Harnessing Technology in Our Battle With COVID-19

Tech companies are pumping out new services and products to tackle pandemic challenges.

For all the misery caused by the COVID-19 pandemic, it looks certain to leave us with at least one benign legacy: technological innovation. Across sectors and industries, from medicine and biotechnology to logistics and communications, existing technology is being repurposed while new innovations are emerging within a matter of weeks in the battle against the coronavirus.

In fact, we may be at the beginning of major changes in the way we manage outbreaks, with global coordinated research and innovation. The changes could extend to how we work and live, building on cross-fertilisation across sectors and among new technologies, and a necessary cultural shift in adopting technology. That was one of the key takeaways from our webinar "Tech Meets COVID-19", part of the INSEAD series on **Navigating the Turbulence of COVID-19** and organised jointly with the **INSEAD TMT Network** and the **INSEAD Healthcare Club**.

Breaking new ground are not just technological innovations from global tech corporations and major pharmaceuticals, but a whole spectrum of organisations including small and medium-sized enterprises and academic research centres. All this is happening while the world still grapples with other epidemics such as Ebola, dengue and HIV/AIDS, as well as major humanitarian challenges in fragile States.

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The list of technological innovations and scientific research triggered by COVID-19 is endless. **_Nature magazine_** has an updated summary of notable medical findings. Technological innovations, meanwhile, include:

- **next-generation sequencing to reduce the complexity and cost of large-scale testing**

- technologies for **distance-monitoring of patients**

- open-source **AI-based diagnostic tools** to facilitate online medical consultation

- natural language processing technologies, like **IBM's Jeopardy-winning** version, repurposed into chatbots to answer questions on COVID-19

- **machine learning-supported search for treatments**

- **technologies able to "nowcast" and forecast the spread of COVID-19**

- **contact tracing** technologies, including one being developed by Apple and Google

- "personalised" policies, as discussed in a recent **INSEAD working paper**.

Mission rapid response

In the race against COVID-19, getting technology innovation up to speed is key. Since COVID-19 laid siege to the Chinese city of Wuhan in January, one of us (Xian-Sheng Hua) has been heading an "intelligent healthcare team" – a kind of rapid response team – at Alibaba's **DAMO Academy** to develop or repurpose technologies quickly to meet the specific needs of the epidemic response.

The Alibaba team followed an Agile-like strategy, as solutions needed to be developed in a matter of days. From day one the team worked on multiple things simultaneously, such as data analysis, model definition, parameter modelling, parameter learning, verification and deployment.

We presented a few technology innovations from Alibaba during the webinar: the CT Image Analytics and genome sequencing analytics to help doctors diagnose COVID-19; a prediction tool that models scenarios as far out as 60 days; and the DingTalk communication platform for quarantined schoolchildren and medical professionals alike. The **CT Image Analytics for COVID-19** is powered by deep-learning algorithms trained on over 5,000 previous scans from China. It is described as being capable of identifying pneumonia caused by the novel coronavirus – rather than by other viruses – "with 96 percent accuracy within four seconds". According to Alibaba communications, more than 160 public institutions in China are using this technology.

The **genome sequencing solution** performs a full comparison between the test sample and the known genes of the coronavirus. By using distributed computing technology and optimised comparison algorithms, it completes the test in 14 hours with almost 100 percent accuracy, compared to existing approaches which typically take two or three days.

While diagnostic tools ferret out infections, policymakers and other stakeholders need predictive tools to make informed decisions and take action. This is where big data technology comes to the fore, too. Alibaba's **epidemic prediction tool** taps publicly available data such as the rates of infection, incubation and recovery as well as government policies (such as mandatory social distancing) and major events to offer estimates on the extent, duration and peak of the epidemic in a given region. Based on practices in China, the epidemic prediction service is able to achieve 98 percent accuracy and provide more than 60-day forecasts of the epidemic trends.

From axe to scalpel

Increasingly, however, **privacy is becoming a concern** as technologies are deployed for a "new normal" of living with the coronavirus while the

search for a vaccine or treatment continues. Yet it is in the wholesale lockdowns that the debate over individual liberty versus the collective good is raging the most.

The alternative to blanket lockdowns could lie in **"personalised" COVID-19 policies and measures**, as one of us (Theos Evgeniou) discussed in a recent article. After all, technologies for personalisation spanning pricing, insurance, credit and online marketing have been among the core innovations of the past 20 years.

Targeted measures on a broader level will also be needed. Take border closures around the world for example. A number of them could probably be, if not lifted, at least lessened for the sake of keeping the global supply chain running. To do so, we need tools to facilitate rapid risk assessment for travel from country A to country B, depending on the epidemiology of the disease in both countries, the surveillance and health care capacity of both countries, for example.

The epidemic response is very much inter-sectoral; it is not just a public health issue. Experience has shown the importance of the agriculture, transport, education, communication, research and security sectors. But if there is one thing that is different in our arsenal today, it is technology and science, from diagnostics to logistics and communications. Even though human behaviour and national interest do not easily change, information technology has already revolutionised the coordination of multiple sectors and stakeholders by simply enabling teleconferencing at anytime from anywhere with instant data sharing. Similarly, social media have enriched **epidemic intelligence** and become an essential channel for risk communication. The emergence of AI in medicine and health security today is sowing the seed of tomorrow's technology for worldwide epidemic intelligence and global coordination of pandemic response.

*INSEAD's webinar series "Navigating the Turbulence of COVID-19" features expert inputs on key issues surrounding pandemic control and current countermeasures around the world. Sign up **here**.*

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