4 million deaths caused by the pandemic[5] as of May 26, 2021. COVID-19 hasn't come to an end and it continues to ravage the world by affecting people's lives and economic development of all the counties in the world. The pandemic is boundless and countries are more than ever connected to each other in their concerted efforts to defeat COVID-19. A peaceful and secure international environment will contribute to win-win cooperation and common development of all the countries in the region. Lancang-Mekong countries, Cambodia, China, Lao PDR, Myanmar, Thailand and Vietnam are important neighboring countries to each other. These countries are inter-connected by trade, agriculture, education, cross-border labor mobility and so on and so forth. In a community of a shared future, China is willing to share its successful practices concerning containing the virus with other Lancang-Mekong countries for building a more integrated, prosperous and harmonious Lancang-Mekong Region. For jointly safeguarding people's lives and promoting social and economic development in the region, the study is aimed to share China's good practices on utilizing technologies in COVID-19 response and share practical recommendations with other Lancang-Mekong countries for reference. The study schedules to fulfill the following three tasks.

4 UN chief praises China's contribution to global fight against COVID-19. http://www.xinhuanet.com/english/2020-02/25/c_138815005.htm
5 Global COVID-19 Data Real Time Summary. http://www.bitpush.news/covid19/

Investigating China's mainstream media reports from January until the end of November 2020, a general idea of current situation of utilization of technology in China for tackling with COVID-19 can be clearly understood. Then after an analysis of media reports, Big data, AI and UAV technology are identified for further discussion because of its popularization in response efforts.

Interviews with representatives of technology providers, respectively Shanghai QR code research and development team, Shukun Technology and DJI were conduct for further research and video recording. Further analysis is made to judge whether those technologies are suitable to be introduced to other Lancang-Mekong countries or not.

Around 15 ordinary people as technology users from various sector participated in interviews on the subject matter in hope of gathering views from their own perspectives. Qualitative analysis of the above interviews reflects thoughts and attitudes of ordinary people toward China's response efforts and humanitarian aid to the world.

Significance

According to economists, the corona virus outbreak is the most unexpected "black swan event"[6] since 2020, which can cause unpredictable, unusual and negative impact on the economy and exert long-lasting influence on society we live in. When the corona virus was reported in Wuhan in China, people seemed not to be aware of immediately until vast number of confirmed cased and fatalities were reported and the situation was getting deteriorated then. In people's traditional mentality, it is more of a rarity that the whole mankind will be struck by an invisible and unknown virus. When humanity is at the mercy of the pandemic, no one will deny the fact that precautionary efforts and early prediction deserve our solemn attention to avoid a fully-fledged catastrophe. It seems that something unforeseen can be more disastrous than some facts that we have already perceived. It is high time for human beings to think outside the box in face of new emerging issues and escape from outmoded conventions.

Though a panoramic study of the COVID-19 in China, it provides general information to the public regarding the detection, transmission and prevention of the virus. This study embarks on technology embodiment across all sectors and reveals the implementation of latest technologies, specifically big data and AI in every part of people's lives and works. As a benefaction of digitalization, China takes advantage in every bit of it, accommodating its efforts in pandemic prevention and control in an efficient way. It is fair to say that COVID-19 has speeded up the development of the above technologies. In an era of science and technology, China has set a good example to leverage technology for serving all aspects of life specially in the most trying of times.

When its domestic situation was relatively under control, China was obliged to fulfil its responsibilities and share good practices with many other countries across the globe. Over the past year, China has launched an unprecedented global campaign of emergency humanitarian assistance by provide timely medical supplies to more than 150 countries and international organizations according to their need. China has organized thematic video conferences between Chinese health professionals and their counterparts in over 180 countries. Besides, China has sent 33 medical teams to 31 countries badly in need. For better sharing data, China has established "Data Sharing and Analysis System for Global Coronavirus Omics" and "2019 novel coronavirus database" platform[7], which has provided free download for over 4 million documents in the relevant fields.

6 Black Swan Event–Coronavirus.https://www.linkedin.com/pulse/black-swan-event-coronavirus-ronald-bishop?articleId=6649003303537557504

7 China National Agency for International Development Cooperation Released: "2019 New Coronavirus Resource Pool", Providing Services to over 76000 Browsers across 152 Countries. http://news.china.com.cn/txt/2020-03/26/content_75862892.htm


KAZAKHSTAN
PEOPLE'S REPUBLIC OF CHINA
IRAN
LIBYA
SAUDI ARABIA
INDIA
Arabian Sea
Bay of Bengal
ETHIOPIA
SOMALIA
D.R.CONGO
TANZANIA
ANGOLA
NAMIBIA
BOTSWANA
SOUTH AFRICA
MADAGASCAR
INDIAN OCEAN

Although China has provided generous support to the global anti-pandemic fight, there is still some voices of doubt. As State Councilor and Minister of Foreign Affairs Wang Yi said in a speech At the French Institute of International Relations last August, this pandemic is just like a mirror to reflect sophisticated international circumstances where partnership and collaboration are mingled with notorious blame games, unilateralism and bullying[8]. China has reached out to the international community simply out of humanitarian assistance as people throughout countries in the world are in a community of a shared future. China's efforts to keep the pandemic under control and its open, transparent ways of information sharing and tremendous support to help other countries elucidate China shouldering key international responsibilities.

Looking at neighboring geography, China and countries in Lancang-Mekong Region supported each other and shared weal and woe to interpret the value of the Lancang-Mekong community with a shared future. COVID-19 can be a precious opportunity for finding new channels of cooperation between China and other Lancang-Mekong countries. When COVID-19 first appeared in China, head of Myanmar, Lao PDR, Thailand, Vietnam and Cambodia made phone calls to Chinese President and Premier. Governments, companies and people from all walks of life in Lancang-Mekong countries showed much support to China, which reflected affiliation and friendship between the two sides. When other Lancang-Mekong countries experienced the pandemic, China repaid immediately and gave generous support to other Lancang-Mekong countries in monetary and in kind. China donated all kinds of relief suppliers to those countries, including protective suits, surgical masks, medical equipment and sent medical teams abroad. China officially released the digital versions of *Multilingual COVID-19 Precaution Handbooks* to share prevention and control experiences in five different languages, specifically Myanmar, Laotian, Thai, Vietnamese and Cambodian.

Chinese Premier Li Keqiang said during the 3rd Lancang-Mekong Cooperation (LMC) Leaders' Meeting, Lancang-Mekong countries need to build a network of "fast tracks" and "green lanes" during the COVID-19 new normal. China plans to set up *Special Public Health Fund* under the LMC Scheme, and continues to provide pandemic supplies and technological support to Lancang-Mekong community with our capacity.

Multilingual COVID-19 Precaution Handbooks

8 Wang Yi. Upholding the Trend of Peace and Development of Our World with Unity, Cooperation, Openness and Inclusiveness. A Speech Made at the French Institute of International Relations

METHODOLOGY

Research Methodology

According to Collins Online English Dictionary, "A methodology is a system of methods and principles for doing something, for example for teaching or carrying out research[9]". While methodology is a systematic way to tackle an issue, methods focus on more specific schemes and steps taken in addressing a problem. In this study, quantitative and qualitative approaches are adopted. Processing news articles reflects a quantitative procedure, which allows us to collect news data on a massive scale for analysis and comparison for the purpose of finding out regularity. Qualitative methods are adopted when carrying out interviews of technology providers, namely Shukun Technology, Shanghai QR code research and development team and DJI, which promotes our understanding by diving into details of each case. Moreover, participants as technology users from various sector participated in interviews on the subject matter in hope of gathering views from their own perspectives.

Processing News Articles

This study searches news articles through key words, such as ['疫情 (pandemic)', '新冠 (corona virus)', '肺炎 (pneumonia)', '新冠病毒 (COVID-19)', '抗疫 (pandemic prevention and control)'] from China's mainstream media specifically People.cn and Xinhua.cn. The total number of news reports are 14,475 through the above retrieval, among which 10,547 are from People.cn and 3,928 are from Xinhua.cn. The study excludes repetitive articles calculated according to the news headline and gets 14,430 journalists reports. Then a second selection is done through [above mentioned key words] plus [5G, AI, Internet, Big data, 3S] etc., and ultimately 389 pieces of news reports closely related to the subject that we aim to discuss emerge as the source data.

9 Definition of methodology. https://www.collinsdictionary.com/dictionary/english/methodology

The above news articles were processed by filling out a questionnaire (Appendix A: Questionnaires for Processing News Articles) designed to get important information for further analysis, such as news headlines, date, source media, website, types of technologies, equipment, tools or applications adopted, relevant sectors, venues, cities or places of deployment of the technology, and explanation of how it works. Questionnaire link is created on wjx.com, news articles were summarized through filling out questionnaires for one piece of news. Totally 230 questionnaires were completed and irrelevant articles are excluded for a second time after thumbing through all the source data news. In the end, 230 pieces of articles are valid for our final analysis.

From the data elicited, it is distinct to get information regarding specific technologies adopted in China, specific names of companies, application fields and etc. With the help of wjx.com, data of questionnaires were extracted. Then two bar charts regarding proportion of News from mainstream media in China and each month were drawn. Ring charts regarding diverse types of technologies, fields, venues and cities of technology application were derived through analyzing the data. Details will be discussed in the 'Findings' section.

It is apparent from judging on the above charts that in the era of technology, big data and AI are widely used mainly in medical sectors, administrative management, transportation, education and etc. for various purposes, such as COVID-19 diagnosis, cases tracing, body temperature measurement and etc. UAV for in patrolling and traffic guidance, promoting pandemic prevention knowledge to the general public, parcel delivery, pray disinfection in various venues. The above types of technology will be the focus of this study.

Providers' Interviews

As a qualitative approach, interviews can resolve confusing questions and explain more details immediately[10]. When there is the need to study something more elaborately, carrying out interview is a suitable way. Usually, interviews are productive[11], interviewees may elicit their ideas in an informative and explainable way, which allows researchers to collect data and information efficiently. Through an interactive and communicative exchange, interviewers are able to spot some new ideas and ask specific questions more in depth. The whole process can be recorded and referred back for further reference afterwards.

In this study, researchers tended to conduct interviews with Shukun Technology and Shanghai QR Code research and development team. With the support of MI and through preliminary preparation, an official letter was sent to Shukun Technology as a request for the interview. Due to the strict pandemic control regulation in the past two months in Beijing, Capital city of China, we are not able to visit Shukun Technology in person finally which is out of our control. But Shukun Technology gave this research tremendous support by answering all our research questions in written form and voice messages. Face-to-face interview is conducted in Shanghai with QR code research and development team and DJI. The interview with Shanghai QR code lasted for about 1.5 hours by answering questions ranging from the research and development process of QR code, its function and efficient role during the pandemic control, to suggestions for other Lancang-Mekong countries in fighting COVID-19. The interview with DJI lasted for about 2 hours by answering questions prepared beforehand. And some random questions are also raised up during the whole interview. Details are discussed in the 'Findings' section.

10 Cohen L, Manion L, Morrison K. Research questions[M]//Research Methods in Education. Eighth edition. New York: Rout-ledge, 2017: 165-172.

11 GONG Cui-ling. [J]A Study of Data Collection based on the Analysis of Interviews and Questionnaires. Overseas English, 2020, (3): 275-276.

Users' Interviews

Interview questions targeting at China's utilization of latest technology in addressing COVID-19 are designed. It is mainly composed of four parts, specifically general information, observation, impact and outcome of COVID-19 containment. Questions include personal information, specific measures taken in tackling COVID-19, effect brought by the pandemic and assessment of China's prevention and control efforts. Around fifteen participants from government, state-owned/foreign enterprise, civil aviation, healthcare, education, journalism, finance and banks hotels, and etc. were invited as representatives of ordinary people to speak about their experiences and opinions towards China's prevention and control measures and evaluation of China's assistance to other countries. When all the interviews were accomplished, participants' views were collected and analyzed in depth.

Interview Technique

Through the above interviews, it is apparent to notice that thorough preparation is crucial to guarantee successful interviews. This means that relevant research on the topic and interviewees must be done. If the interviewer is purposeful and determined, she/he may bring much more active atmosphere on site, thus creating a good rapport with the interviewee. Making sure that technical support such as videos and cameras are adjusted in the right place is a must before the interview and recording. During the process, interviewer tends to be a good listener and open questions can encourage interviewees to speak out his/her minds freely. For interviewer, one is supposed to make him/her understood, which means to articulate each question clearly. When interviewees are willing to speak out their minds freely, it is advised to give the floor to them and interviewer takes notes for further reference.

FINDINGS

Primary Findings on Big Data

Application of Big Data and Internet

According to the latest statistics from the Ministry of industry and information technology, China has 1.6 billion mobile phone users (There are three telephone operation companies: China Telecom, China Mobile and China Unicom, some people may use two or more phones), and new technologies specifically big data and Internet enable real-time, accurate and comprehensive support for pandemic prevention and control.

Through big data, we can statistically analyze the dynamic flow of people across the country, especially in key areas such as Wuhan and Hubei, and analyze and predict the dynamic flow of key populations such as confirmed cases, suspected patients, and close contacts. For example, people in China are familiar with the applet in WeChat called National Government Service Platform, which is a standardized data sharing and service channel. Based on big data, this platform can provide real time pandemic situation, close contact check-up, nucleic acid testing risk level of a certain district and medical guidance, etc.

Chinese people buy tickets in the website, https://www.12306.cn, which includes massive information regarding travelers and routes. If there are confirmed or suspected passengers on the train, relevant information of the passengers and other passengers on the same train can be retrieved. This measure is quite essential during the early detection of cases.

Many enterprises used personal health record system for employees to report their health status daily. Big data on the map can demonstrate a general information of the flow of people. These measures will contribute to the policy making and resumption of work after the pandemic.

The use of big data can also simplify the information collection process to some extent, Hangzhou took the lead in launching a health code nationwide, using a red, yellow and green QR code as a digital health certificate, which improves the efficiency of pandemic prevention and control, as well as technically avoids "filling out forms to fight the pandemic."

On the other hand, the internet shows its strength in the modern times. On February 3, China Internet Network Information Center (CNNIC) released the 47th "Statistical Report on China's Internet Development Status" (hereinafter referred to as the "Report"). The "Report" shows that as of December 2020, the number of Internet users in China was 989 million, and the Internet penetration rate reached 70.4%. The fight against the pandemic has accelerated the development of China's Internet industry.

At the beginning of 2021, affected by the COVID-19, the user scale of most network applications has shown a substantial increase. Among them, the user scale of online education, online government affairs, online payment, online video, online shopping, instant messaging, online music, search engine and other applications has increased rapidly with an increase of around 10% compared with March of 2020.

Due to the postponed reopen time of schools across the country, 265 million students generally switched to online courses to make sure that their study was not lagging behind. At the same time, the online retail has become an important driving force for reviving the economy. As of December 2020, the number of online shop users in China reached 782 million, an increase of 9.2% from the March of 2020. National online retail sales increased by 10.9% compared with 2019, along with retail sales of physical goods accounting for 24.9% of the total retail sales of consumer goods.

The national integrated government service platform has played a strong supporting role in pandemic prevention and control. As of December 2020, the number of online government service users in China has reached 843 million, an increase of 17.8% from the March of 2020. During the pandemic, the national and regional integrated government service platforms provided pandemic information services, implemented online management, and assisted in the advancement of precise pandemic prevention, which has become a new channel for innovative government management and optimization of government services.

Shanghai QR Code Research and Development Team's Interview

Owning to solid foundation of information infrastructure, high popularity of mobile phones and concerted coordination from different departments, adopting digital measures to monitor the pandemic is no truer than a canal is formed when water comes. Interviews with Professor Lin Li, the team leader of Shanghai QR code, focused on the following four main aspects, namely the significance and function of technology empowerment in containment process, application of big data and ensuring personal privacy, the rising awareness of public general in coordinating with government guidance, suggestions for Mekong countries in COVID-19 response and in the post corona new normal.

Lin used to lead a team for developing an application named Suishenban (an application providing various types of municipal services to citizens). Bases on research and successful implementation of this mobile application, it is logical to resort to technological measures, specifically by designing a QR code.

By utilizing big data and the internet, various types of information, for instance, personal location, visiting pandemic affected districts, traveling by train/bus stations or airports, whether gotten a fever or not, and etc. were extensively collected. Three risk statues marked with red, yellow and green colors are evaluated based on national and local public administration data accrued from Shanghai big data resources platform.

Lin led a group of approximately twenty people consisting of scientific researchers and volunteers. Guided by Shanghai Municipal government, this team began to undertake this program. At the beginning, there was no payment for those scientific workers and many of them gave up holidays working around the clock; thus, the first addition went alive within 48 hours. After the application is done, the development team has made over twenty times of upgrading to improve its function. This includes supporting high volume of scanning needs in peak time, ensuring its safety on data protection, etc.

When a specific user scans the QR code by WeChat scan or Alipay scan, he/she will need to input his/her basic information about where does he/she live, did he/she got a fever in recent days, did he/she recently closely contact with infected etc., When fulfill the questions, his/her QR code will emerge in three different colors. It is quite straightforward to comprehend meanings representing by each one: green code meaning allowed to pass, red code indicating observation needed and red code warning quarantine immediately. This dynamic code cannot be counterfeited, changed or replaced by a screen shot. This code is secure enough as it only displays basic and necessary information needed for checking staff, such as name, health status and trajectory. Other personal information is well encoded and managed by government authorities.

Lin mentioned in the process of utilizing big data, different departments are cautious in monitoring individual information. All the data collected and simply combined together from different departments, such as Department of Transportation, Bureau of Public Security, telecommunication operators, and etc., and no extra surveillance has been done on individuals. The combination of personal data is for the purpose of pandemic control, all the information has been strictly processed by the government and the revealing of personal information has been minimized. Shanghai QR research and development team has not taken the suggestion of using more than three different colors to display health status of a person, as more colors might expose much more personal privacy than needed in the containment process.

Tackling COVID-19 is a comprehensive task requiring coordination from the whole society. A single person or certain department cannot accomplish the entire project. Without highly cooperative actions taken across all sectors, pandemic control is a heap loose of sand. In some countries where wearing surgical masks for prevention yet remain an issue of common consensus, it can absolutely hinder carrying out of relevant measures by its authorities. In fact, China's strict measures enable relatively free flow of people, which ultimately making people enjoy leisure and free time. Chinese government is trusted by people and ordinary people are willing to follow the guidance of its government. Those measures including strict social distancing rules, prompt lockdown and mass nucleic acid test. People normally have strong sense of law and abide by rules and regulations and they adhere to science and medicine to address issues. All the above factors contribute to the final success of pandemic control. The government aims at providing better services to people instead of purely monitoring the public. People of all the provinces and municipalities took the initiative to cooperate with government at all levels. It is noticeable that QR code or technology functions as adhesive bonding people and COVID-19 containment together.

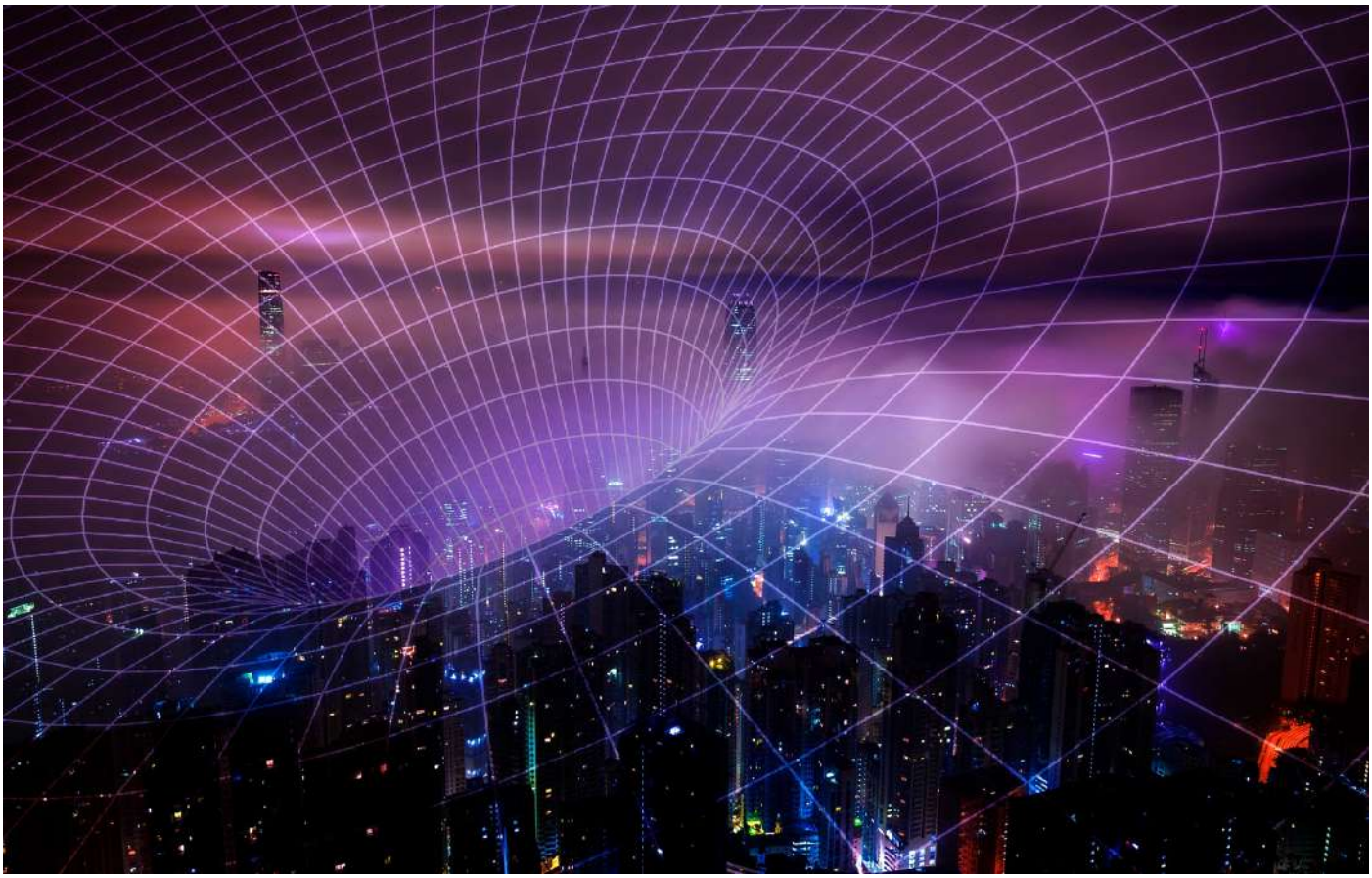
Lin introduced that Shanghai QR code is widely adopted at all public venues in which people need to enter. Shanghai and Zhejiang Province took the lead in developing QR code, then other cities in China followed suit. In Beijing, the same measure is called Health Kit and Health Code in some other cities. This method has largely facilitated and increased efficiency of pandemic control across China. With the same idea, Shanghai QR code contributes to smart city construction. It is not necessary to bring along personal health insurance card when going to hospitals, taking subways/buses. Swift scanning of the card is enough to show your identity and make payment. Personal ID and driving licenses can also be traced by scanning a QR code.

Suggestions for Other Lancang-Mekong Countries in Big Data Construction

According to Professor Lin, so far, our QR technology has yet exported to other countries as it requires strong foundation of information infrastructure construction and close coordination of different departments for data collection and integration. Although QR can be applied in other countries other than China, without a solid base it could be challenging to export directly. The research and development group of QR code belongs to entire team with over a hundred people working for Suishenban application. That's why it turns out to be efficient for making it alive within a few days.

As for other Lancang-Mekong countries, Professor Lin's suggestions are as follows. First and foremost, process advancement will be achieved through a gradual, orderly and reciprocal way. This indicates that if efforts haven't been done, network will remain the same level as before. Network of 2G□3G or 4G speed is not going to upgrade unless consumers and the markets push it to do so. Well-designed application will attract an increasing number of users, in turn people would feel that the current network is not enough, further stimulating the development of faster network. Step by step, major headways can be achieved in this field. Other Lancang-Mekong countries are supposed to devote more energy into exploring technologies and accumulate their own experiences for future development. Secondly, awareness of vital role played by technology should be raised. Frankly speaking, science and technology is the first productive force that exerts crucial impact of on the development of economy, society and people's lives. Technology is undoubtedly a beneficial industry, whose achievements can forcefully impel the holistic social and economy growth. In the era where modern technology and digitalization gain their dominance, positive impact of technology will loom large. Countries should embrace technology and be determined to build up this capacity in due time. They should not necessarily be a follower of QR code, but may resort to other similar IT technology for bettering cultural lives of their people or public services of government. When its sound foundation of information is in place, it will take a leap to achieve anything induced by it.

Utilizing technology does not mean abusing it privilege on personal surveillance, and no one can guarantee one hundred percent effective outcome in the containment process. It is rather an alarming scheme, when colors show that there are people from medium and high rick areas, it is high time that some measures must be taken. Experiences across China reflects satisfactory results, and it owes not fully to itself but all kinds of cooperation and other methods.



Scanning, Syncing, and Staying Safe

KEY POINTS OF BIG DATA AND THE INTERNET

Information and data sharing

Health status monitoring

Contact tracing

Data collection and integration from different departments/sectors

Color-coded digital health certificates

Developing a sound IT infrastructure

Practicing multi-sector collaboration

Harnessing innovation and technology

Primary Findings on AI

Application of AI

AI means that human intelligence is programmed inside a machine to make it undertake a task for us like real humans. During the outbreak of the pandemic, thousands of new confirmed cases were reported every day. Traditional check-up and confirmation process take much longer time, which increased the possibilities of new infections. AI assisted in the process of CT medical imaging for diagnosis of new corona-virus pneumonia, which could decrease the time spent for confirming each case from over ten minutes to a few minutes. The highly efficient and time-saving technology released the burden of front-line medical staff and most importantly spared extra time to save patients' lives.

Besides, Alibaba Cloud has provided AI computing to support scientific research such as the virus gene sequencing, R&D of drugs and medicine and etc. In this way, many human resources are saved and the efficiency of work is elevated.

Shukun Technology's Interview

Shukun Technology is a high-tech business start-up founded in 2017, mainly providing AI diagnosis and treatment solutions, and its leading product including "Digital Heart", "Digital Lunge", "Digital brain", and etc. Interview with this company mainly focus on the following aspects, specifically timeline and experiences for developing AI aided imaging diagnosis system, unique strength of the enterprise, advantages of AI imaging system, suggestions to other Lancang-Mekong countries.

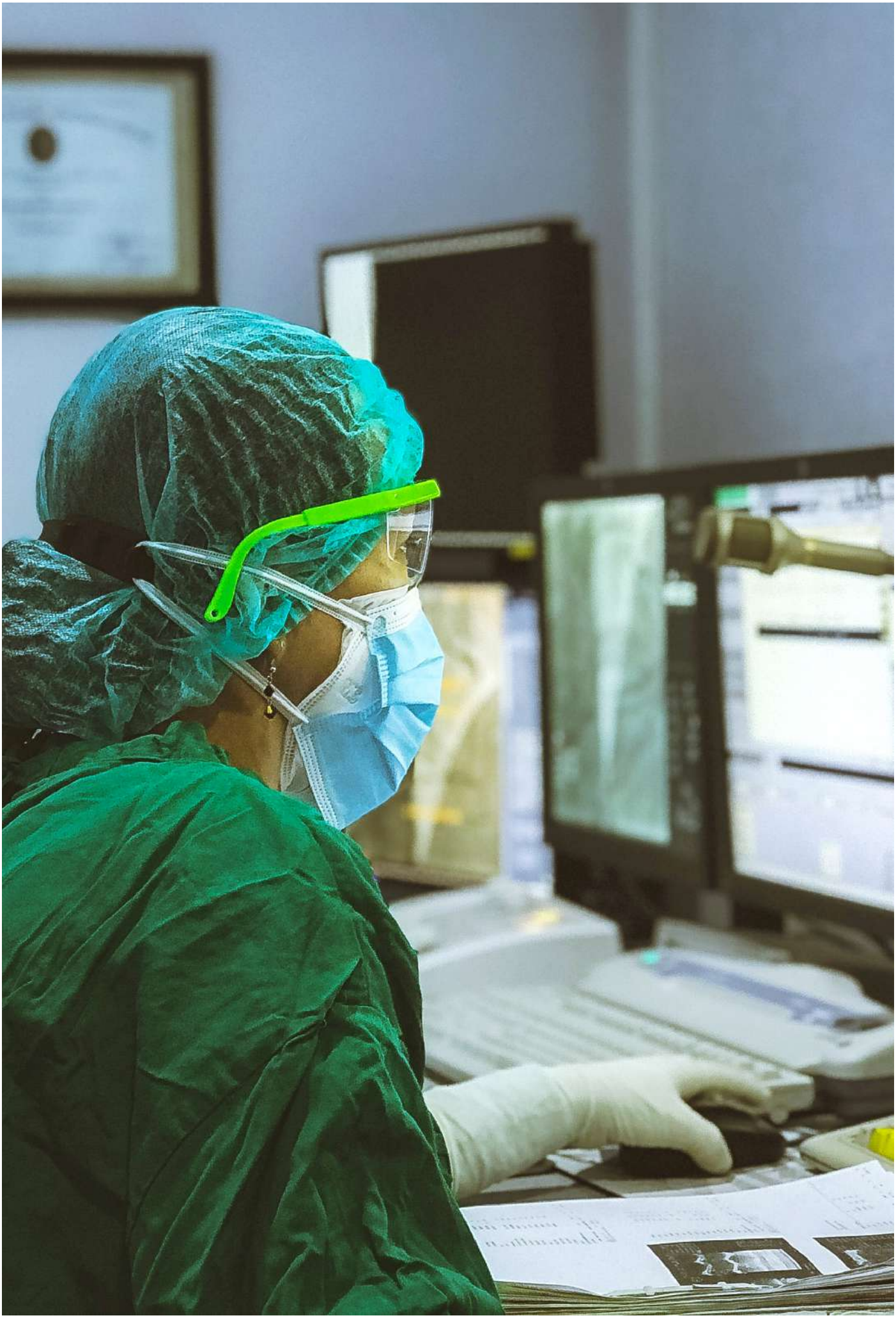
Shukun Technology began its move in developing PneumoniaDoc from Chinese Lunar New Year Eve. On February 3, 2020, the office of the National Health Commission issued a notice on strengthening information technology to support the prevention and control of COVID-19 infection, which requires that information technology should fully leverage its supporting role in assisting pandemic research and judgment, innovating diagnosis and treatment mode, and improving service efficiency.

On February 4, the Ministry of Industry and Information Technology issued a proposal of giving full play of artificial intelligence empowerment and making concerted efforts to fight against COVID-19, further identifying priority task as developing auxiliary diagnosis related product or application.

On February 14, 2020, General Secretary Xi Jinping chaired the Twelfth Meeting of the Central Committee for Comprehensively Deepening Reform and delivered an important speech. He encouraged the use of digital technology such as big data, artificial intelligence and cloud computing to support pandemic monitoring and analysis, virus tracing, prevention and treatment, resource allocation and etc.

Beijing Municipal Science & Technology Commission coordinated with Beijing Municipal Health Commission and Beijing Hospital Authority, promoting the deployment of Shukun AI imaging in Beijing Ditan Hospital, Beijing You'an Hospital of Capital Medical University, Beijing Xiaotangshan Hospital and etc.

In such a short notice, Shunkun Technology has been successfully in developing AI-assisted Imaging Diagnosis System largely attributes to three main advantages. Firstly, Shukun Technology developed its original AI network and algorithm model, supplying over a hundred national patents for inventions. This AI imaging system functions as a digital doctor enabling automatic detection, segmentation, concise quantification and automatic comparison, assisting human medical staff doing the job swiftly and providing more accurate information for clinical treatment. Secondly, Shukun Technology established a good cooperation mechanism to work along with doctors and hospitals, which allows itself to gain valuable experience and feedback from front lines. Shukun Technology cooperated with Wuhan Hospital of Traditional Chinese Medicine for the research and development of various projects. AI imaging system iterated and upgraded to ultimately meet clinical needs. Thirdly, Shunkun Technology's R&D personnel are composed of elite AI and medical scientists. Its staff used to work in International Business Machines Corporation, General Electric and other top world IT giants, and some of them have graduated from Tsinghua University, Massachusetts Institute of Technology, Stanford University and other world-renowned research centers. Employees have shown their excellence in winning AI competitions, such as Kaggle AI competition and etc., and they have been granted over one hundred patents. Its R&D team work closely with doctors for developing specific systems and publish research papers in SCI journals.



This PneumoniaDoc was independently developed by Shukun Technology. This system can shorten the workflow of one patient from 10 minutes to just 2 seconds. It can identify Computed Tomography (CT) images quickly and accurately, evaluate and follow up, assess imaging changes of a patient from common to severe type.

During the outbreak of the pandemic, human doctors have to read a high volume of CT images of one patient. AI is a viable approach to replace repetitive work for human doctors, thus releasing the burden of human resources. Within seconds, PneumoniaDoc identifies lesion areas automatically and presents concise analysis. Simultaneously, a large number of patients can be screened during the peak time of hospitalization. Reexamination and follow up can be realized through this system. Overloaded hospitals benefit from PneumoniaDoc, and patients seized precious time for further treatment.

CT is one of the mainly important means of COVID-19 pneumonia diagnosis. On one hand, it is useful for early detection and treatment, on the other, it provides valuable information for quarantine and swiftly respond to public health event. The rapid outbreak of the pandemic posed a shortage of medical resources to our society. According to image doctors from Wuhan, during the most trying of times, they were supposed to read four times the CT images than ordinary time. Even doctors worked on a shift twenty-four hours a day for seven days a week, it was far less satisfactory to catching up the speed.

PneumoniaDoc by Shukun Technology

Shukun Technology donated its PneumoniaDoc to hospitals, alleviating urgent needs of hospitals through detection of millions of patients. For its tremendous efforts done in the pandemic control, Shukun Technology has received honors by the Ministry of Industry and Information Technology and Beijing Xiaotangshan Hospital. Shukun Technology continued to contribute its efforts in international community, they helped countries hit hard by the pandemic by donating the system.

The shortage of medical resources is a global problem, and how to promptly expand the supply capacity of medical resources and improve operation efficiency of medical resources remain an acute issue. AI, big data, cloud computing and other emerging technology has brought and will continue to elevate production efficiency and expand the current capacity, and make breakthroughs in health care industry. Its application in medical industry appears as a new "weapon" for doctors, and this will definitely reshape working style of image doctors and advance the development of imagology.

Suggestions for Other Lancang-Mekong Countries in AI Application

AI plays considerably a positive role in increasing medical resources supply, improving local medical supply capacity and efficiency. Local communities, organizations, medical institution need to take concerted efforts to reach the consensus to attach importance to the cultivation of AI industry.

In terms of development and localization of AI, technological enterprises need to cooperate with local medical institutions. Gaining support, trust and collaboration from hospitals and medical staff is vital for each stage of AI, specifically in its design, research, application and feedback. This determines whether AI can be successfully applied in the clinical practice or not. AI companies need to establish a scheme of good rapport with hospitals for the purpose of researching and developing products for clinical needs.

Minimizing Risks, Maximizing Efficiency

KEY POINTS OF ARTIFICIAL INTELLIGENCE

AI-assisted imaging diagnosis system

Virus gene sequencing

Medical R&D

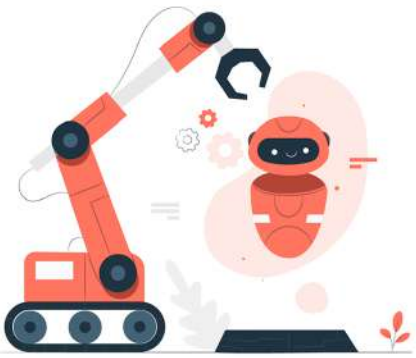
Shortened workflow of a patient

More accurate information for clinical treatment

Time saved = Lives saved

Improving operation capacity and efficiency

Creating breakthroughs in the health care industry



Cultivating the AI industry

Cementing cooperation between technological enterprises and hospitals

Encouraging participatory approach in the development process

Primary Findings on UAV

Since China launched national Level 1 public emergency response in January, DJI made a decision through convening a corporate meeting that utilizing its product UAV to assist the pandemic control. Through making industrious coordination and getting over numerous difficulties, DJI mobilized and assembled UAV manipulator, UAV for disinfection and disinfectant by the beginning of February. DJI launched "Battle against the Pandemic" for Pandemic Control, and meanwhile contacted several other UAV enterprises to join the efforts. Different communities, districts, schools and other organizations actively assisted in UAV outdoor disinfection. General public were guided by UAV broadcast to wear masks, remember no gathering and keep away from UAV on the assignment. These actions ensured the safety operation of UAV.

DJI's Interview

Mr. Hou Chunxuan, a manipulator from DJI introduced main areas of its UAV application. UAVs were deployed during the pandemic prevention and control mainly in the following four aspects.

This technology has been widely used in patrolling and traffic guidance. UAV facilitates management of public areas and road traffic through patrolling across wide areas and regulate congested roads, as well as comprehensively checking public areas and evacuating unnecessary gatherings. During the peak time of newly confirmed cases and simultaneously it was Chinese Spring Festival time, expressways, transportation hubs, parking lots are places rated as high venues for congestion. Densely populated people and traffic flow posed severe challenges to administrative departments. Crowdedness of car flow is considered to be high risk factors for accidents such as rear-end collision and scraping. Meanwhile, police are unable to reach the scenes timely when accidents happen. Without properly settled, accidents may deteriorate the traffic condition, thus road safety and traffic efficiency cannot be further improved. DJI UAV has been widely adopted by traffic department to unleash traffic pressure through monitoring entire road conditions and addressed drivers and crowd through loudspeaker on UAV. Traffic controllers are able to oversee and direct traffic remotely, timely detect abnormal situations such as violation of traffic rules, congestion, accidents, bad weather and etc. The data collected can be transmitted to police stations and command center of traffic control bureau, which can be referred to when needed. With the assistance of UAV, police do not need to reach the site so as to minimize personal contact and decrease the rate of infection. When UAV is patrolling in communities, its loudspeaker can remind people of keeping social distancing and wearing face masks.

UAV was a tool for promoting pandemic prevention knowledge to the general public. Pandemic control knowledge was disseminated through a loudspeaker guiding people to keep good personal protection and follow prevention rules of public places. UAV told people dos and don'ts during the pandemic period and provided guidance for people to cooperate with daily inspection. In some communities and villages, UAV was flying to broadcast countermeasures that can be done from each individual. Those slogans included "Frequently wash your hands, keep your rooms ventilated, avoid outing, wearing face masks, pay attention to personal hygiene and etc." Some of the reminders appeared to be interesting and popular, making it easier for people to follow, such as "Mask or ventilator, depends on your choice.", "No handshaking but nodding to people you meet as a new way of greeting.". During the time when people were suggested to stay at their homes, it could be much entertainment when hearing words like this. Loudspeaker on the UAV in some villages were designed to speak local dialect for people to understand. DJI UAV shortened the time need for district patrolling, increased efficiency of pandemic control, and more importantly ensure health and safety of pandemic control workers.

UAV was a courier for parcel delivery. Through utilizing UAV, medical supplies and other deliveries were able to reach people in an efficient and fast way. Compared with traditional delivery, it minimized contact opportunities and thus decreased rates of getting infected. During the outbreak, several front-line staff such as city patrollers, sanitation worker, policeman/woman, and community workers fulfilled their respective responsibilities on their posts. UAV was a smart courier for those staff on duty in that it carried needy necessary supplies on site for them, such as pandemic prevention supplies and daily meals. Communities across China implemented mode of closed-ended management to prevent the spread of the virus during certain period of time. To certain extent, communities or villages were isolated during the measures taking effect. When it was a problem for people to buy daily necessities, wise UAV was deployed by community workers to deliver those daily necessities. For those people returning from high risks areas and during their quarantine time, and senior citizens who tends to be difficult in mobility, articles for their daily use were delivered by UAV. As for temporary hospitals and other hospitals where its location is in the epicenter or streets were blocked for pandemic control reasons, UAV exerted its ability in full play and provided service to hospitals and medical staff in need.

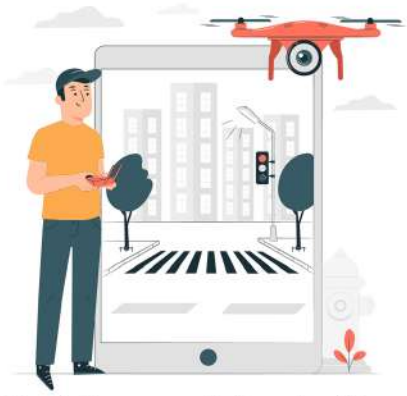
UAV was used for spray disinfection in various venues, such as industrial park, waste plant, schools, hospitals and communities. Disinfection in public areas was essential in stopping the spread of further infections. During the time when pandemic control staff was in a shortage, DJI donated hundreds of UAV and called for manipulators to conduct disinfection assignment in key areas. This technique guaranteed safety of front-line workers by controlling UAV for the work, besides it is efficient for covering 12 hectares per hour. By February 12, 2021, DJI UAV transformed from plant protection function had completed disinfection task of 600 million square meters. Compared with solely relying on human resources, UAV disinfection carrying liquid disinfectant can reach wider space vertically and horizontally and this way turns out to be more efficient. It effectively made up the shortage of relevant equipment and staff.

Suggestions for Other Lancang-Mekong Countries in Applying UAV

According to the interview, generally speaking UAV requires relatively open space for aviation. In spaces where there are many trees or poles, safety of the vehicle might be a concern. UAV does not rely on Internet when conducting assignment, this could be an advantage in remote areas that network is not available temporarily. Usually, countries formulate laws and regulations for flying UAV, and some districts are marked as no flying zones and rules must be abide by. Before each assignment, authorities need to certify or approve the action. UAV manipulators need to be trained and take professional courses before actually handling the tasks. Training courses include structure and principal of UAV, safe aviation guidance, knowledge regarding disinfection and disinfectant, relevant laws and regulations and etc. DJI has provided assistance to Southeast Asian countries such as the Philippines and Indonesia, and Lancang-Mekong countries such as Lao PDR and Vietnam. UAV assisted local disinfection in public areas such as residential quarters and streets, and positive feedback were received from local people in fighting against the pandemic. Mr. Hou reckoned that it is practical to apply UAV in Lancang-Mekong countries as long as its aviation is in accordance with local laws and regulations, and skillful manipulators were trained. Functions can be selected according to various needs and situation, such as patrolling, body temperature measurement and other sectors for instance agriculture.

From Dissemination to Disinfection

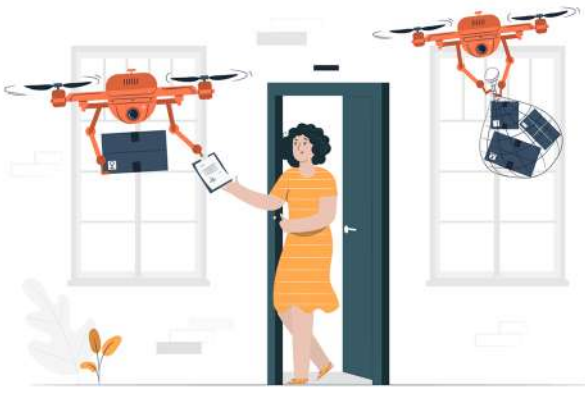
KEY POINTS OF UNMANNED AERIAL VEHICLE



Real time aerial patrolling and contactless traffic and road monitoring

Information is transmitted to police stations and traffic control bureaus

Pandemic prevention knowledge and localized public safety announcements were also aired over a loudspeaker



Faster, safer, and more efficient delivery of medical supplies, meals, and other necessities in remote and lockdown areas

Spray disinfection of public places with wider reach and coverage of 12 hectares per hour

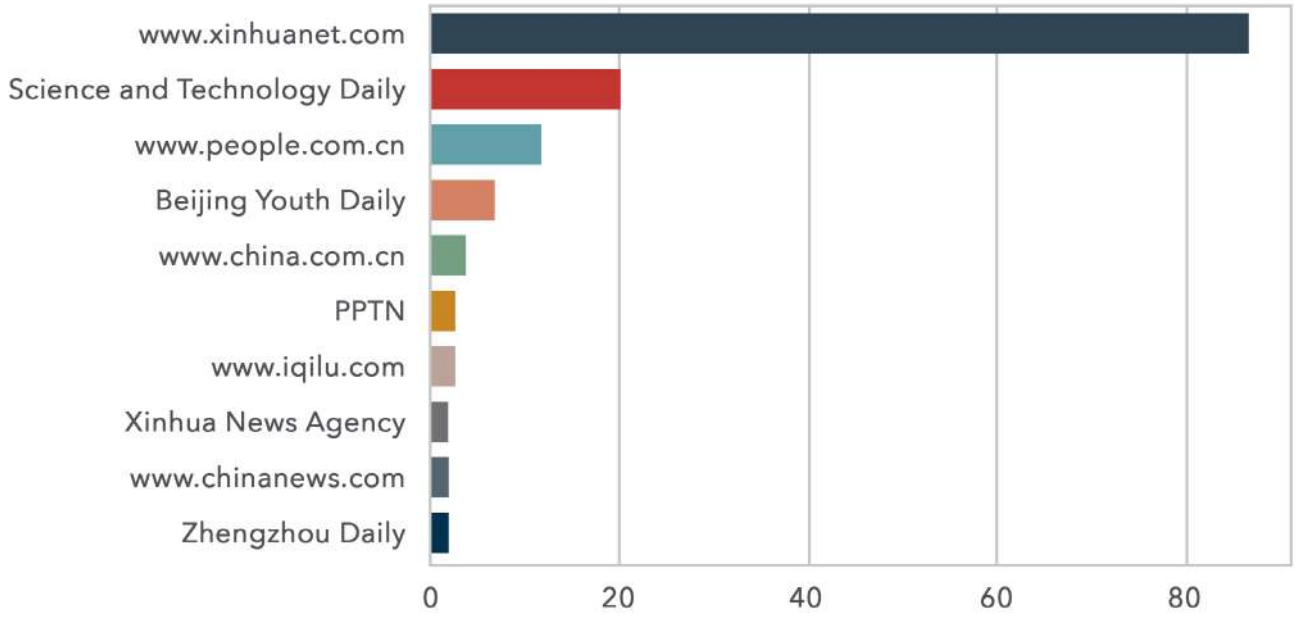
Data Analysis of News Articles

With the help of wjx.cn., a questionnaire consisting of twelve questions (Appendix A) is created to further quantitative analysis. They are 389 original news articles, then by thumbing through each one and filling out this designated questionnaire, finally 230 pieces are valid and relevant for the topic of this research. Further quantitative analysis has been conducted through wjx.cn., major results are as follows.

The following Wordle shows that during the time-period from January 2020 till November 2020, words like Epidemic, Pandemic control, Novel Coronavirus catch quite lots of Chinese netizens' attention. And Big Data, AI, 5G are widely concerned by them, people have the awareness of using technology to tackle the pandemic. Meanwhile, from key words such as return to work, economy, industry, enterprises etc. It is obvious to say that COVID-19 has affected people's daily life and they wish to go back to normal life.

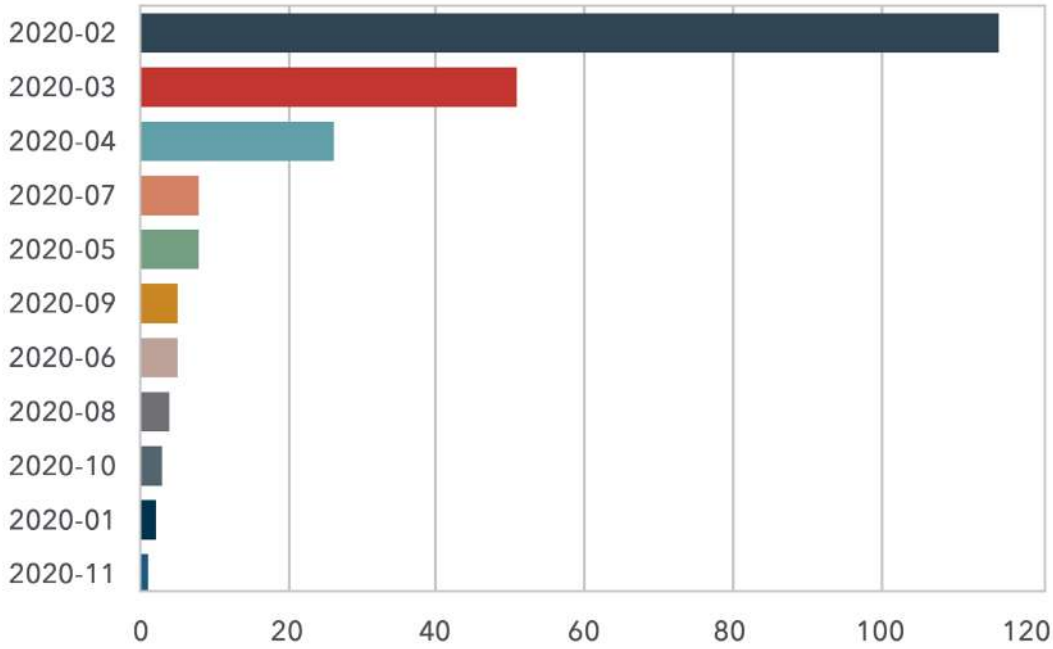
Wordle with key words mostly concerned by people

Media's attention is always audience's attention. The following Bar Chart 1 indicates that three mainstream medias in China, specifically Xinhuanet.com, Digitalpaper.stdaily.com and People.com have reported utilization of technology in COVID-19 response and the number of new articles found in the above media decrease in the same order. Xinhuanet.com far exceeded other medias in relevant reports.



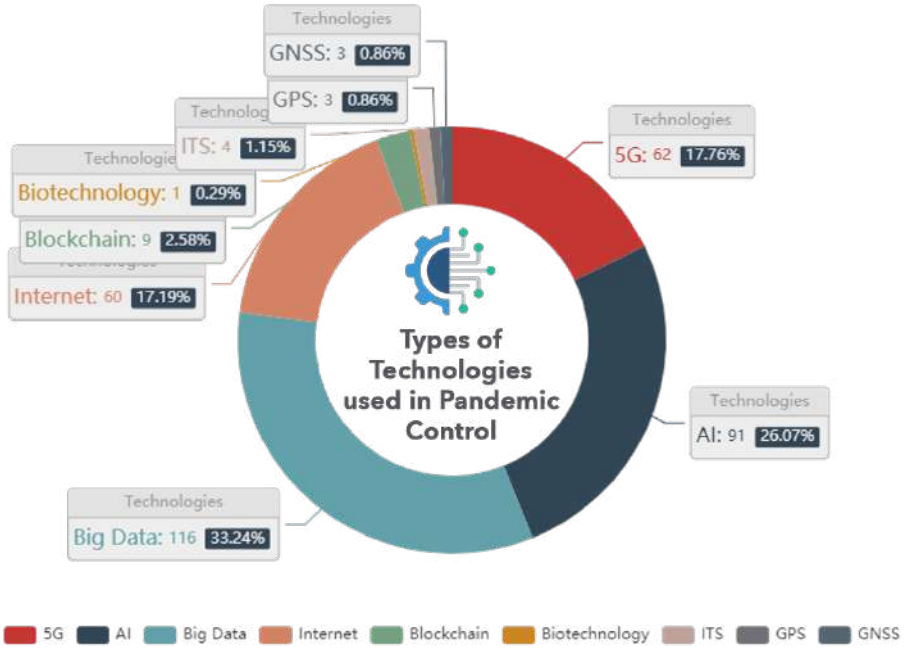
Bar Chart 1: News reporting from Media in China

During the peak time of COVID-19 outbreak in February, it can be seen from the numbers of articles as shown in Bar Chart 2 that people's expectation of getting relevant information on technological prevention and control of COVID-19 was high, meanwhile the government showed iron will in relentless efforts against the pandemic by fully deploying the latest technologies available. Technology permeated every corner of people's lives. When the virus was gradually contained and pandemic control became new normal, the number of news reports decreased.

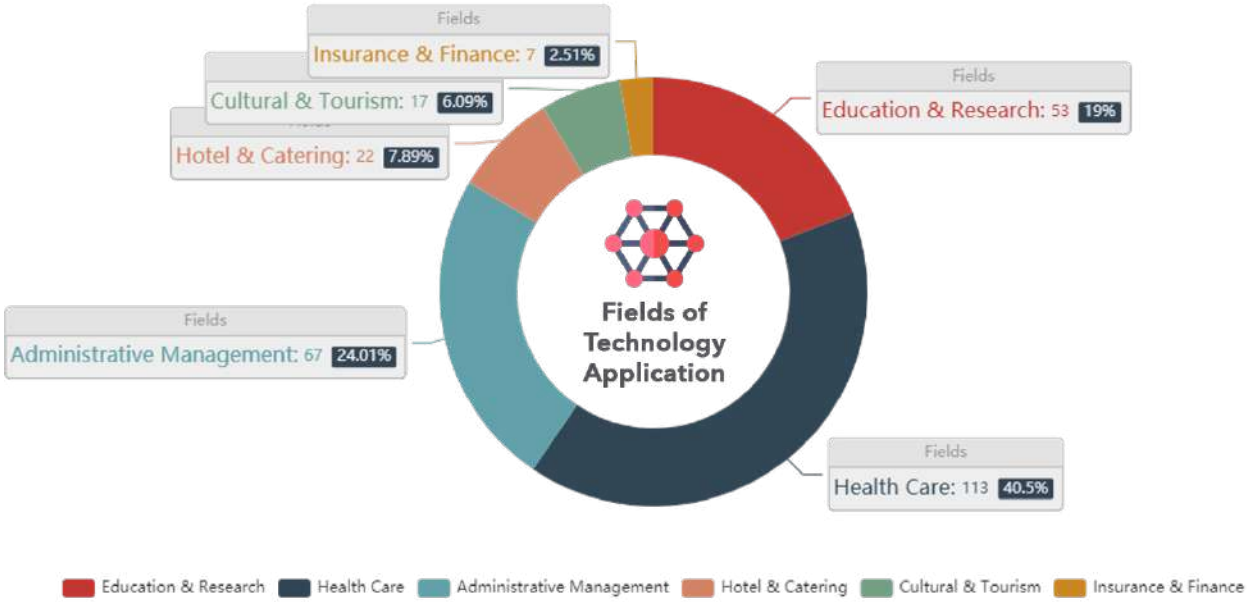


Bar Chart 2: News Concerning Technology in Each Month

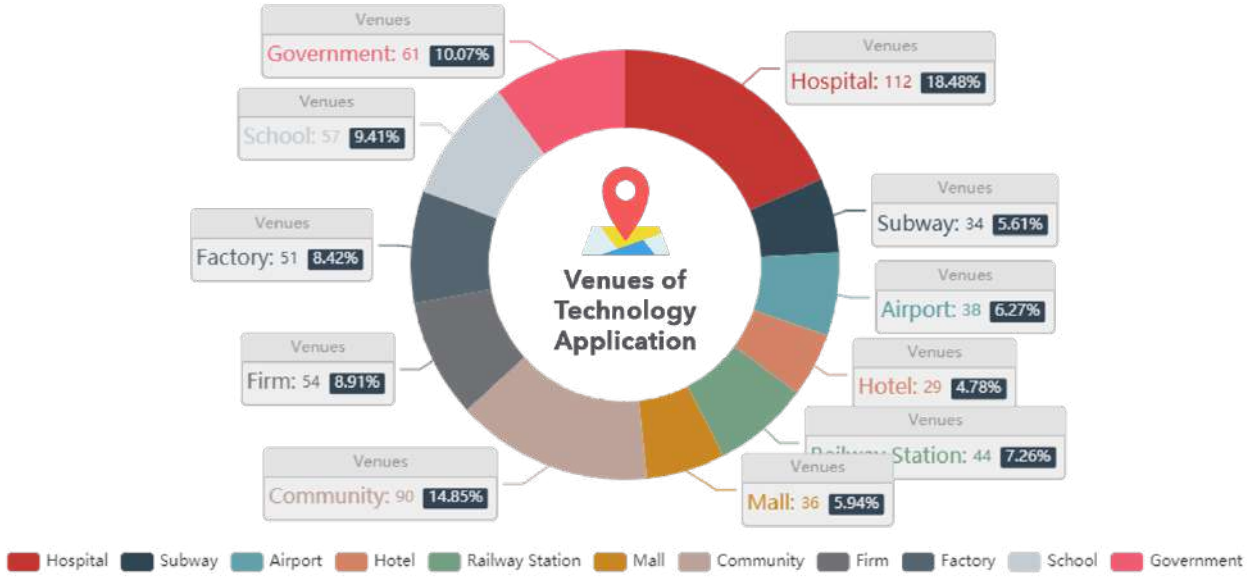
Block chain, biotechnology, digital transportation system, remote sensing, Global Navigation Health System, GIS and many other types of technologies are reported in the news, among which big data, AI, 5G and internet occupy the majority. Besides, optoelectronic technique, thermal imaging, dual light fusion technology and etc. showed a relatively high rate of utilization. QR code was widely applied at the entrance of a village or community, residential quarter, working places, enterprises, pharmacies, markets and stores for routine check, ensuring a fast entry and exist to avoid crowdedness and infection. AI was widely adopted in joint prevention and control as seen in body temperature measurement, temperature and humidity measurement. Big data has been a crucial tool for analyzing and predicting flow of key groups of people, such as suspected and confirmed cases, close contacts and etc.



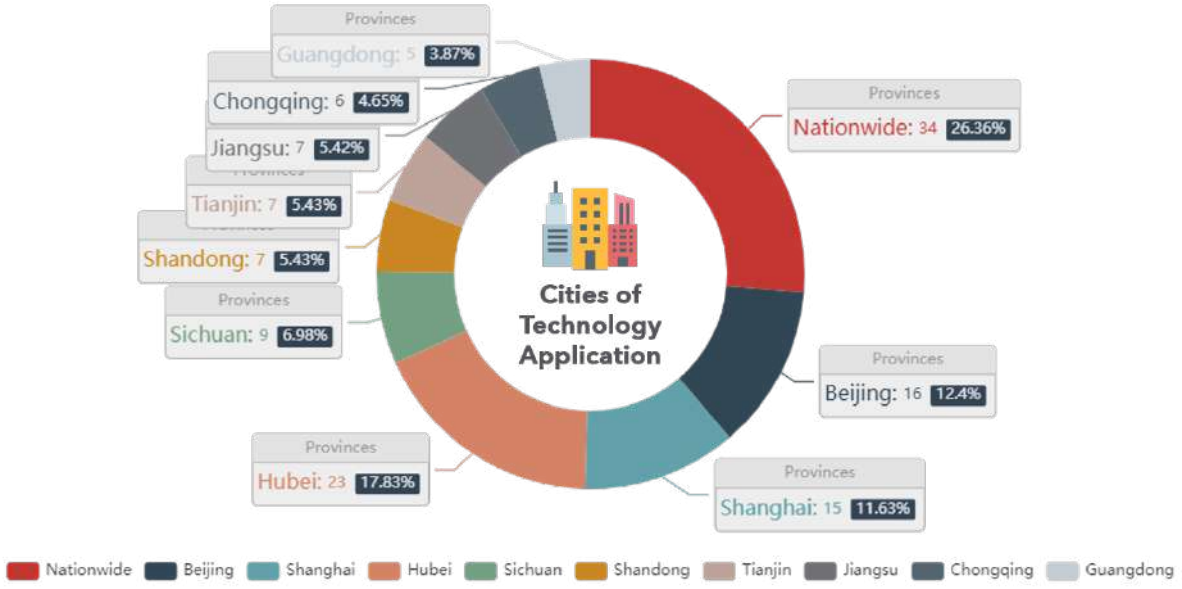
Technologies were universally applied in various sectors (Ring Chart 2), including health care, administrative management, education and research, cultural and tourism, Insurance and Finance, etc. Although COVID-19 presented enormous challenges to daily lives of ordinary people, key roles of science and technology were highlighted in its capacity to assist remote working, learning and medication, facilitate communicate and exchange, provide entertainment and social activity. For example, in healthcare, people could enjoy "ordering online and medicine delivered at door", which brought much convenience and guarantees safety for numerous patients. Online order of medicine grew into popularity during the pandemic period, and the number of new users of online order application increased dramatically. In insurance and finance sector, credit card business of banks was trailed by online use of credit cards and intelligent operation. Those banks that had equipped with new technologies showed their competitiveness.



Ring Chart 3 illustrates that technologies appeared almost at all venues of human activities, including airports, train stations, hotels, schools and universities, governments, shopping centers, residential quarters and etc.



Technology was well set in every city and province, and in metropolitans such as Beijing and Shanghai, modern technology was a driving force for the pandemic prevention and control. In Wuhan and other parts of Hubei Province where severely hit by the pandemic, technology was undoubtedly a vital approach to combat the enemy.



Reviewing Information Consumption

KEY POINTS OF DATA ANALYSIS OF NEWS ARTICLES

Trending keywords included "Epidemic", "Pandemic Control", "Novel Coronavirus", "back to work", "economy", among others

Three mainstream medias in China reported utilization of technology in the COVID-19 response

Public demand for information on technological prevention of COVID-19 was met with government efforts in deploying the latest technologies

Big data, AI, 5G and the Internet topped the list of technologies reported in the news

These technologies were utilized through QR code scanning, body temperature monitoring, contact tracing, etc.

Technology demonstrated its ability to assist remote working and learning, facilitate communication, promote e-commerce, and provide entertainment and social activity during the pandemic

Participants' Interviews

COVID-19, which has spread rapidly and enveloped most of the world, is a global public health crisis the likes of which we have not seen in a century. In the above statement, interviews with technology providers—private enterprise Shukun Technology and government-led authority Shanghai QR code have been demonstrated. Then it is high time to focus on the beneficiary, which is the users of technological advances. In this research, we interviewed around fifteen people from different fields of work to find out their opinions towards the using of technologies in fighting against the pandemic and China's assistance to the global world. Interviewees are ordinary people from government, state-owned/foreign enterprise, civil aviation, healthcare, education, journalism, finance and banks, hotels, and etc., and they told their stories and feeling towards prevention and control from their own perspectives.

From the interview, we find out that whatever fields people are working in, their trust to the government is increasing with the implementation of pandemic control measures. China's control of the virus made a great success in quite a short time. Our interviewees all agreed with China's efforts, they said that Chinese authorities released timely data in an open, transparent and responsible manner to provide people with dynamic, clear and important information so that they could fully understand the government's policies, strategies and measures to deal with the pandemic. "The public is fully informed" is the common consensus.

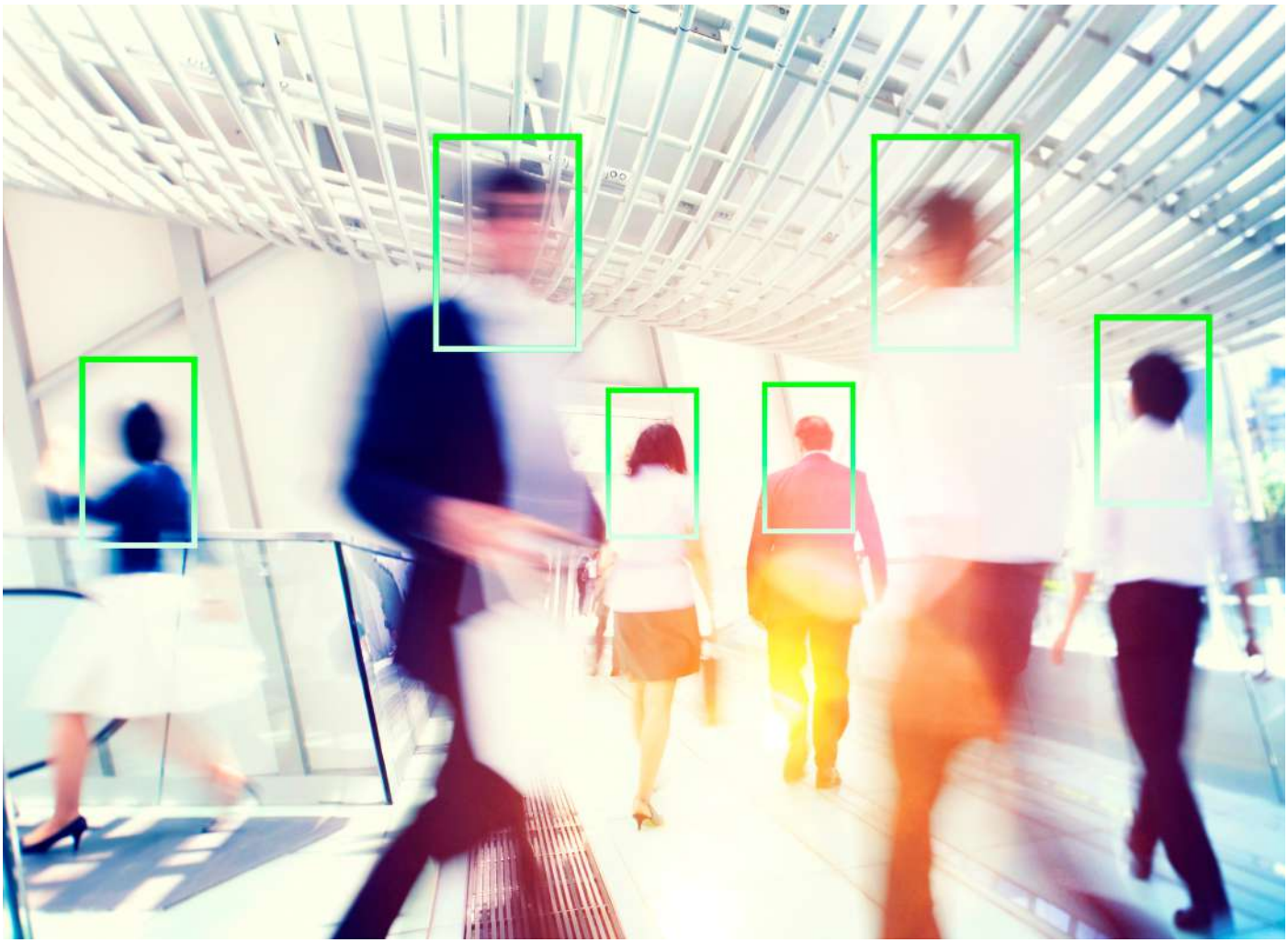
Prevention Measures

Following the start of the COVID-19 outbreak in January 2020, China implemented a wide-reaching strategy to control and contain the virus. China put great emphasis on pandemic control and prevention at the source, implemented policies such as "early detection, reporting, quarantine and treatment" and "testing all who needed to be tested, hospitalization of all who needed to be hospitalized, isolating and treating all who needed to be isolated and treated". Among the policies, most of our interviewees said that "early detection and reporting", at the same time "testing and isolating all in need" were quite effective, they thought that those strategies played an important role in reducing transmission and fatality rates.

It is safe to conclude that on a massive scale, prevention and control measures are spread out widely in every corner of the society. It is evident that government and enterprises value the health and wellbeing of its employees. All the enterprises, government bodies and various industries across China implemented technological measures, majority of them deployed thermal temperature measuring machine, body temperature gun, QR code, traveling record, daily sign in application, and etc. During daily exercise, staff will be required to report their health on time, have their body-temperature measured upon setting foot in the working place, wear surgical masks in offices, follow one-meter waiting line in canteens or other pubic venues, and etc. According to circumstance when sporadic cases happened, they might timely check if employees or family members they live with had any connection with confirmed cases and went to the places where confirmed cases visited, as well as conduct massive nucleic acid test. Some companies allowed flexible work scheme, which means employees taking shift to work in offices and remotely from home, thus minimizing the number of people staying together and decreasing opportunities for infection. For those who intended to leave the city of residence, they often were strictly required to report for approval, thus reducing the rate of unnecessary flow of people.

Technologies are critical tools in the ongoing fight against the global COVID-19 pandemic. AI, big data, 5G and robotics can provide valuable and innovative solutions for patient treatment, frontline protection, risk reduction, communications and improve quality of living under lockdown as the world continues to battle against COVID-19. AI temperature measurement system developed by Baidu was prevalent at schools and subway station. Baidu electronic entry pass or face recognition/ fingerprint system was used in many residential quarters. At short notice, pandemic risk reporting system developed by Jingdong went alive, which enabled ordinary people to report pandemic events by uploading photos and specify locations. This technological assistant could provide real time, efficient and accurate information regarding potential pandemic risks. Some of the interviewees expressed that they used or heard of automatic notification system for taking the same flight with confirmed cases developed by China TravelSky. Besides, AI computing developed by Alibaba shorten the time of gene analysis for suspected cases to half an hour, providing much labor resources for medical staff. Examples of 5G and Internet application were widely visible in the society. For instance, people were able to receive medication and education remotely, hold video conferences, have body temperature monitored through infrared temperature equipment.

Thirteen out of fifteen interviewees fully agreed with the using of Health QR codes in public places. And they thought that Health QR codes played a vital role in making sure the safe and health for both themselves and others. Health QR codes were promoted to ensure convenience for residents. Individuals could download health QR codes from government service network platforms to serve as permits for making trips, going to school or work and accessing public venues. Normally codes are in three colors — green, yellow and red — and restrictions could be imposed accordingly. This way, data on pandemic control could be collected precisely. With Health QR codes, everything was traceable while privacy was protected. Nowadays in China, especially in the post COVID-19 period, people are still encouraged to show their Health QR codes when entering every public place.



Effect and Outcome

People have been affected by COVID-19 at various scales. Some reckoned that enterprises saw a decrease of business, while individuals earned less income while facing increasing pressure. Many of the interviewees felt nervous as pandemic brought new challenges to their routines. Take teachers as an example. They used to deliver lectures to one or two classes in real classrooms. As the pandemic spread, all the courses had gone remotely and teachers were required to give online lessons that were open to students from all the campuses. As a result, it was heavily scheduled for teacher to do prior preparation, thus making faculties more stressful than usual.

Some other sectors such as hospitals are facing unprecedented challenges. They were more than ever under great stress. Nurses, doctors and other health workers were at the forefront of the COVID-19 response – providing high quality, respectful treatment and care, leading community dialogue to address fears and questions, as well as in some instances, collecting data for clinical studies. In our interview, nurses and doctors from hospitals such as Kungang Hospital in Kunming, capital city of southwest China's Yunnan province and Xijng Hospital in Xi'an, capital city of northwest China's Shaanxi Province said that they felt highly pressured during work and with the increasing of infected patients, their anxiety reached a high level than ever before.

Another immediate influence on people's daily lives is that the pandemic reshaped their purchasing habits. People said that very frequently they did online shopping when there were risks to buy in physical stores. Taobao., Tmall, JD, Vipshop, Meituan and etc. are among the top choices of online purchasing channels. A dazzling array of collections are available through simple clicking mobile phone application. Thanks to the internet and other technologies facilitating online shopping, people enjoyed a convenient way to support daily lives during this special time. One of the participants who is working in aviation used online shopping more than usual and has already got used to the life technology brought to her. Products she bought ranged from daily necessities, clothes and cosmetics to face covering products, alcohol pads and sanitizers etc. In her mind, with the convenience of technology brought to her life, China should put more efforts in technology research and provide more knowledge about how to use this technology.

Additionally, media's function in the special time cannot be ignored. Public media covered moving stories of frontline medical workers, community workers, volunteers, police officers and other officials. These stories inspired an increasing number of citizens from all walks of life to participate in prevention and control efforts across the country. From its outbreak to post COVID-19 period, our interviewees all felt that through reading articles published in different terminals of the media they were inspired to do their best to combat the virus. Some of them even wanted to volunteer in Wuhan.

When talking about the outcome of pandemic control measures, interviewees expressed their satisfaction and it is widely believed that other Chinese people holds identical views for setting a leading example to the international community. China established large numbers of makeshift hospitals, such as Fangcang Hospitals, by conversing stadiums and exhibition centers to address its blooming confirmed cases. Normally mild cases were admitted for observation before becoming severe. Open and transparent release of pandemic information assured people's worries towards the situation. Chinese central government proposed "early detection, reporting, quarantine and treatment" measure, which is an effective practice to block the transmission to the minimum. Public or private organizations followed government's guidance of canceling unnecessary gatherings and public activities helped ease the virus spreading. When asked about the most impressive moments during the pandemic, some interviewees did not deny the fact that Chinese victory was indebted to heroes who put themselves in harm's way. Many medical staff volunteered to fight in the front line, policeman and policewoman stood fast at their posts, couriers made our deliveries on time, community workers carried out investigations relentlessly, and highly discipline people coordinate with governments. It was suggested and expected by the general people that daily prevention measures such as disinfection, ventilation, keeping a hygiene habit should be extended as regularity even life is back to normal in the future.

When its domestic situation is relatively under the control, China generously provided humanitarian assistance to other countries, including dispatching medical teams, providing technical support, and making vaccine a public good for countries needed. As of March 2020, China has provided assistance to over 130 countries and international organizations to fight the coronavirus pandemic. It has sent face masks, protective suits, testing kits to 127 countries and 4 international organizations, 13 medical teams to 11 countries and held over 70 video conferences sharing experience and data with more than 150 countries and regions as well as international organizations. Chinese people are supportive of assisting other countries and organizations. Some of them stated that China has a long history of helping others, some others thought that it was more blessed to give than to receive. Moreover, some interviewees said that for such as big country like China, it was our duty to shoulder more responsibilities. A participate from media said that her organization provided help to Myanmar, and the other participate from aviation said that her company provided support to Myanmar and Thailand by donating facial masks and protective suits. Another participant from China CITIC Bank expressed that his bank supported the students in America with prevention equipment.

Conclusion from Participants' Interviews

With concerted efforts across the whole nation, China weathered the storm and continued to adjust relevant measures in the post corona era. Great courage and will helped taming the spread of the virus, marking an initial triumph for the country. China has a culture of united will. People actively participated in the nationwide fight against the virus: a "people's battle" powered by a united will. Relying strongly on people is a key component in "winning the battle". Chinese people trust their government because they have bettered their lives for several generations. The people also expect a bright future. They are aware that peace and stability are essential to realize what China has achieved and this requires strong leadership to bring it about.

The pandemic was considered a major public health emergency, requiring a wide range of strong prevention and control measures. Millions of Chinese medical workers fought on the front line in the battle against COVID-19, risking their lives to save many others. They are the ones who brought light and hope to the nation at a dark time. Over the past months, China has shared technical documents on treatment protocols and containment strategies with a total of 180 countries and over 10 international and regional organizations.

When referring to decision-making mechanisms and fundamental strategies and policies, it cannot be ignored that strong leadership, a comprehensive mechanism and broad support are the key factor. Strong leadership ensured the right direction and strategy in fighting coronavirus. In times of the unexpected COVID-19 outbreak, the Central Committee of the Communist Party of China (CPC) has maintained its grasp over the situation while taking decisive actions. More than 4.6 million grassroots Party organizations led the fight on the ground across the country. A comprehensive mechanism could fully cope with the COVID-19 crisis. Public health emergency is not only a serious health issue, but also "a complex economic, social, and political problem", which needs systematic responses. In January, China set up the Joint Prevention and Control Mechanism of the State Council at the central government level, consisting of 32 agencies and covering disease prevention and control, scientific research, publicity, foreign affairs, logistics support, and frontline work. The total number of confirmed cases stands at 101,241 and the death toll at 4,831 on the Chinese mainland, while 733 asymptomatic patients are under medical observation. Broad support was crucial to battle against COVID-19. This was "people's battle" and everybody played a role in China. Face covering, social distancing, self-isolation, and quarantine were effective ways to reduce the virus spread. However, those practices need individual discipline and full obedience. With the understanding and cooperation of 1.4 billion Chinese people, the Chinese government was able to implement the most comprehensive prevention and control measures to battle the pandemic.

Prevention and Action

KEY POINTS OF PARTICIPANTS' INTERVIEWS

15 interviewees
from various sectors

Shared effort coupled
with a strong sense
of public trust

Government's transparent
and accountable COVID-19
response and management

Citizen patrol app enabled individuals
to report pandemic-related events by
uploading photos and sharing information

Mass testing, early detection, reporting
+
Health and safety protocols in place

The Chinese experience rests on

strong leadership

comprehensive and
systematic approach

unwavering unity
and collaboration

REFLECTIONS

Conclusion

The year 2020 is unextraordinary in the teeth of COVID-19 strike, and the situation of the world is yet fully under control and uncertainties intensify for the future. When the pandemic appeared in China, the whole country calls forth its own energy and resources, China finally won the battle against COVID-19 and has continued contributing its efforts to the international community in the post corona era. Chinese government made timely decisions and response to the pandemic, those countermeasures compromise well-coordinated prevention, control and treatment. By implementing measures such as prompt lockdown, mass blanket test, strict social distancing rules, integrating traditional medicine into treatment, research in vaccines and etc., pandemic situation in China has been contained. As science and technology gathered momentum, it was no denying that China resort to those techniques, such as big data, AI, Internet, 5G and etc. Technology fully leveraged its role in the pandemic control and prevention as it promoted efficiency in testing patients, enabled monitoring of massive people flow, guaranteed gradual resumption of work and economy recovery. There is a grain of truth to this, but it mises the bigger picture. It is not so much technological force as the discipline and high coordination from the whole nation that made success the pandemic fight. In the course of our efforts, technology empowerment made our countermeasures easier, then followed by people's awareness of full participation, which created the whole view of erecting the "great wall" of beating the virus.

GETTY IMAGES/STRINGER

For the technological aspect, this project explores the application of big data, AI and UAV in the course of containment in China. Based on big data, cities across China created their QR code as a practical warning scheme to monitor the flow of key groups of people, trace close contacts, and evaluate risk level of certain district, etc. When people need to enter a public venue, such as market, shopping mall, train station, airport and etc., they are aware that they will be required to show their version of QR code to approve health status. All these measures will finally address the pandemic control issue we face. The application of AI in the pneumonia CT system helped human doctors to diagnose quickly and identify lung lesions accurately thus saving much human resources and seizing valuable hours for patients. AI has its appearance in the process containment, such as AI robot for disinfection and postage delivery, AI thermal imaging body temperature measurement, AI computing for gene sequence, and etc. These technologies bloom, extend to the pandemic control new normal and continue to shape the digital life of future cities. UAVs were deployed during the pandemic prevention and control in various ways. UAV outdoor disinfection was adopted in communities, districts, schools and other organizations. General public were guided by UAV broadcast to wear masks, UAVs assist to parcel delivery, patrolling and traffic guidance and in the future, it will be more widely used in the future. While technologies were indispensable, in this study we also find out that China being able to fight the coronavirus with high efficiency and effectiveness was generally due to the following reasons.

Universal consensus and public mobilization. With timely release of information, dissemination of knowledge about prevention and control, public opinion guidance and support by mainstream media as well as universal participation with social cohesion, China could primarily block the virus within three months.

Treatment plans and scientific research. In this context, dual goals of containing the source of infection and extension of treatment, better treatment plan and better treatment method, the positive role of Traditional Chinese Medicine in treatment through preemptive prevention, differentiated medication and multi-target intervention were adopted.

Social isolation and traffic control. The specific measure included city lockdown and transport freeze in hardest-hit areas, differentiated traffic controls in less severe districts, tactics to prevent social gathering and cross-infections, community isolation as basic line of defense.

Allocation of resources and guarantee of supplies. In the pandemic-hit center, Hubei province got national health workforce support, tremendous efforts were made in manufacturing of medical supplies, and coordinated allocation of daily necessities were guaranteed.

Screening, testing and dynamic monitoring. Thorough screening at communities, improving virus testing, establishing a dynamic management system, intensifying epidemiological investigation were done orderly and professionally.

Command system and strategic policies. Top decision-making mechanism, fundamental strategies and policies as well as country's efficient execution mechanisms and comprehensive countermeasures contributed to the triumph of the country.

It is suggested that steady advancement can be done to reach sound technological infrastructure in countries who have the need to do so. Either for internet construction, application of AI technique or other forms of latest technologies. Raising the awareness of people and their countries to embrace technology in their containment efforts and build up the competency in managing its empowerment of technology. Practical countermeasures such as big data and AI can be imported to Lancang-Mekong countries depending on the collaboration of different sectors, localization of AI technique and accommodate data gathered from doctors well with the technology. Publicity of thorough participation of general public is the key to the battle against COVID-19, and discoordination will be a hindrance containment.

Constraints of this Study

This study investigates into three types of technologies, namely big data, AI and UAV by interviewing one private enterprise-Shukun Technology and Shanghai QR code R&D team led by Shanghai Municipal government and DJI. Additionally, interviewee of users in media, medical, government, individual businesses, bank, education and etc. were carried out as an opportunity to elicit ordinary people's views towards the topic. Despite the above efforts, limitations are unavoidable. When it comes to technologies in the containment process, numerous others gain prominence, such as 5G, 3S[12], block chain and etc. It is impractical to elaborate in details for all types of technologies at one time. Interview with Shukun Technology does not fully meet interviewer's expectations as person in charge answered proposed questions in written form. Without direct face-to-face interview, it is not possible to ask further for follow-up questions, meanwhile it lacks a kind of rapport developed through communication with interviewees. During conduct of this study, some companies are not quite open for interviews, which means switching to investigate other companies and requires more efforts from the researchers. More quantitative research is expected to be done although interviews of companies and individuals were completed for qualitative analysis.

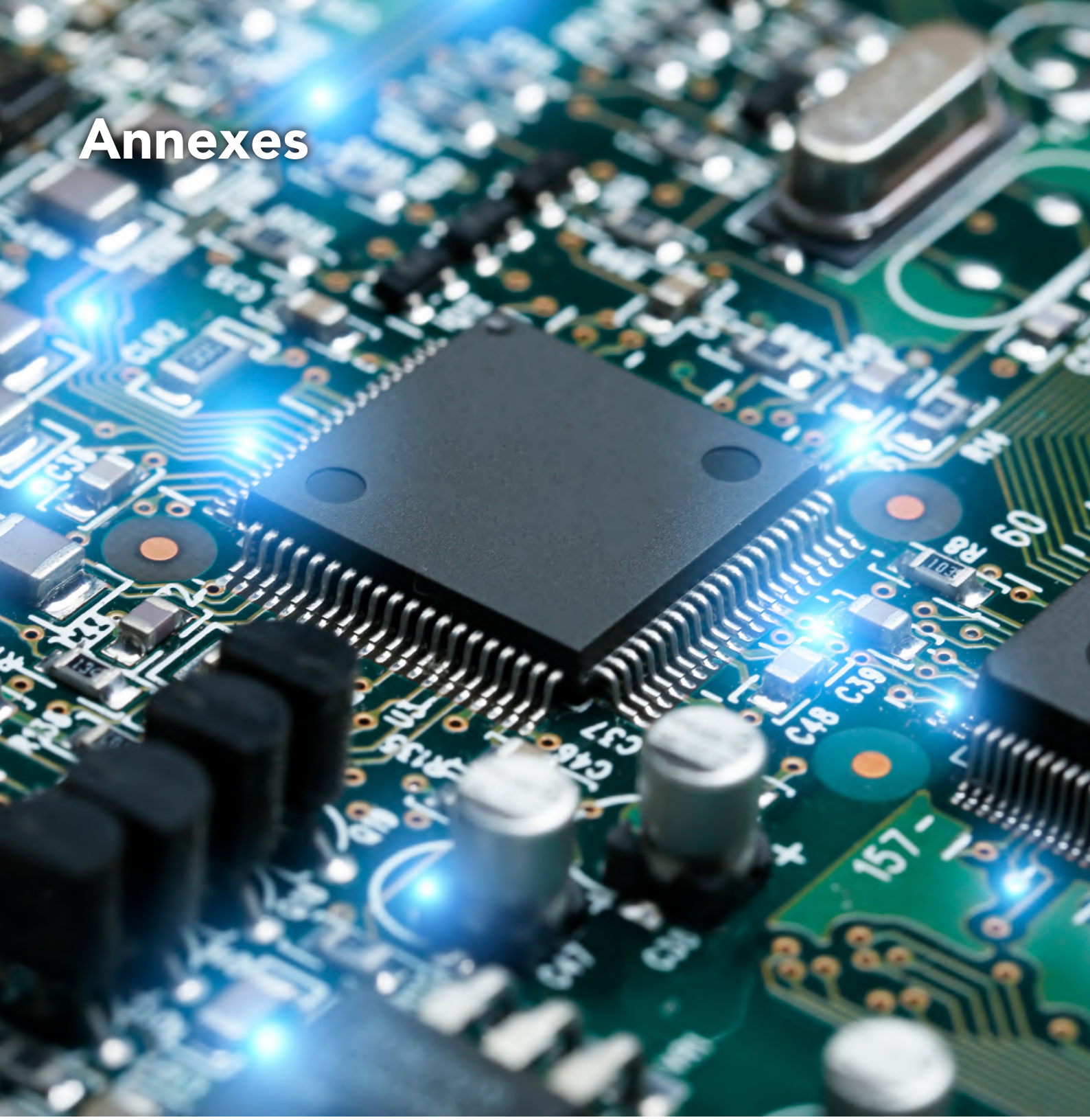
Direction of Future Research

Through preliminary studies on modern technologies during the responding efforts, it is evident that 5G is widely adopted in China. Many hospitals established remote diagnosis and consultation platform. Advanced medical devices, such as intelligent robots for patrolling, delivery, cleaning and disinfection, appear on the front lines. Installing 5G can make sure a smooth communication specially for China's medical system. Governments at all levels, hospitals and different businesses are keen to update their information network construction to 5G as employees meet frequently through the video systems and doing their tasks online.

Another technique is 3S, which is widely used in city planning, transportation, mapping, geological exploration, tourism and health. For example, the Fire-God Mountain Hospital and the Thunder-God Mountain Hospital was completed within 18 days due to the high-precision positioning, space measurement and ecological environment monitoring supported by remote sensing.

This program can be viewed as an attempt to summarize China's practices in combating the COVID-19 pandemic with technologies. Due to time and authorial limits, the research still needs continuous updates and improvements, particularly given the rapid changes in the pandemic situation and new technology progress. In the future, it is worthwhile to explore the related topics and beyond in more depth as the combination of technologies and people's concerted efforts contributed to the ultimate victory in combating the virus. Moreover, it will be fascinating to dive into other products or application of technologies, such as AI robots, voice-controlled elevator, automatic phone calls system, online medical consulting application, facial recognition terminals, and etc. It will also be appealing to probe into the relationship of technology and people's daily lives. Within various scopes, prospects of the program can be continuously carried forward.

12 3S refers to Remote Sensing (RS), Global Position System (GPS) and Geographic Information System (GIS)



Annexes

Annex A: Questions for Processing News Articles

1. What types of technologies are mentioned?
2. When was this news article published?
3. What are the sectors that technologies are applied to?
4. Where the above technologies are utilized?
5. Which city used the above technologies?
6. How does the above technologies work?

Annex B: Interview Questions for Shanghai QR Code Research and Development Team

1. When did Shanghai QR Code began to work on the project? Is there any support from the government or cooperative organizations?
2. How many people in Shanghai QR Code team and how long Shanghai QR Code spent before the application went alive? What were the obstacles that you encountered?
3. What types of technologies are embedded in QR code? Such as big data, AI or others, could you please explain briefly core technologies that it depends on?
4. How do Shanghai QR Code describe constructive role QR code has been playing in the containment?
5. What occasions and venues has QR code been applied to? How frequently it is used and what outcome has been achieved?
6. Is it secure to scan QR code for each individual? How to guarantee data safety of each person when there is the need to utilize big data?
7. What are the similarities and differences of Shanghai QR code and Beijing Health Kit?
8. Functions of QR code have evolved from healthy travel from pandemic management in the past to medical insurance and medication, transportation and travel pass, culture and sports and many more applications. QR code has always being along with people as its Chinese homonym "Suishenma" pronounced. How do Shanghai QR Code evaluate the prospects and needs of QR code both in China and in the world?
9. What are the implications of QR code in building a digital city in the future?
10. Has QR code been transferred to other countries? What contributions have you and your team made to help other countries in COVID-19 response efforts?
11. What can Lancang-Mekong countries learn from big data and AI in their scientific approach to pandemic control?

Annex C: Interview Questions for Shukun Technology

1. Looking back to timelines of pandemic control, when Shukun Technology responded to the calls of nation and took the initiative to participate in COVID-19 prevention and control? During the process, is there any support from government or cooperation with professional institutions?
2. Shukun Technology was able to develop AI imaging system at such short notice, why and could you explain main strength of your company?
3. What other types of technologies Shukun Technology used during the pandemic control except AI?
4. How does AI imaging system work, could you introduce its operating principles?
5. Compared with regular pneumonia diagnosis methods, to what extent can this AI imaging system improve diagnosis efficiency? What level is this technology both in China and in the world?
6. Are there any specific requirements for software facilities in hospitals and could you please elaborate in details?
7. Are there other competitors in the same area in China and other countries?
8. In China your technology has been implemented in Beijing Ditan Hospital, Beijing You'an Hospital of Capital Medical University, Beijing Friendship Hospital and etc. What you have contributed to the international community in terms of pandemic control?
9. What is your assessment regarding prospects and needs of AI imaging system in the future?
10. What can Lancang-Mekong countries learn from China's experiences in combating COVID-19 afflict?
11. What role will AI play in the medical fields in the future?

Annex D: Interview Questions for DJI

1. Looking back to timelines of pandemic control, when DJI responded to the calls of nation and took the initiative to participate in COVID-19 prevention and control? During the process, is there any support from government or cooperation with professional institutions?
2. What other types of technologies DJI used during the pandemic control? Could you explain main strength of your company? How long did it take for developing this technology?
3. Could you introduce "War against the Pandemic" for pandemic control? What kind of role did it play nationwide?
4. What is the coverage and utilization rate for UAV in patrolling and traffic guidance, promoting pandemic prevention knowledge, parcel delivery, disinfection? Compared with traditional methods, how effective can it be in pandemic control process?
5. Are there any requirements for deploying UAV, such as software/hardware environment (smooth and fast network)?
6. Could you please briefly introduce its operating principals? How to control the vehicle and how it works?
7. Are there other competitors in the same area in China and other countries?
8. What efforts have you made to assist pandemic control internationally?
9. Is it applicable to localize UAV in Lancang-Mekong countries? Could you please list a few things needed attention?

Annex E: Questionnaire for Participants

Dear Participants,

Thank you for your assistance in this research!

This study aims at exploring countermeasures of pandemic control in China, and promoting and sharing Chinese successful experiences and practices. Your opinions are invaluable. This interview is completed anonymously. Your answers will not be disclosed nor used for any commercial purposes. Thank you again for your precious time.

Part One: General Information

1. Place of residence (province/municipality) _____
2. Gender: __Male __Female
3. Age: __20-29 __30-39 __40-49 __50-59 __60-69 __70 and above
4. Education: __Junior Middle School __Senior Middle School __Bachelor __Master __PhD
5. What industries your company or work belong to?
   __education and teaching __government __telecommunication, IT services, software __news/media __bank/finance __real estate __construction __business services __catering __hotel/tourism __medication __engineering/ technology __others please specify: _____
6. Has your company set up pandemic prevention and control team?
   __Yes __No

7. Are there any specific programs including internal and external prevention efforts?
__Yes (Specify:_____) __No
8. During the pandemic period, what are the equipment or technologies installed by your company or working place?
__infrared thermometer
__forehead thermometer/thermometer
__remote conference/work
__QR Code
__travel record
__sign in applet
__others, please specify: _____
9. What measures or regulations were taken by your enterprise or working place?
__nuclear acid test for all
__reporting health status daily
__applying for approval and report details of itinerary before leaving the city of residence
__checking if employees or family members living together visited high-risk areas, or had connection with confirmed cased or not
__flexible working schedule
__wearing face masks in working place
__setting up one-meter line in canteen or public venues
10. What technical support your company has provided or what action your company took in the containment?
__providing 5G technical support
__participating in information infrastructure building of government
__hospitals and enterprises
__providing disinfection/food delivery/ward rounding robot
__big data
__assisting in pneumonia diagnosis
__not providing the above technology
__others please specify: _____
11. What assistance your company has provided to the international community?
__providing face masks, protective suits and other pandemic prevention supplies
__providing medical equipment
__dispatching technical staff
__providing supporting technologies such as 5G, AI and other kinds
__not participating international pandemic prevention efforts

Part Two: Observation

12. What measures you have experienced in your daily lives?
__taking body temperature __QR code __travel record __reporting personal health on a daily basis __others please specify: _____
13. What is your attitude towards using QR code and green code in public places?
__strongly disagree __disagree __neutral __agree __strongly agree __others please specify:_____
14. During the pandemic, with the help of internet what are the following services that you have used?
__online medical consultation for overseas Chinese provided by Ali Health
__"Chinese Medicine for Global Health" -The global COVID-19 prevention and treatment platform of Beijing University of Chinese Medicine
__"Online Medical Consulting with Elite Doctors Fighting COVID-19" by Jingdong Health
__WeDoctor Global Consultation and Prevention Center
__none of the above
__others, please specify_____

15. Since the outbreak of the pandemic, what 5G applications have you seen?
__remote medication __remote education __ remote live broadcast __infrared temperature measurement __remote conference __others please specify: _____
16. Have you noticed or used Unmanned Aerial Vehicle (UAV) for delivery around the community where you live?
__yes __no
17. Have you seen sterilizing/cleaning robots working in public venues, such as airports, train stations and shopping malls?
__yes __no
18. What AI applications have you heard about?
__AI temperature measurement system
__electronic entry pass developed by Baidu
__face recognition/fingerprint system
__pandemic risk reporting system developed by JD Cloud & AI
__automatic notification system for taking the same flight with confirmed cases developed by China TravelSky
__AI algorithms by Alibaba DAMO Academy
__none of the above
__others, please specify: _____

Part Three: Impact

19. What influences have the pandemic exerted to you?
__decrease in business volume
__decrease in personal income
__increasing working pressure
__not allowing free flow of people
__causing mental health issues
__others, please specify: _____
20. What is your mood towards the pandemic?
__no impact __a little nervous __nervous __very nervous __extreme nervous
21. How did you get news regarding COVID-19?
__mobile phone applications (sina.com, 163.com, toutiao.com, tencent.com and etc.)
__TV
__colleagues, classmates or friends
__newspapers and magazines
__new broadcast
__microblog
__WeChat
__others, please specify: _____
22. Which of the following ways describe your shopping habits during the pandemic?
__physical stores/shopping malls __taobao/tmall __jingdong.com __vipshop __dmall.com __missfresh.cn __meituan __others, please specify: _____
23. How often do you shop online?
__never __seldom__sometimes __often __always
24. What did you purchase online?
__daily necessities __fresh vegetables and fruits __clothes __cosmetics and skin care product __others, please specify: _____
25. What is your opinion toward making payment by scanning QR code, remote ordering?
__very troublesome __troublesome __neutral __convenient __very convenient

Part Four: Outcome

26. How do you evaluate the outcome of COVID-19 containment in China?
__very dissatisfied __dissatisfied __neutral __satisfied __very satisfied
27. What aspects do you think need to be improved?
__enforcement of technology in prevention and control
__publicity of technology know-how and health knowledge in prevention and control
__implementation of prevention and control measures
__others, please specify: _____
28. What countermeasures from government do you consider effective?
__quickly building up makeshift hospitals
__early detection, reporting, quarantine and treatment
__no gathering, meetings and diner party
__canceling unnecessary conferences/activities
__fourteen days' quarantine for people from medium and high-risk areas
__others, please specify: _____
29. What impressed you most during COVID-19 containment?
__Medical staff have given up holidays and risen to the challenge
__CPC members pioneered in the frontline and led the way to fight against COVID-19
__Donations from Chinese people came all over the world.
__"Though we're oceans apart, a shared moon connects hearts"-by Japanese poet Chanwu. (A verse written in medical supplies donated by Japan)
__Students from School of Design and Art of Zhejiang Institute of Media designed over 100 popular science posters for pandemic control, and they said "sketchpad and pen are our weapons".
__A boy donated all his lucky money from Chinese Spring Festival and said "Although I do not have much money, this is a little token of my heart."
30. Which countries/districts your company assisted?
__Myanmar __Laos __Thailand __Cambodia __Vietnam __Japan __Russia __India __Nepal __South Korea __USA __UK __others, please specify: _____
31. What is your opinion towards providing assistance to other countries?
__strongly disagree
__disagree
__neutral
__agree
__strongly agree

This is the end of our interview, thank you again for your participation!

Annex F: Participant Consent Form

BACKGROUND INFORMATION

The title of this study is "China's Way of Utilization of Technology to Tackle COVID-19 Pandemic". The principal investigator of this project is Yanqin Liu, a PhD. candidate in School of Journalism, Fudan University. I am studying about technology empowerment to help China fight against the pandemic.

In cooperation with Mekong Institute, an intergovernmental organization founded by the six member countries of the Greater Mekong Sub-region, namely Cambodia, P.R. China (Yunnan Province and Guangxi Zhuang Autonomous Region), Lao PDR, Myanmar, Thailand and Vietnam. I am going to collect data of both technology providers and users in China.

PROCEDURES AND PROTECTION

The research involves answering questions either face to face or in a writing format. The whole session should take about 30 minutes.

Your participation in the project/survey is entirely voluntary and you are free to withdraw from the project at any point. If you are uncertain or uncomfortable about any aspect of your participation, please contact the Principal Investigators listed at the top of this letter to discuss your concerns or request clarification on any aspect of the study.

Any information you supply to use will be treated confidentially in accordance with the Data Protection Act 1998: your name and identifying affiliations will be anonymized in any resulting publications, unless you give us your explicit consent to identify you as a subject.

Thank you very much for participating.

Yanqin Liu

CONSENT STATEMENT

Thank you for agreeing to participate in this study. Before we carry out the research, we would like you to read the following statements and confirm your agreement to take part in this study.

PLEASE TICK TO CONFIRM

__I confirm that I have read and understand the Participant Consent form dated .....
__All the questions that I have about the research have been satisfactorily answered.
__I understand that my participation is voluntary and that I am free to withdraw from the study at any time, without giving reason.
__I agree to participate.

Participant's signature: _____
Participant's name (please print): _____

__Tick here if you would like to receive a summary of the results of this study (no personal results) by e-mail.

E-mail: _____
Date: _____

MEKONG INSTITUTE

123 Mittraphap Rd., Muang District Khon Kaen 40002, Thailand
+66 (0) 43 202 411 information@mekonginstitute.org
mekonginstitute.org mekonginstitute.org MekongInstitute