

In collaboration with
The Boston Consulting Group



Critical Frontier: Leveraging Technology to Combat COVID-19

WHITE PAPER

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Contents

3	Introduction
6	Key observations
7	A Areas of concentration
7	B Areas of potential gaps
8	C Closing remarks
9	1 Information management
12	2 Detection and containment
16	3 Healthcare provider enablement
20	4 Treatment acceleration
22	5 Economic resilience
25	6 Social cohesion
27	7 Cybersecurity
30	Contributors

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Introduction



“ Its main function is to provide a better picture of the role of technology in times of pandemic and to encourage companies around the world to replicate the efforts made elsewhere.

The COVID-19 pandemic has challenged clinicians, public health authorities, companies and governments to quickly develop new capabilities for supporting recovery, maintaining health security, and building resilience. Digital tools and strategies have become crucial in this effort.

The World Economic Forum seeks to help by aggregating and amplifying such digital offerings to facilitate implementation, identify gaps and better align efforts with needs.

This document is an update of the [Early Compendium of Technology Responses to COVID-19](#) published in April 2020. It more than triples the number of solutions, providing better visibility into the diverse uses of technology for the COVID-19 response.

Similar to the Early Compendium, this document is not meant to provide an exhaustive list of technology tools for COVID-19 response, nor does it seek to make recommendations on which efforts are most effective. Its main function is to provide a better picture of the role of technology in times of pandemic and to encourage companies around the world to replicate the efforts made elsewhere.

As such, cases were sourced as objectively as possible. We applied an AI-based natural language processing tool to a database of over 150 million English-language publications from more than 30 countries on all continents from December 2019 to May 2020. We also put out a call to World Economic Forum partner companies to submit their solutions. Full market analyses of functional areas is left to future research.

While the use cases featured largely represent offerings from the technology and communications industry, they include many solutions from the public sector, academia and civil society as well, demonstrating that effective technology applications can come from a variety of economic actors.

Now that these use cases have been compiled, those satisfying the relevant criteria are being submitted to the [WHO COVID-19 Digital Solution Clearinghouse](#). Furthermore, companies offering solutions detailed in this compendium are encouraged to submit them to the [UpLink COVID-19 challenges](#).

At a glance, this document:

- **Includes 232 use cases**
- **Represents 177 unique entities**
- **Covers 41 countries and all major regions of the world**

For ease of presentation and review, all solutions in this compendium are organized into seven functional categories, even though a solution may fit more than one:

- 1. Information management:** Efforts that involve sharing, safeguarding and promoting factual information in the fight against the pandemic

Use cases include interactive maps that help chart the spread and containment of the pandemic, advanced screening tools that help the public gather additional information and message management efforts in conjunction with governments and institutions around the world.

- 2. Detection and containment:** Efforts that support early detection of the virus and containment of the spread through non-pharmaceutical intervention.

Use cases include leveraging company-owned datasets to inform government preventive measures or help assess their efficacy, using mobile-based contact tracing applications, social distancing tools and immunity passport solutions, among others.

- 3. Healthcare provider enablement:** Efforts that supply front-line healthcare workers with the tools, technology and capabilities they need to fight the virus by managing patient flow and smart resource deployment

Use cases range from managing hospital capacity and supply planning to leveraging AI technology, chatbots and remote diagnosis based on CT imaging over 5G networks to improve provider operational efficiency.

- 4. Treatment acceleration:** Efforts that support businesses and organizations working on drug and vaccine discovery through big data and health research

Use cases vary from providing open datasets and open access to scholarly articles, to AI-assisted drug testing in the cloud, and to providing high-end computing resources to researchers.

- 5. Economic resilience:** Efforts that support local and global commerce through levers such as critical infrastructure support, business enablement for small and medium-sized enterprises, and prediction models for policy-makers

Use cases include a variety of solutions for all economic agents: from business continuity solutions for managing supply chains, to

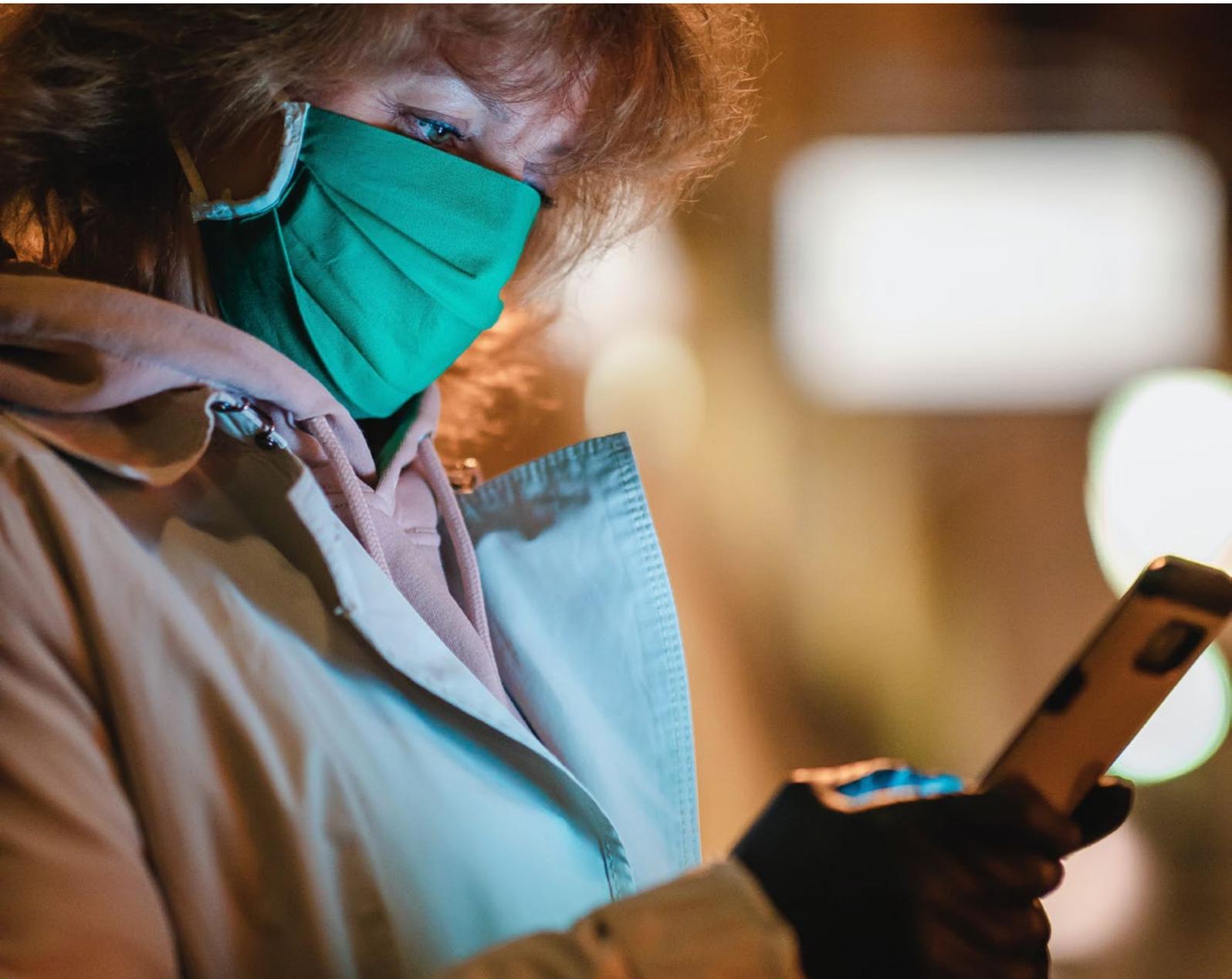
remote equipment maintenance, to maintaining bandwidth for consumers and businesses and supporting distance learning platforms for isolated youth.

- 6. Social cohesion:** Efforts that foster communication and cohesion between and among individuals, corporations and institutions

Use cases involve hackathons that address the mental health impact of social isolation and platforms that allow communities to connect and help each other.

- 7. Cybersecurity:** Efforts that support the cybersecurity and cyber resilience of organizations focused on the COVID-19 pandemic and organizations that have transitioned to remote working; with employees and individuals spending more time online, solutions help mitigate the increased risk of cybercrime

Use cases include technology solutions to protect networks and capacity-building tools and materials to educate users on best practices.



Key observations



Given the significantly higher number of use cases included in this edition, it is now possible to comment on the overall way in which technology is being used to combat COVID-19. Although the compendium does not claim completeness

and is not based on a thorough market analysis, the insight nevertheless highlights areas of concentration, where many players are publicly promoting solutions, and areas of potential gaps, with significantly fewer solutions being publicized.

A Areas of concentration

The number of solutions featured in the **Detection and Containment** and **Healthcare Provider Enablement** categories grew by approximately 300% since the April compendium. Over the last two months, many new approaches have come to the market, including solutions that use wearables to monitor adherence to social distancing measures or to provide diagnoses, AI-powered solutions to promote handwashing and solutions to help hospitals triage patients, among others.

Within the **Detection and Containment** and **Information Management** categories, we noticed many seemingly similar self-assessment tools, interactive COVID-19 maps and, to a lesser extent, big data solutions leveraging mobility data to help hospitals, governments or businesses in decision-making.

In terms of concentration, it is worth highlighting the degree of innovation coming from China, where

companies in collaboration with the government are pushing the boundaries of what can be achieved with existing technology. Examples include e-contract service in WeChat and several smart digital sourcing platforms on blockchain for small businesses, as well as various AI-powered solutions for detection and subsequent rapid diagnosis of the virus.

Finally, it is important to note that, in a rapidly evolving situation, numerous new “safe return to work” applications have appeared only recently, since the analyses on which this document was based have been completed. Although they did not make it into the compendium, that market niche has become much more competitive, and highlights the dynamic nature of the technology response to COVID-19. The same applies to national contact tracing applications that were recently launched in several countries, and missed the cut for the compendium.

B Areas of potential gaps

The **Treatment Acceleration** category saw the fewest new cases (7) in the past three months, perhaps reflecting a significant barrier to entry.

Social Cohesion remains low on technology applications with the fewest included use cases despite being an important piece of [successful stay-at-home orders](#) and the [efficiency of other policy interventions](#). Potential applications include addressing employee well-being, curbing home violence, and building a sense of community by facilitating neighbourhood support initiatives.

For this version of the compendium we added a new category – **Cybersecurity**. Remote working modalities create a greater “attack surface” for cybercriminals, and have already [given rise to targeted phishing attacks and other cyber risks](#). However, a relatively limited number of dedicated tools to manage this changed threat environment have surfaced for the compendium as companies opt to leverage existing offerings – in many instances pro bono.

Moving beyond the lens of the functional category, an important point revealed by the compendium is that just under one-third of all solutions were developed jointly by two or more companies or as part of public-private collaboration. While this could be seen as promising for such a new and competitive market, the absence of more

collaboration presents a significant standardization and solutions interoperability challenge. This is especially critical for the types of solutions where widespread adoption is key for success, such as for many solutions in the **Detection and Containment** and **Economic Resilience** categories.

In particular, the ability to resolve issues in data-sharing and to adhere to multiple sets of COVID-19 rules for the new “safe return to work” technology applications will be key to unlocking efficient physical interaction between businesses in post-lockdown times.

Lastly, across the compendium, only 19 solutions in total are developed in or targeted specifically at **Africa, Oceania** or **Latin America**, compared to 69, 54 and 20 for **Asia, North America** or **Europe**, respectively. While we acknowledge that our collection methods may be subject to bias due to our English-language-only media scan, and could also be strongly influenced by the physical location of leading technology firms in North America and Asia, this observation nonetheless raises the question of equal access across the globe to technology tools and services to fight COVID-19, which is worth further exploration by others. Of note is the recently announced [Joint Action Plan](#) by the World Bank, World Economic Forum, GSMA and ITU, which calls for ensuring equal access to digital tools, services and infrastructure in the global response to COVID-19.

C Closing remarks

The proliferation of solutions contained in this compendium represents a staggering financial investment, distributed widely across companies, academia and governments. Examining the totality of this cost, it becomes clear that there will be a strong incentive to repurpose or

continue to use these technologies once a COVID-19 vaccine is widely available. It is worth asking the question: which technology applications created for COVID-19 response will stay with us, and how will they be used once the pandemic has passed?



1

Information management

Sharing, safeguarding and promoting factual information in the fight against the pandemic.



Solutions include interactive maps that help chart the spread and containment of the pandemic, advanced screening tools that help the public gather additional information and message management efforts in conjunction with governments and institutions around the world.

Essential goods availability tracking

Companies are supporting public access to essential goods by tracking product availability at online vendors.

Example:

- Price Technologies: [Price.com product availability feature](#)

Interactive COVID-19 maps

Interactive mapping technology has leveraged big data to dynamically track case growth, recoveries and trends on both national and international scales. The information is available publicly and used to spread public awareness and to assist local governments in containment efforts.

Examples:

- AccuWeather: [Coronavirus Tracker](#)
- Baidu: [Baidu Maps](#) (in Chinese)
- HERE technologies: [Tracking coronavirus](#)
- IBM and Weather.com: [COVID map](#)
- Microsoft: [Bing COVID tracker](#)
- Tableau Software: [COVID-19 Data Hub](#)
- TIBCO: [Global](#) and [US Heat Map](#)
- University of Botswana and Government of Botswana: [COVID-19 Botswana Dashboard](#)
- Yandex: [COVID map](#) (in Russian)

Knowledge sharing and collaboration tools

These platforms enable multi-country collaboration and data-sharing on projects aimed at combatting COVID-19.

Examples:

- Alibaba. [Global MediXchange for Combating COVID-19](#)
- Codementor: [Code against COVID-19](#) platform
- Fundação Dom Cabral and Deloitte: [CRI Ventures](#)

- Open Data Institute: [Free support to make data, models and software available for public use](#)
- Tech Initiative Africa: [Combat COVID-19 Africa platform](#)

Map of free meal sites

Companies have partnered to develop a comprehensive, crowdsourced open-source interactive map of free meal sites in the US to address food insecurity as one of the most immediate challenges of the COVID-19 pandemic.

Example:

- 10x Management and WhyHunger: [Find Food COVID](#)

Misleading information removal

Companies are using AI to remove misleading and/or false information from their websites and platforms – both public ones and private companies' intranets.

Examples:

- Facebook, Google, Microsoft, LinkedIn, Twitter, Reddit and YouTube: [Using AI to remove misleading information](#)
- SAP: [Bridge-IT: Precision COVID-19 data platform](#)

Online repatriation management solutions

Online solutions to ease data collection and repatriation processes for citizens found themselves abroad during lockdown, as well as to facilitate repatriation whenever demanded by the national government.

Example:

- Germany's Foreign Ministry and SAP: [Citizens Return Campaign App](#)

Public opinion tracking

Text analysis is providing insight into public sentiment on important COVID-19 issues by reviewing publications and social media posts.

Example:

- Sugon: [Public Opinion Analysis Platform](#) (in Chinese)

Self-assessment tools

Screening tools enable the general public to conduct self-assessments via mobile or online platforms. Following the diagnostic, these tools provide a variety of additional resources, including suggested next steps and best practices, self-reporting to governments, symptom monitoring tools and treatment assistance.

Examples:

- Alibaba: [Intelligent Robot \(tailored to pandemic requests\)](#)
- Apple: [COVID-19 app](#)
- Bharti Airtel: [Self-diagnostic tool](#)
- C.P. Group and Digital Council of Thailand: [Self-D care and uSAFE apps](#)
- Government of Goa and Innovaccer: [Test Yourself Goa app](#)
- IBM: [Watson Assistant for citizens](#)
- John Hopkins University and Esri: COVID-19 Dashboard
- Libyan government: [Speetar triage platform](#)
- Microsoft/CDC: [COVID-19 Assessment Clara bot](#)

Support for official COVID-19 communications

Companies are working with and/or amplifying messages from health authorities to send news updates, warnings and tips to the public.

Examples:

- BSNL, Bharti Airtel and Reliance Jio: [Caller Tune to spread awareness](#)
- machineVantage: [AI to Identify Effective Models For Public Communications Regarding Covid-19](#)
- Pakistan's National Information Technology Board: [COVID-19 Information app](#)
- Reliance Industries: [Jio symptom checker](#)
- Robi: [Real-time SMS-based alert](#)
- Telegram: [National channels for Ministries of Health](#)
- UNICEF & National Telecom Commission of Philippines: [Text messages-based campaign](#)
- UNECA: [Africa Communication and Information Platform](#)
- WhatsApp: [WHO Health Alert](#)
- WIPRO: [AI bot to answer citizen's questions](#)

2

Detection and containment

Supporting early detection of the virus and containment of the spread through non-pharmaceutical interventions.



“ Apps enable functionalities such as emergency alert systems

Use cases include leveraging company-owned datasets to inform government preventive measures or help assess their efficacy, using mobile-based contact tracing applications, social distancing tools and immunity passport solutions, among others.

Big data solutions to aide decision-making

The use of big data for spread tracking has aided containment efforts through predictive forecasting and the measurement of public adherence to localized preventive measures. Insights are gathered through company data that allow local governments, organizations and individuals to track users through mobility data and digital technology.

Examples:

- BlueDot: [AI-driven infectious disease surveillance](#)
- Brigham and Women’s Hospital and Harvard Medical School: [Machine learning to detect spread patterns](#)
- China Association for Science and Information technology (CASIT): [Population Information Big Data Management System](#)
- China Telecom: [Mobility data analysis](#) (in Chinese)
- Deutsche Telekom: [Anonymized mobility data for Robert Koch Institute](#)
- Facebook: [Data for Good programme](#)
- Facebook: [US citizens survey for Carnegie Mellon University](#)
- Google: [COVID-19 community mobility reports](#)
- KT Corporation: [Mobility data for City of Seoul dashboard](#) (in Korean)
- Peking University (PKU): [Multi-source big data epidemic prevention and control research and judgment system](#) (in Chinese)
- Quantum Computing Inc: [Spread tracking](#)
- São Paulo, Brazil and Vivo, Claro, Oi and TIM: [São Paulo Intelligent Monitoring System](#)
- Swisscom: [Mobility data to gauge adherence to social distancing measures](#)

- Telenor: [Data for Social Good programme](#)
- TIBCO: [COVID-19 visual analysis hub](#)
- UberMedia: [Aggregated Mobile location data provision & insights](#)
- Yandex: [Social isolation index for maps](#) (in Russian)

Biometric Identification

In low-income nations where many individuals do not have any form of identification, contactless biometrics can provide an alternative way for people to identify themselves. Companies are developing contactless systems for pulling individuals’ vaccination and health records.

Example:

- iRespond and Simprints: [Biometric ID solution](#)

Contact tracing applications

Mobile-based contact tracing applications help inform individuals and public security officials of users’ health status or potential contact with infected or symptomatic individuals. Apps enable functionalities such as emergency alert systems and user tracking via colour coding systems to support containment efforts.

Examples:

- Apple and Google: [iOS and Android APIs for contact tracing](#)
- Australian government: [COVIDsafe app](#)
- DP-3T: [Protocol White paper](#)
- Government of Germany, SAP and Deutsche Telekom: [Corona-Warn-App](#)
- Government of Iceland: [Rakning C-19](#)
- Government of India: [Aarogya Setu app](#)
- MIT: PACT: [Private Automated Contact Tracing](#)
- Singapore government: [TraceTogether app](#)
- Zurich: [GeoHealth app](#)

Epidemic management systems and hotspot identification

Specialized systems based on centrally collected or self-screening data that can identify hotspots and predict trends. Insights are gathered through individual or company data that allow local governments, organizations and individuals to track users through digital technology.

Examples:

- Atos: [EpiSYS](#)
- BroadReach: [COVID-19 Pandemic Management](#)
- Diagnostic Robotics: [Digital risk assessment and monitoring platform](#)
- Kinsa: [US Health Weather map](#)

Fee waivers for mobile payments

Multiple telecommunication companies in Africa have lowered fees and increased mobile wallet limits to increase the use of contactless money exchange.

Example:

- Safaricom, Airtel, MTN, Orange Cameroon, Airtel, Zamtel: [Source](#)

Hand-washing control solutions

Companies are developing solutions that will help employees and customers adhere to recommended hand-scrubbing routine and duration, which not only allow any individual to follow the process but are essential for healthcare, hotels and food-industry businesses that their employees scrub properly. Technologies used include both AI and wearables.

Examples:

- Apple: [Apple Watch handwashing guide](#)
- Fujitsu: [Hand washing AI](#)

Health verification solutions and immunity passports

Technology is used to verify which individuals will not pose a public health risk if they leave isolation or interact in spaces with other individuals during curfew.

Examples:

- Alibaba: [Alipay health code](#) (in Chinese)
- Onfido: [Source](#)

- Tech Mahindra: [Source](#)
- Tencent: [WeChat Fuxuema app](#) (in Chinese)

Public space monitoring

In cooperation with local governments, technology is being deployed to prevent sick individuals from traveling in public. Technologies include cameras, drones and robots, and are adapted to work during pandemic: e.g. using thermal camera identification, facial recognition of people wearing masks and smart helmet technology, among others.

Examples:

- BCI Integrated Solutions: [Thermal Temperature Monitoring Solution](#)
- Dubai: [Oyoon programme](#)
- Hanwang Technology and Hanvon: [Masked faces recognition technology](#)
- Huawei: [Intelligent Crowd Detection](#)
- Megvii and Baidu: [Smart AI and Thermal scanning](#)
- City of Moscow: [Facial recognition network](#)
- SCC: [Facial Recognition and Thermal scanning system](#)
- Staqu: [Thermal cameras](#)
- UAE government: [Smart helmet technology](#)

Real-time prevention and monitoring blockchain solutions

Blockchain is providing fast, safe, and scalable means to collecting and organizing large amounts of data: for instance, for tracking students health data, out-of-campus status in real time for campus-wide pandemic prevention and control.

Example:

- Shandong University of Finance and Economics: [Blockchain Pandemic Collection and Monitoring System](#) (in Chinese)

Scalable epidemic-prevention platform

A dedicated online platform is coupled with a smartphone app to inform users if an epidemic disease has broken out at their location, describing the symptoms of the outbreak and giving prevention advice. The app also allows users to report their symptoms to nearby health offices.

Examples:

- 4Paradigm: [AI-based epidemics tracing platform](#) (in Chinese)
- KT Corporation: [Global Epidemic Prevention Platform](#)

Social distancing tools

New technology focused on ensuring proper social distancing, from helping businesses monitor occupancy to alerting individuals of close proximity on the work floor, simplifying following the social distancing guidelines.

Examples:

- Inter-Dimensional Technologies: [Electronic people counter](#)

- Rombit: [Romware Covid Radius](#)
- Triax: [ProximityTrace IoT system](#)

Wearable diagnostic tools

Sensors monitoring user data, such as temperature and fitness levels, may help identify potentially sick individuals before they even realize they are sick.

Examples:

- AbilityLab-Northwestern University: [Wearable COVID-19 detection device](#)
- Fitbit: [Fitbit Health Solutions](#)
- VivaLNK: [Medical Wearable Sensors](#)

3

Healthcare provider enablement

Supplying front-line healthcare workers with the tools, technology and capabilities they need to fight the virus.



Use cases range from managing hospital capacity and supply planning, to leveraging AI technology, chatbots and remote diagnosis based on CT imaging over 5G networks to improve provider operational efficiency.

3D printing of medical equipment

Companies and researchers are using 3D printing technology to design and produce medical parts and equipment. The efforts will expedite the supply of essential equipment to front-line medical responders and hospitals.

Examples:

- HP: [3D printing parts to help contain COVID-19](#)
- Merck: [3D printing of face shields](#)
- Worcester Polytechnic Institute (WPI): [Open source designs for 3D printing ventilators](#)

AI-assisted diagnosis

AI technology is being applied to improve detection and diagnosis of COVID-19. These systems and tools use AI to analyse medical images or qPCR test results much more rapidly than can be done manually.

Examples:

- Alibaba: [Damo Academy AI system](#)
- Huawei: [AI-assisted quantitative medical image analysis](#)
- diagnostics.ai: [PCR.ai](#)
- Indian Institute of Technology: [AI-assisted X-ray imaging analysis](#)
- Sri Ramakrishna Engineering College: [AI-assisted X-ray imaging analysis](#)
- Tencent: [Novel Coronavirus Pneumonia AI Diagnosis System](#)

Connectivity solutions for hospitals

Companies have coordinated with local governments, hospitals and the military to provide essential network infrastructure and connectivity to healthcare providers in areas of greatest need.

Examples:

- Amazon: [\\$5 million in devices for healthcare providers globally](#)
- CenturyLink: [High-speed connectivity for emergency hospitals](#)

- Cisco: [No-Cost Wireless Networking Equipment for Healthcare's Pandemic Response](#)
- C.P. Group: [5G Network at Sanam Wachira Hospital, Phuket](#)
- HPE Aruba: [\\$50 million in secure connectivity kits for pop-up clinics](#)
- Huawei: [5G network at Wuhan Huoshenshan Hospital](#)
- Lenovo: [IT equipment for emergency hospitals](#)

Deployment of digital-first COVID-19 Test Labs

Companies are leveraging their eHealth expertise and deploying cloud-enabled COVID-19 test labs and outpatient department centres to help governments in containing the pandemic. The centers are equipped with all relevant medical apparatus and are integrated with Electronic Medical Record applications; an online dashboard allows to track status of the OPDs.

Example:

- [HPE COVID-19 Test Labs and Outpatient Department Centers in India](#)

Home care safety management tools

Tech-enabled tools that help essential health workers do their job as safely as possible, including shift-tracking, automated reminders and agency-specific protocol notifications when providing home care services.

Example:

- SMARTcare Software: [COVID-19 Surveillance Tool Set](#)

Hospital capacity and supply planning

Data analytics are helping governments and hospitals anticipate surges in care demand and manage resources when demand is high. Healthcare facilities guidance supports resource planning, including economic and supply chain considerations.

Examples:

- InVita Healthcare technologies: [HemaControl Real-Time Inventory Management System](#)
- JD.com: [Emergency Resources Information Release Platform](#) (in Chinese)
- KenSci: [RealTime Command Center and Hospital Capacity Planning tool](#)

- Kinetica & Disaster Technology: [COVID-19 Hospital admissions forecasting & equipment availability](#)
- Palantir: [Partnership with NHSX, Amazon Web Services, Microsoft, Google and Faculty AI](#)
- Premier: [Stanson Health Clinical Decision Support solution](#)
- SAP: [Bed capacity & supplies management solution](#)
- SAP and EY: [Logistics application for Disaster Response Network](#)
- TIBCO: [COVID-19 Visual Analysis Hub](#)

Online platforms for booking COVID-19 testing

Companies are launching online platforms facilitating access to the information and bookings for testing at the nearby approved facility.

Example:

- Alibaba, JD.com, Tencent: [Booking services for COVID-19 testing](#)

Patient triaging

Software is being developed that helps hospitals prioritize care in the event of a shortage in resources. The tools identify at risk populations and patient illness severity.

Examples:

- 1000minds: [ICU bed prioritization solution](#)
- Clarify Health: [Clarify COVID-19 Elderly Vulnerability Population Index \(EVI\) and the Clarify COVID-19 Patient Risk Profile](#)

Robotic laboratory for telemedicine

The establishment of a robotic laboratory will cater to researchers and innovators tasked with developing robots for 5G telemedicine. They will work with medical personnel to build robots that serve hospital needs.

Example:

- AIS: [Robotic laboratory](#)

Scheduling platform access to health workers

Free access to a digital scheduling platform helps match healthcare professionals with organizations and facilities seeking immediate

shift coverage. This technology helps organizations address the shortage in front-line labour through digital means.

Example:

- Apollo: [Platform to match healthcare pros with hospitals](#)

Specialized medical software solutions

To enable uninterrupted services during COVID-19, specialized tools are offered: a range of free templates, licences and services to healthcare customers.

Example:

- Nuance: [Dragon Medical for free for 90 days](#)

Telemedicine solutions roll-out

Companies working to provide access to telemedicine solutions, ensuring those without a personal physician or living in rural areas are able to get qualified medical support remotely.

Examples:

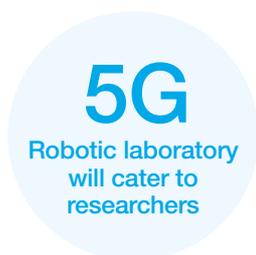
- American Well: [Telehealth solution](#)
- CareCentrix: [Telehealth, care collaboration and home monitoring tools](#)
- Dialog Axiata: [Free trilingual hotline with access to doctors in Sri Lanka](#)
- Novonordisk: [Digital Health solution with online consultation platform](#) (in Chinese)
- SAP: [Skybuffer](#) telemedicine solution
- Sehat Kahani: [Mobile Health solution in Pakistan](#)
- Sirona.tv: [Telehealth Solution for Seniors](#)
- Telewound Coalition: [Connecting wound doctors, nurses, and experts to bring telehealth relief](#)
- TELUS Health and Babylon: [Telemedicine Solution](#)

VR education solutions for healthcare providers

Technology is being used to help healthcare providers better understand the effects that COVID-19 has on a patient through immersive experience.

Example:

- Surgical Theatre: [3D VR patient lungs fly-through](#)



Workforce pulse check

Applications enabling healthcare administrators and leaders to communicate with anyone in the organization at any time to support employees the best possible way through these turbulent times, as well as rapidly understand and prioritize the most immediate needs in a timely manner.

Example:

- SAP: [Free Qualtrics Healthcare Workforce Pulse](#)



4

Treatment acceleration

Supporting businesses and organizations working on drug and vaccine discovery through big data and health research.



“ COVID-19 Open Research Dataset (CORD-19), a database of more than 29,000 machine-readable scholarly articles, has been made available to the public.

Use cases vary from providing open datasets and open access to scholarly articles, to AI-assisted drug testing in the cloud, and to providing high-end computing resources to researchers.

Access to data analysis platform

Free access to commercial versions of this data platform helps developers, researchers and data scientists working on COVID-19- related projects.

Example:

- Neo4j: [Graph Data platform](#)

Access to patented technologies

Amazon, Facebook, HPE, IBM, Intel, Microsoft, Mozilla, Uber, AT&T, Fujitsu and SAP signed the Open COVID Pledge, granting free access to COVID-19-relevant patented technologies for the purpose of diagnosing, preventing, containing and treating COVID-19.

Example:

- Founding Adopters: [Open COVID Pledge](#)

AI-assisted drug screening

Providing AI-assisted screening helps accelerate new drug and vaccine development. The technology is assisting the scientific community by automating critical components of drug research in an attempt to expedite the search for therapies.

Examples:

- Adaptive Biotechnologies/Microsoft: [Open data access to decode COVID-19 immune responses](#)
- DeepMind: [AI-assisted drug screening](#)
- Exscientia and Healex: [AI-assisted drug screening](#)
- HPE: [High-performance computing resources for AI drug screening](#)
- Huawei: [AI-assisted drug screening](#)
- IBM: [AI-assisted drug screening](#)
- Nuritas: [AI-assisted drug screening](#)
- WIPRO: [HOLMES Assistant for Researcher](#)

Clinical trial management

Software or tools help clinical trials related to COVID-19 run efficiently and effectively.

Example:

- eClinical Solutions: [Real time clinical trials management](#)

COVID-19 dataset for researchers

In partnership with Microsoft, Chan Zuckerberg Initiative, leading research institutions and the White House Office of Science and Technology Policy, the COVID-19 Open Research Dataset (CORD-19), a database of more than 29,000 machine-readable scholarly articles, has been made available to the public. Partners have jointly issued a call to action to the world's AI experts to develop text and data mining tools that can help the medical community develop answers to high-priority scientific questions, aided by the data contained in CORD-19.

Example:

- Allen Institute for AI: [Machine-readable COVID-19 dataset](#)

High-performance computing resources for researchers

The White House, the US Department of Energy and IBM spearheaded the unique COVID-19 High Performance Computing public-private consortium, which includes government, industry – Amazon, Google, HPE and Microsoft – and academic leaders who joined forces to provide supercomputing software and applications expertise free of charge to help researchers rapidly advance scientific research for treatments and a vaccine.

Example:

- Source: [COVID-19 High-Performance Computing Consortium](#)

Online database for COVID-19 research product and service supply

Companies are building consolidated online databases for product and service supply of raw materials and research products for researchers, developers and manufacturers of COVID-19 vaccine and therapeutics.

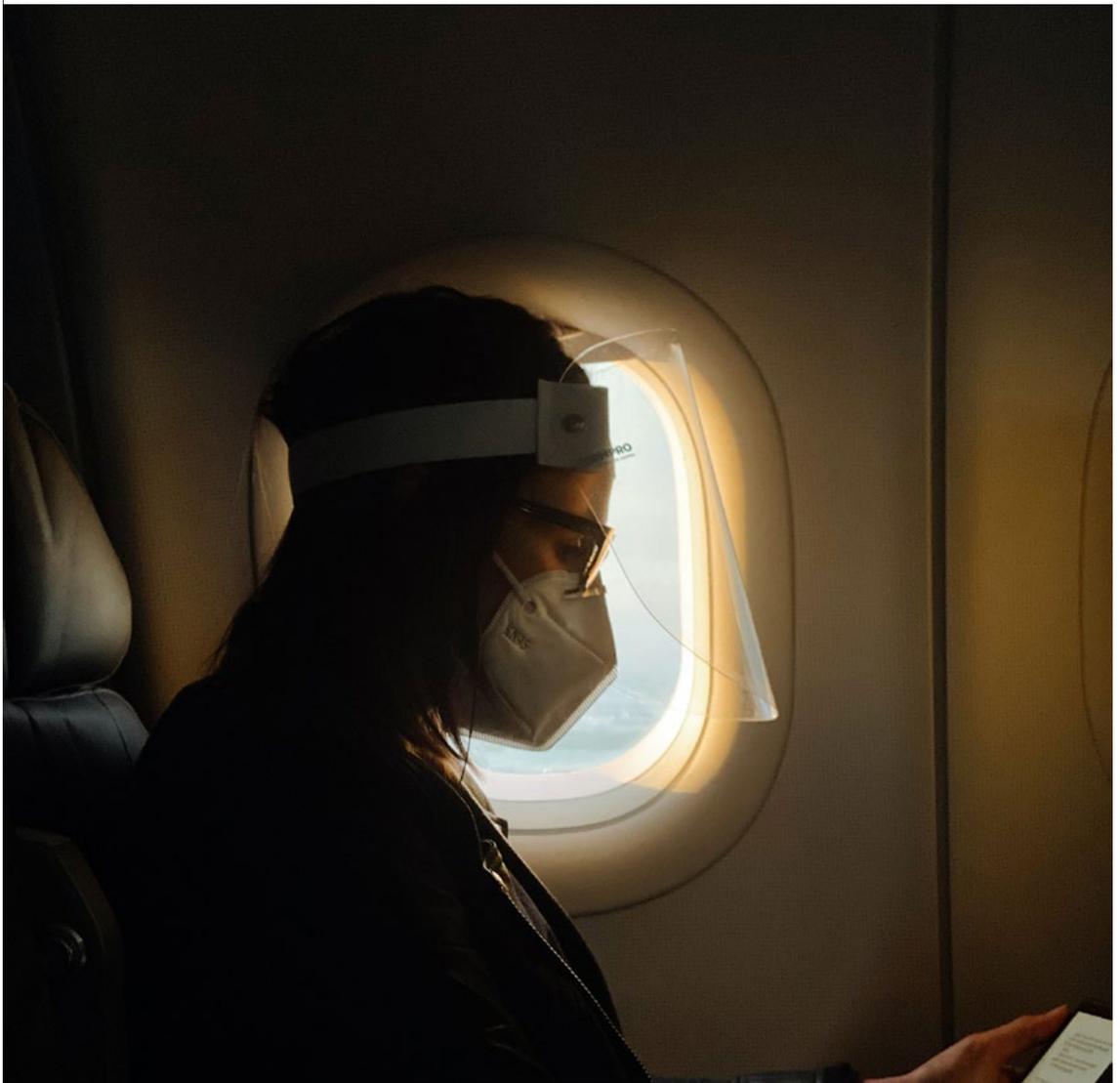
Example:

- Merck: [Millipore Sigma's database](#)

5

Economic resilience

Leveraging digital solutions to keep local and global commercial operations running at times of lockdown and disrupted supply chains.



Use cases include a variety of solutions for all economic agents, from business continuity solutions for managing supply chains, to remote equipment maintenance to maintaining bandwidth for consumers and businesses and supporting distance learning platforms for isolated youth.

5G-aided smart construction and unmanned distribution

Expertise in 5G is aiding with unmanned distribution technology and smart construction in COVID-19-stricken areas.

Example:

- China Unicom: [MWC announcement](#)

Access to digital collaboration solutions

Companies have helped business improve remote collaboration by opening up teaming services free of charge or at reduced rates. Services include virtual data rooms and virtual meeting capabilities.

Examples:

- ABB Industrial Automation: [ABB Ability Collaborative Operations for manufacturing workers](#)
- Cisco: [Free Webex solution in certain countries](#)
- Cortado: [Teampace online storage software](#)
- C.P. Group: [True Virtual World Platform](#) (in Thai)
- Microsoft: [Microsoft teams software](#)

Access to distance learning solutions

Through the use of distance learning software and platforms, companies have enabled educational institutions and individuals to adapt to remote learning environments. Online platforms have been made available free of charge to minimize disruptions in student learning and academic curricula.

Examples:

- Avaya: [Avaya Spaces Collaboration App](#)
- Government of China in partnership with China Mobile, China Unicom, China Telecom, Baidu, Alibaba and Huawei: [National Learning Platform for schools](#)
- Dialog Axiata: [Free access to Guru.lk and Sri Lanka's Government Education Platforms](#)
- Google: [Distance learning online capability building resources](#)

- Government of China: [National Network Cloud Platform for Primary and Secondary Schools](#)
- Huawei: [Distance education solution](#)
- MTN Group: [Free connectivity to educational resources](#)
- Sonatel: [1 Gb free education pass](#) (in French)
- TCS: [iON Digital Glass Room](#)
- Telkom: [Free connectivity to educational resources](#)
- Viettel: [ViettelStudy](#) (in Vietnamese)
- Vodafone: [Free Udemy online learning resources](#)
- Yandex: [Yandex.School free online classes](#) (in Russian)

Business continuity solutions

Tools that companies may leverage to ensure business continuity and to build economic resilience from remote production equipment monitoring, to enabling intelligent routing and contactless payments for couriers, to robotic process automation.

Examples:

- Cognizant: [Insights and resources for businesses](#)
- FarEye: [Fee-free delivery management software](#)
- Infosys and Pega: [Supply chain collaboration and communication solution](#)
- QuickBase: [COVID-19 Small Business Loan Accelerator](#)
- Tencent: [E-contract service in WeChat](#)
- UiPath: [Robotic Process Automation solutions](#)
- Zyfra: [Remote real time production equipment monitoring](#)

Donation platform for health equipment

A partnership with the Digital Council of Thailand is introducing Helpital, a central donation platform for the collection of donated health equipment for distribution to hospitals in need. The donated equipment will directly support front-line health workers by improving protective measures.

Example:

- C.P. Group: [Helpital platform](#) (in Thai)

Network bandwidth management

Companies have taken action across the world to tackle the challenge of network upkeep and bandwidth usage. Telcos and tech firms have worked with local governments to maintain and expand networks and, to the extent possible, curtail bandwidth consumption to improve connectivity.

Examples:

- FCC and US Telecom and broadband providers: [Keep Americans Connected Pledge](#)
- Netflix: [Reducing stream quality](#)
- T-Mobile US: [Increasing network capacity](#)

Real-time insight

Digital solutions provide up-to-date insight so that businesses can rapidly respond to the dynamic situation as it unfolds.

Examples:

- Dataminr: [Real-time AI for Event and Risk detection](#)
- Numerator: [Shopping Behaviour Index](#)
- SunView Software: [ChangeGear IT Service Management \(ITSM\) platform](#)

Safe-back-to-work solutions

Tools that combine HR, incident and other relevant data are being developed to help companies ensure the safety of their workforce and make data-driven personnel decisions.

Examples:

- Clear: [Temperature checking pods](#)
- IBM: [Return-to-Workplace-Advisor](#)

- Microsoft and UnitedHealth Group: [ProtectWell employee health screening](#)
- Palantir: [Palantir Foundry for employees mapping](#)
- PWC: [Check-in software](#)
- Salesforce: [Work.com platform](#)
- Tech Mahindra and Pega: [Manufacturing production ramp readiness solution](#)

Smart digital sourcing platforms

Small and medium-sized businesses find themselves in a difficult situation with fewer resources and digital tools. Companies are providing dedicated platforms to address sourcing needs of SMEs. While connecting SMEs to suppliers (including with free trial periods), some platforms also provide valuable additional services: online management of payments, financial verification, certification on the material demand, supply and transport links and loans, solving the trust problem with blockchain-based solutions.

Examples:

- AliPay: [Alipay Epidemic Prevention Material Distribution Public Service Platform](#) (in Chinese)
- Ant Blockchain, Alibaba Cloud and Gansu Wenrui Company: [Blockchain + Remote Online Bid Opening System](#) (in Chinese)
- Beijing Financial Control Group: [Supply Chain Debt Platform](#) (in Chinese)
- French government and Mirakl: [StopCOVID19 essential goods online marketplace](#)
- SAP: [Free access to SAP Ariba Discovery platform](#)

6

Social cohesion

Fostering communication and cohesion between and among individuals, corporations and institutions.



Use cases involve hackathons that address the mental-health impact of social isolation, as well as providing platforms allowing communities to connect and help each other.

Community help platforms

The expansion of digital community help portals enables individuals to request and offer assistance in their communities. The features include diverse support related to baby supplies, transport, food etc.

Examples:

- Facebook: [Community help](#)
- NextDoor: [Help centre](#)
- Tech Mahindra: [Entellio chatbot](#)
- Uniper: [Cross-Platform Telehealth and Social Engagement Service for Older Adult Population To Address Isolation Hardships](#)
- WIPRO: [COAST India Platform](#)

Family content

Families everywhere are creating a new sense of normalcy, and companies are providing digital resources to help families play, learn and spend time more meaningfully together while addressing anxiety over the coronavirus and lockdown measures.

Example:

- Sesame Street Workshop: [Ahlan Simsim](#) in Arabic

Public hackathons

Companies, non-profits, and governments are hosting hackathons aimed at building software solutions that tackle some of the challenges related to the pandemic. Hackathon organizers focus the participants on a number of key challenges to solve.

Examples:

- Devpost: [COVID-19 Global Hackathon](#)
- European Innovation Council: [EUvsVirus Hackathon](#)
- IBM: [2020 Call for Code Global Challenge](#)
- Merck: [Research Grant for Pandemic Preparedness](#)
- SmartDevelopmentHack: [The Hackathon](#)
- World Health Organization (WHO), Facebook, Microsoft: [COVID-19 Hackathon](#)

Virtual shopping

Virtual reality can offer an escape from isolation. Virtual reality allows consumers to visit stores and shop.

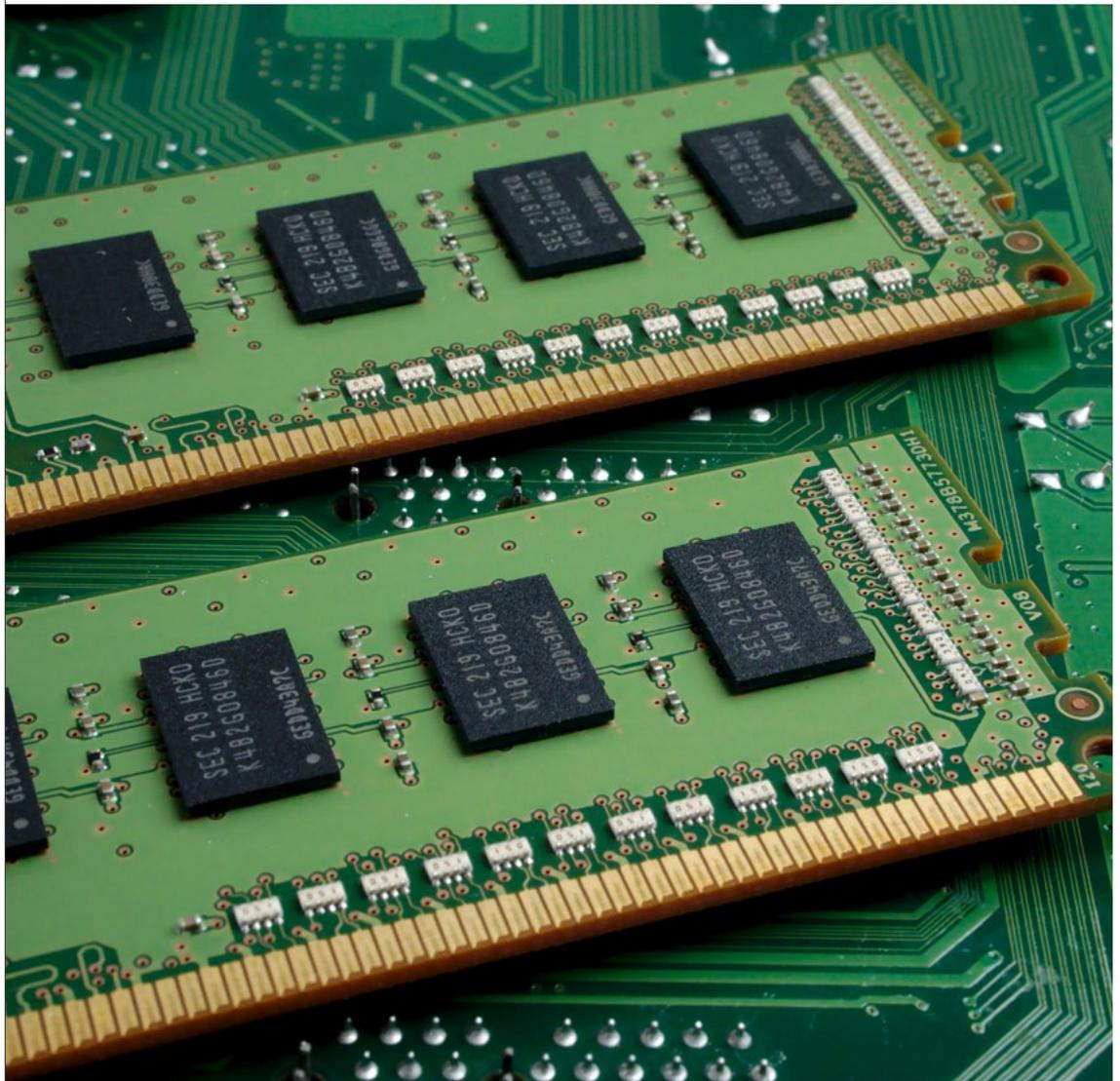
Example:

- LifeStyles In 360: [Virtual reality shopping experience](#)

7

Cybersecurity

Helping organizations mitigate the increased risk of cybercrime with transition to remote working.



“ Civil society organizations in particular are organized around supporting organizations focused on pandemic response.

Use cases include technology solutions to protect networks but also capability-building tools and materials to educate users on best practices, a critical component to building a resilient COVID-19 ready organization.

Many solutions mentioned below are offered free of charge, forming an initial [pro-bono cybersecurity](#) repository.

Cyberthreat intelligence field support for hospitals

A growing number of cybersecurity professionals are working together to help hospitals fend off hackers and other bad cyber actors. The first objective is to neutralize attacks before they happen; the second is to help any medical organization after they are attacked.

Example:

- CTI League: [Online Expert community to support hospitals](#)

Cyber resilience capacity-building

Companies are offering online education opportunities to ensure that the workers responsible for the pandemic response have the requisite awareness to avoid falling victim to cyberattacks. Some educational efforts are also focused on cybersecurity professionals within pandemic response organizations to ensure they can counter the vulnerabilities that come with new, remote work modalities.

Examples:

- Fortinet: [Free cybersecurity training](#)
- Microsoft and Terranova Security: [Cybersecurity awareness kit](#)

Data leak prevention

To minimize the risk of cyberattacks on corporate systems and support resumption of production, companies are providing software focused on cyberspace asset mapping and exposure management to prevent information from being illegitimately removed from company systems, and then tracking information if it is taken.

Examples:

- CubeSec: [SaaS for Internet Security monitoring](#) (in Chinese)
- Dimension Data: [Cloud Platform for Leak Traceability and Forensics](#) (in Chinese)

Online best-practice repositories

Companies and civil society groups are providing curated materials on various cybersecurity topics, from individual online hygiene to building secure communication networks and habits in times of working from home. These text materials are crucial in bridging the gaps between cyber expertise on the one hand, and organizations and people in need of guidance on cybersecurity and resilience issues on the other. Civil society organizations in particular are organized around supporting organizations focused on pandemic response.

Examples:

- China Academy of Information and Communication Technology (CAICT): [“2020 digital medicine: network security risk research during pandemic prevention and control” research](#) (in Chinese)
- Cyber Readiness Institute: [Remote Work Resources](#) and [Ransomware Playbook](#)
- Global Cyber Alliance: [Work From Home, Secure Your Business programme](#)
- Zurich: [Managing Ransomware: Building Cyber Secure Mindsets](#) and [The Cyber Dimension of COVID-19](#)

Online cyber resilience assessment tools

Companies from various sectors are providing their existing and potential customers interactive online tools to assess their current practices and cyber readiness as well as build awareness about good behaviours and approaches to increase their cyber resilience without additional investments.

Examples:

- Tech Mahindra: [COMPASS: Continuity, Maturity & Pandemic Impact Assessment Tool](#)
- UBS: [UBS Cyber Security Check Individual & KMU](#)

Secure connectivity equipment for hospitals

Companies have provided solutions for establishing secure network infrastructure and connectivity to healthcare providers in areas of greatest need.

Examples:

- Qi An Xin: [Donation of network security equipment to hospitals](#) (in Chinese)

Secure hosting for online medical businesses

With the rise in importance of medical companies operating online, it has become paramount to provide them with dedicated security solutions that take into account the sensitive nature of medical data and availability of critical services for patients.

Examples:

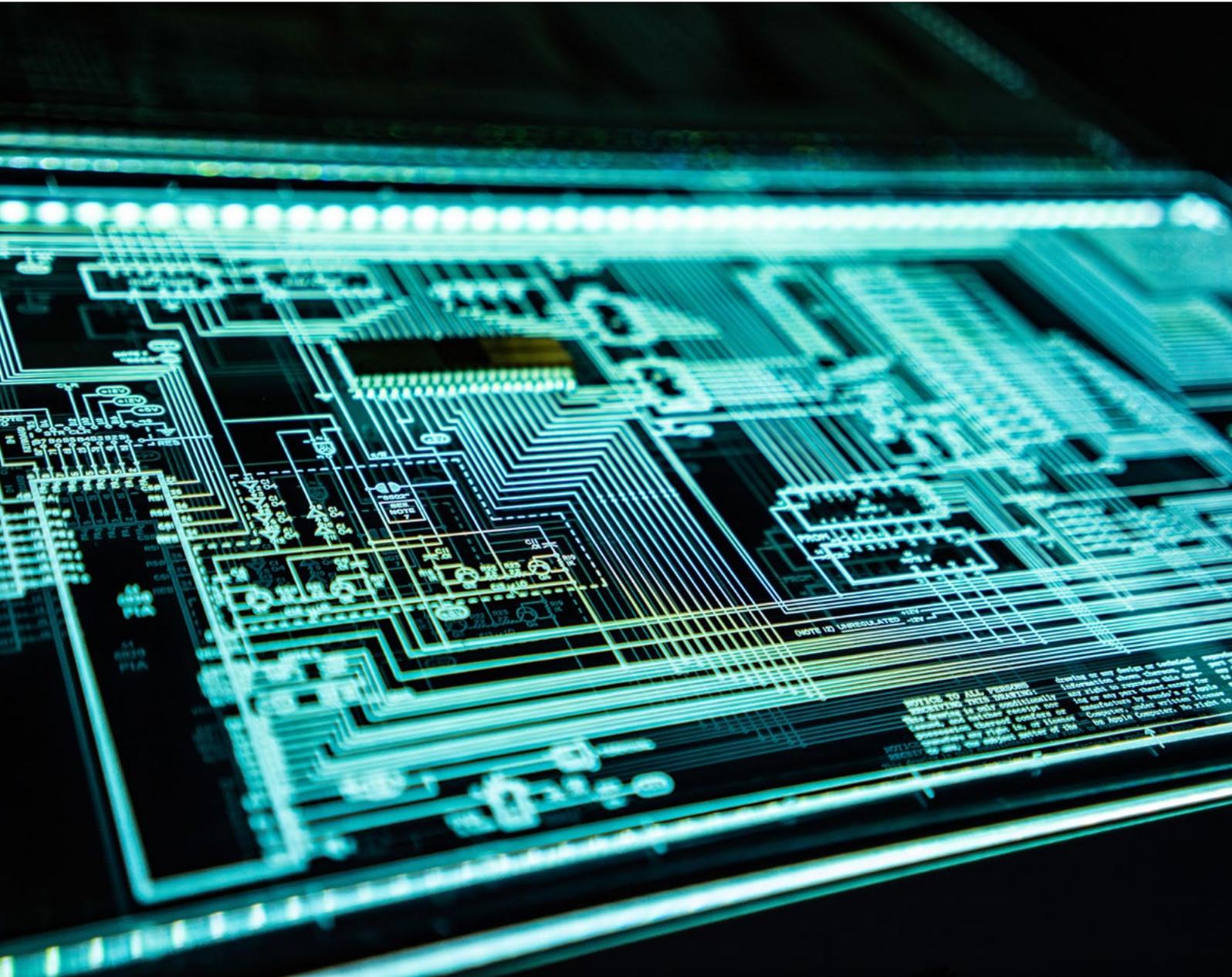
- Anheng: [SaaS hosting for medical businesses](#) (in Chinese)

Security solutions for remote work

Programmes developed to ensure an organization's networks are secure and resilient are crucial given the necessity for reliable and trusted connectivity during the pandemic. These technologies are increasingly being made available as a public service for COVID-19 response organizations.

Examples:

- Fortinet: [Free FortiClient VPN](#)
- Palo Alto Networks: [Free Prisma Access and Next-Generation Firewall](#)
- Synology: [VPN Plus licenses for free for Synology Routers](#)



Contributors

Many technology applications mentioned in this document were submitted to the Information Technology and Digital Communications Industry team directly by our partners. The World Economic Forum thanks them and is encouraged by all the work they do – far beyond their own companies. Additional cases were added through our collaboration with the Boston Consulting Group, which ran an analysis of open sources (see introduction for more details) and provided the typology to organize the cases.

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