

Technology Assists in Fighting COVID-19

Media and Government Communication Material | PACD 2020-04

Instructions

Target audience	Stakeholders in the media, governments, and relevant organizations
Purpose	This document presents the role of digital technology in the fight against the COVID-19 outbreak. It focuses on case studies in China, including but not limited to Huawei applications. This material does not intend to promote Huawei's brand and solutions.
Use scenarios	Media roundtables and government communication
Notes	1. During communication, please emphasize that there are opportunities and possibilities of using technologies to fight the pandemic. This document contains some complex medical/genetic technologies and some applications that have not been widely adopted. 2. It is not suitable to send this document to the media. It contains images that, because of time constraints, we were not able to get permission to reproduce. 3. It is recommended that local cases be added when frontline personnel use the material.
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Bill Gates: COVID-19 may be the “once-in-a-century pathogen we’ve been worried about”

842999 Confirmed cases

41456 Confirmed deaths

204 Countries, areas or territories

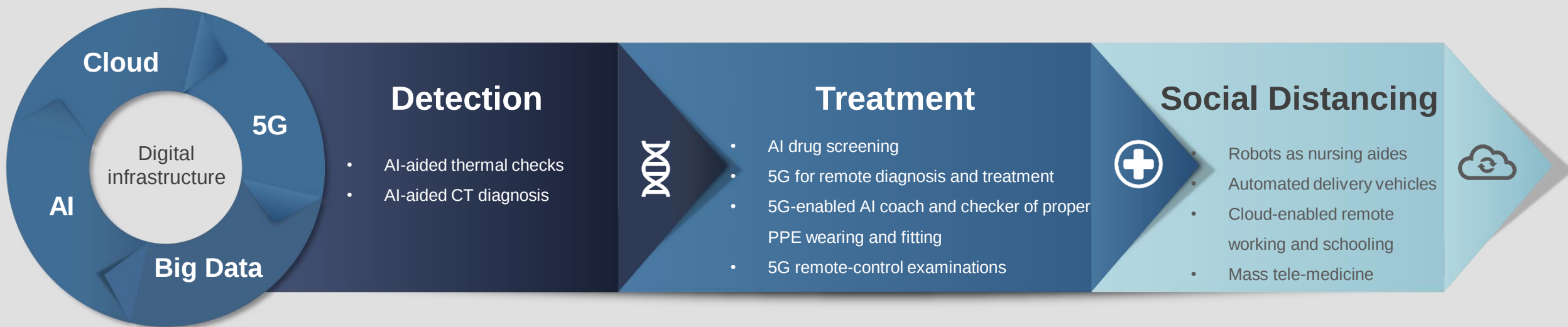
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The COVID-19 outbreak worldwide poses a severe test for global public health systems.

Emerging digital technologies, marshalled into use, is playing a critical role.

Digital technology applications in the anti-epidemic fight

5G, AI, big data, cloud computing and other techs have been deployed to prevent contagion, treat patients, and shorten crisis.



Scenario

- To reduce infections from travelers, authorities want to identify those who have fever.
- It needs to be done quickly and accurately, even if lots of people are passing through.

Technical Challenges

- It's easy to miss people in crowds.
- Need to quickly identify and locate travelers with fever.
- In a fast-developing pandemic, the fever checks need to be set up quickly.

How It Was Solved

- 5G: No cabling/fiber is required, and there's enough bandwidth for the upload.
- Thermal imaging cameras: Monitoring data of body temperature and target features.
- AI: Provides visual recognition support to identify sick passengers based on ID information (On airside, passengers already provided personal details.)

AI-aided thermal imaging: Speeds up temperature checks in public places



Masses of people pass through Qinghe Railway Station, a new transportation hub in Beijing

5G infrared temperature measurement “improves traffic efficiency and significantly reduces the risk of cross infection”. Yang Xiaohong, VP of the Guangdong Provincial People's Hospital



Used in airports, railway stations, and other transport/transit hubs

1 Min  200 People 

The technology can check the temperature of over 200 people per minute, with passengers barely needing to slow down. They just need to move in lines.

Detection

Treatment

Social
Distancing

Scenario

- CT has become a standard diagnosis tool for COVID-19. During a pandemic, hospital capabilities can be overwhelmed.
- Lack of radiologist: Radiologists have to participate in consultations with medical experts for special cases onsite, which is time-consuming and increases their risk of being infected.

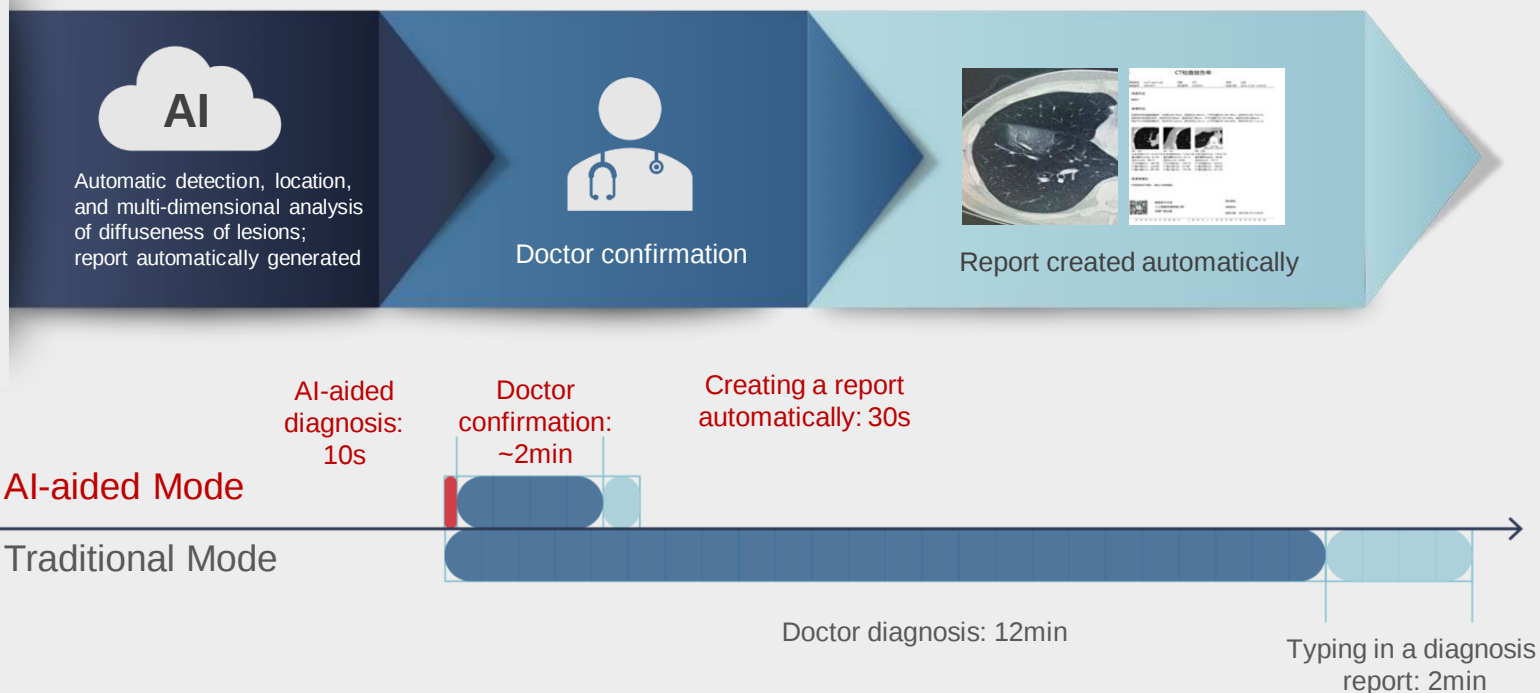
Technical Challenges

- Traditionally, evaluation involves the accurate measurement of the size of the lesion. This needs to be done on several images. It's time consuming.
- 3D modeling would help to anatomize and locate lesions.

How It Was Solved: Cloud computing + AI

- Concept: With the help of multiple CT scans of actual patients, "train" the AI to develop diagnostic capabilities.
- In practice: Through the PACS system, the AI provides doctors with diagnosis advice. It identifies and segments lesions, accurately measures the size, and delivers a 3D model

AI-aided CT diagnosis: Quicker assessment means earlier administration of right treatment to patient



Case: The First People's Hospital of Tianmen in Hubei Province:

The technology has helped to boost doctors' diagnosis capabilities by slashing the required time by over 10 minutes.

Patients and suspected cases spend less time waiting which helps reduce contagion.

As of the end of March, **60 medical institutions**, in China and Europe, have adopted AI-aided CT scanning. The accuracy is as high as professional doctors.

Detection

Treatment

Social
Distancing

Scenario

- With countless lives at stake, finding a treatment quickly is imperative.
- Screening of known drugs as well as lesser-known compounds from molecule library.
- Each compound has to be tested against several viral targets.

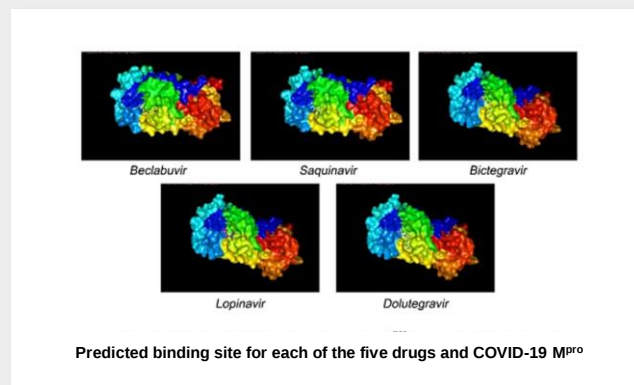
Technical Challenges

- Mass-screening of millions of molecules at quickest speed
- Efficiently and accurately pick out candidate molecules for new drugs and predict drug target

How It Was Solved

- Build a high-quality machine learning model based on computer-aided drug design to complete the protein structure homology-modelling, molecular dynamics simulation calculation, and large-scale virtual drug screening.
- Complete hundreds of billions of calculations in a short time, shortening computer-aided drug screening from months to hours.

AI-enabled drug screening: Shortening discovery of effective drugs



homologous
modeling



Massive
filtering



Precision
medicine

Drug development time 
shortened by dozens of time

Traditional computing takes months

AI-aided: in **7** days, screened

8506 drugs,

resulting in **5** candidates,
two -Saquinavir and Lopinavir- are in clinical trials

The joint team has also conducted a larger-scale drug screening of over 160 million compound molecules in UniChem's small-molecule library, with results available for research institutes and pharmaceutical companies for long-term drug development.

Joint research team: Basic Medical School of Tongji Medical College of Huazhong University of Science and Technology, Wuhan Children's Hospital of Tongji Medical College of Huazhong University of Science and Technology, First Affiliated Hospital of Xi'an Jiaotong University, Beijing Institute of Genomics of Chinese Academy of Sciences, and Huawei

Detection

Treatment

Social
Distancing

Scenario

- Frontline medical personnel with a heavy workload; Some of country's top experts based outside Hubei
- Traditional CT diagnosis is based on CT images shared via mobile phones. Due to severe distortion of these images, the top medical experts elsewhere cannot give accurate advice.

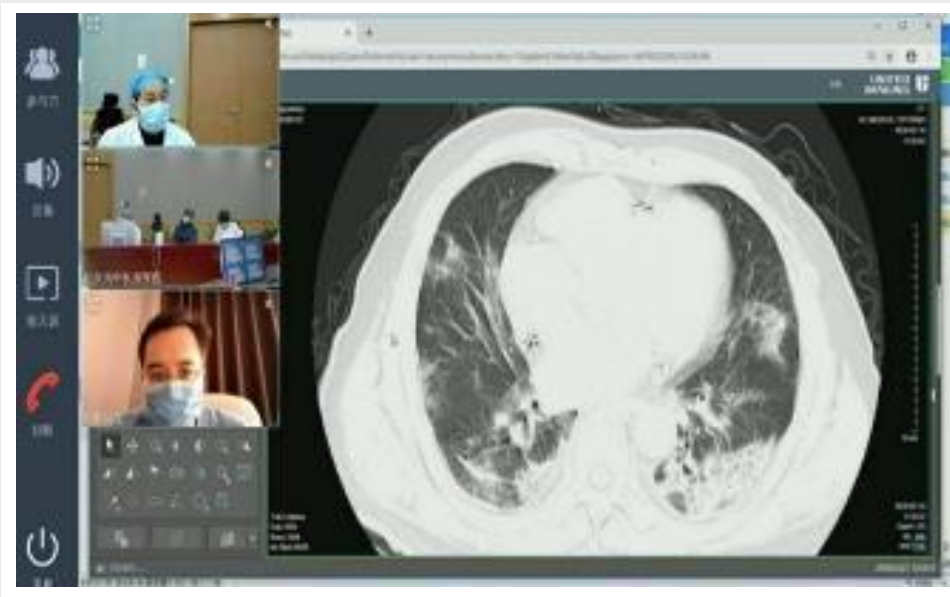
Technical Challenges

- Real-time transmission of large amounts of data
- A stable HD video system supporting interactions of multiple parties
- Multiple office collaboration capabilities

How It Was Solved

- Being wireless, 5G provides connectivity quickly. Large bandwidth suitable for HD.
- Set up HD video conferencing system.
- Have specialized cloud-based remote office system.

5G + remote consultation: Improving diagnosis and treatment of critically-ill patients



"We need medical experts with different backgrounds in the back office to give us support in decision-making and diagnosis. By discussing with them the diagnosis of complex cases, our frontline medical personnel can more effectively treat patients."

Wang Xinghuan, head of Leishenshan Hospital, Wuhan

Remote consultation systems have been deployed in Huoshenshan Hospital, Jinyintan Hospital, Wuhan Union Hospital, Wuhan Union Hospital (Guanggu Campus), and Renmin Hospital of Wuhan University.



High-end experts
online guidance



Real-time transmission
of large amounts of data



Remote multi-party
collaboration

Detection

Treatment

Social
Distancing

Scenario

- Proper wearing of Personal Protective Equipment (PPE) in contaminated areas is essential to keep medical personnel safe. The procedure for wearing PPE is complex.
- Some medical staff are new to PPE use. Even for regular users, it is hard to make sure that it's properly fitted in all places..
- Fixed broadband (optical fiber) is not suitable for onsite deployment

Technical Challenges

- Flexible deployment and wireless access
- Video interactions
- Multi-angle videos

How It Was Solved: 5G + HD cameras

- Two ultra-HD cameras assist medical personnel to see the front and back of the PPE while they put it on. Wearers can more easily check whether it's on correctly.
- Experts on proper wear can communicate guidance by checking remotely from a centralized station.
- Being wireless, 5G is quick to install and provides the bandwidth for HD video.

Interactive video: Ensuring medical staff wear protective gear properly



Multiple ultra-HD cameras



Multi-angle flexible self-check



5G Wireless
Fast image transmission

Scenario

- Although it's possible to build large hospitals in a few days, staffing them with experienced doctors can be more difficult.
- Non-contact examination for doctors and patients to reduce the possibility of cross-infection.

Technical Challenges

- Remote operations of robotic arms, particularly in medical settings, demand low latency
- Video and sensor data must also reach physician in real time.

How It Was Solved

- 5G provides high-bandwidth and low-latency. It can be deployed quickly in popup hospitals.
- Onsite ultrasonic scan robots/robotic arms
- Remote sensing operation platform

5G + remote contactless examination: Relieving the shortage of specialists on the frontline



In February, by remotely operating a robotic arm, a doctor in Zhejiang (east coast of China) performed an ultrasound scan of a COVID-19 patient lying 700km away in a makeshift hospital in Wuhan (central China). 5G at both ends made the procedure feasible. This was routine for Wuhan.

Detection

Treatment

**Social
Distancing**

Scenario

- When hospitals are busier, more medicines need to be delivered, spaces cleaned, patients monitored.
- Frequent contact with patients raises the risk of infection, for cleaners and messengers too.

Technical Challenges

- Remote control and partial automation
- Capable of navigation/patrol, accurate spatial awareness

How It Was Solved

- Multi-functional robots
- 5G connection allowing robots to navigate the dynamic environment of hospitals.

5G robots as nursing assistants: Reducing workload and infection risk



Delivering drugs at Guangdong Provincial People's Hospital



Disinfecting at Wuhan Xiehe Hospital ER



Distribution of food
and medical supplies



Automatic temperature measurement
and sterilization



Reduce risk of infection

- The robots can deliver medical supplies in hospitals, bring food to people quarantined in hotels, take temperatures, or disinfect spaces.
- The robots have been used in hospitals in Wuhan, Shanghai, and in Guangdong province, supporting medical staff and reducing staff infection risk.

Detection

Treatment

**Social
Distancing**

Scenario

- During the COVID-19 outbreak, especially in Wuhan, materials could not be delivered quickly due to the lockdown of communities and insufficient number of couriers.
- Need to limit contact to lower infection risk.

Technical Challenges

- Automated navigation and driving
- Stable, high-speed, reliable, and low-latency connections
- Large carrying capacity and long battery life
- Supporting remote interactions

How It Was Solved

- The vehicle can work for six to eight hours continuously and move at a walking or jogging speed of 5-15 km/h
- 5G's high bandwidth and low latency enables real-time transmission of road images, so that automated vehicles can avoid obstacles.

5G-connected automated transport vehicles: Safely bringing supplies to hospitals and quarantined areas



In this February 6 photo, an automated delivery vehicle drove 600 meters to Wuhan Ninth Hospital at a speed of 15kmph to deliver medical supplies safely.

- Taking advantage of 5G's high bandwidth and low latency, self-driving unmanned delivery vehicles bring meals and medical supplies to hospital staff.
- Used in dedicated hospitals for treating COVID-19 patients in Beijing, Shanghai, and Wuhan.

Detection

Treatment

**Social
Distancing**

Scenario

- Companies face business continuity challenges due to social distancing or lockdowns.
- During the epidemic period, in China, more than 18 million companies adopted teleworking; over 300 million people worked from home.

Technical Challenges

- High-capacity, Ultra HD conference calls
- Diverse office functions
- Information security

How It Was Solved

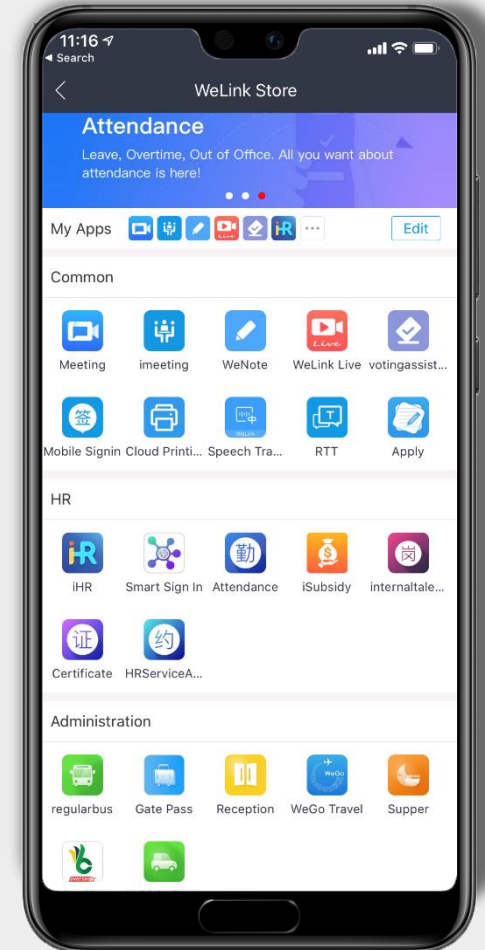
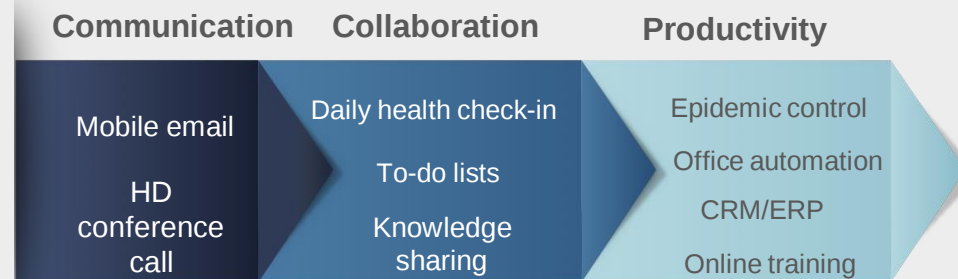
- By adopting cloud-based services, SMEs need not upgrade their IT system.
- Integrated functions: AI assistant, face recognition clock-in, daily health check-in, instant messaging, online storage, and mobile approval.

More powerful remote collaboration platform: Making working from home more realistic

During the pandemic, Huawei WeLink, Tencent Conference, DingTalk, and Zoom continuously updated their products to meet the increasing online office demand. They also offered many services free.



HUAWEI CLOUD WeLink provides free office collaboration services for enterprises and individuals. Enterprises with fewer than 1000 users can use WeLink for free to hold video conferences with 100 participants and unlimited duration.



Detection

Treatment

**Social
Distancing**

Scenario

- In February, 237 million students had to stay home in China. Globally, more than 91% students have been similarly affected by early April. Online teaching was needed.

Technical Challenges

- Virtual classes with the same teachers and classmates as in school
- Large-scale real-time interactions through video conferencing
- Supporting multiple ways of access like mobile phones, computers, and pads

How It Was Solved

- Infrastructure: Capacity upgrade of cloud computing and broadband.
- Online education providers developing teaching platforms with multiple functions mimicking the classroom experience.
- Schools and other education institutions adapting to digital format.

Virtual classrooms: Learning never stops



Within
**Two
Weeks**

Cloud infrastructure
deployment involved: **7000** servers **90T** bps bandwidth



50 Million
students online at the
same time

- Online education platforms, such as Tencent Class, DingTalk, and Mo Lan Yun, provided video on demand, lesson recording, class sign-in, and live interactive voting.
- HUAWEI CLOUD worked with over 100 education partners to establish the Learn Anytime education alliance. More than 50 million online teachers and students used the service. Over 11 million users were online simultaneously at peak hours.

Detection

Treatment

**Social
Distancing**

Scenario

- During a major outbreak, medical resources need to be deployed strategically
- Besides COVID-19 patients, others are also in need of care for unrelated ailments.

Technical Challenges

- Support multiple, simultaneous online accesses
- Create processes for online appointments, reception, payments, and drug delivery.
- Regulatory compliance (privacy/security)

How It Was Solved

- Multifunctional service platforms built on cloud computing
- Recruiting of thousands of medical specialists
- Developing mobile apps for added flexibility

Tele-medicine: Reducing the burdens on hospitals



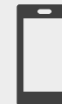
1Month



Tens of millions of visits



Gathering of over 10,000
medical experts



Mobile APP

Over 10,000 medical experts, among them pulmonologists, virologists, and internal medicine specialists, offered medical consultations online. They interacted with tens of millions of Chinese patients, significantly reducing the burden on hospitals.

Technological trends of digital healthcare

1

5G will be the network infrastructure of digital hospitals.

A recent STL study shows that adding 5G to current medical infrastructure could lead to 1 billion additional patients being treated worldwide by 2030.

2

Cloud-based IT infrastructure; AI as a platform

Standards for AI platforms will be developed to ensure the interoperation of AI products.

3

Fitness wearables help healthcare providers to remain in control.

Individual health data from fitness wearables can be used in big data analytics. This facilitates disease prevention, screening, early-intervention, diagnosis, and treatment.

4

IoT platforms and blockchain technology can support data governance.

IoT and blockchain will facilitate the management of medical devices and patients' data, simplifying paperwork and lowering costs, while maintaining data security.

Future Considerations:

Acceptance of digitization by individuals and organizations is growing. This sets the stage for the digital transformation of various sectors, including healthcare.



01

Digital lifestyle during the epidemic:

During the pandemic, consumers grew accustomed to distancing applications like video calls, livestream shopping videos, online shopping, tele-commuting, and virtual classrooms. Will these new habits endure?

Our view:

The era of **routine usage of video** calls and video conferencing has started. Consumers will rely on networks, both fixed and wireless, to an unprecedented extent as the digitalization of society continues. Traditional retail businesses along with logistics and delivery services need to transform themselves.

Application of new technologies:

5G, AI, and cloud have proven themselves in fighting COVID-19. How to promote technology to enable the digitization of the medical industry?

Our view:

Healthcare will not escape the ongoing industrial digitization. Governments should promote the construction of digital infrastructures and new models of healthcare delivery. To foster timely adoption of innovation in healthcare, regulators should also promptly test, and certify when appropriate, newly developed technologies.

02



Personal data and industry data:

Identifying close contacts and indirect contacts of COVID-19 patients has been key to controlling infections. But how can we balance privacy and the public safety imperative? How can data be shared without intruding on personal lives?

Our views:

Data governance is a key component of industrial digital transformation: data needs to be secured during processing. Data cannot be obtained or shared without consent. Public and private organizations need to work together to develop suitable data management and sharing mechanisms.

03



Together we will overcome the pandemic

