

IT and the Fight Against COVID-19

Distinguished Lecturer Webinar
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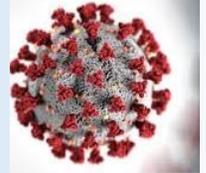
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IT and the Fight Against COVID-19



- The COVID-19 (C-19) pandemic has caused not only a global public health crisis, but also triggered social upheavals, disrupted business and industry, and affected the economy, life and work worldwide.
 - We're all facing deepest crisis and major challenges of our time.
 - It has devastated lives and livelihoods across the world.
 - It has caused untold human sufferings and halted societies and economies around the world.
 - **Nevertheless, some aspects of life must continue without much disturbance.**
- **IT at the epicentre:** To meet this need, IT has helped in new and traditional ways, becoming the epicentre of healthcare, business, education, governance, and community service.
- In the post-COVID-19 era, our world will be different, and **IT will serve significant roles.**
- The pandemic offers the IT industry, professionals and researchers **opportunities and challenges worthy of close examination.**

In this webinar, I plan to



1. Highlight the roles technology is playing in the fight against the coronavirus outbreak.
2. Demonstrate how technologists, developers and businesses rose – and are rising - to the occasion.
3. Impact of COVID-19 on Computing and IT
4. Look at the '*next normal*' post Covid-19

Earlier Pandemics

- Pandemics (plagues, epidemics) are not new! There were major pandemics earlier.
 - For a brief overview, see:
[The Top 8 Pandemics The World Has Gone Through](#)
[20 of the worst epidemics and pandemics in history](#)
- **Past Pandemics**
 - **Spanish Flu (1918–1919)**
 - Severe; infected 500 million people worldwide; over 50 million died
 - Asian Flu 1957–1958
 - Somewhat milder
 - Hong Kong Flu 1968
 - Estimated to have caused 1–4 million deaths each.
 - **Swine Flu Pandemic 2009**
 - infected 1.4 billion people worldwide and claiming lives of almost half a million.
 - Ebola Pandemic, 2014 – affected mostly African countries
- They have ravaged humanity, and changed **the course of history**.

COVID-19: A Multi-faceted Crisis That We Must Tackle

- It presented us several **new challenges *and* new opportunities**, and we needed to take decisions that we haven't even imagined.
- The outbreak is forcing executives, managers and policy makers worldwide to **quickly and continually assess** the risks they face and make and **implement business and operational decisions** that **change the status-go.**
- We're forced to live, work, learn, and socialize in a **new environment with constraints.**
- We have to adapt to this and tackle this successfully and effectively.
- **We're embracing technology to address this crisis.**

IT and COVID-19

- Information technology (IT) plays central role in every activity.
 - IT has become an **epicentre of** several operations in healthcare, business, education, governance, judiciary, community service, and more.
- Technology is helping companies and individuals everywhere get through this unfortunate, unforeseen crisis.

■ **Technology is put into use!**

“Technology has value only if you can do something useful with it.”

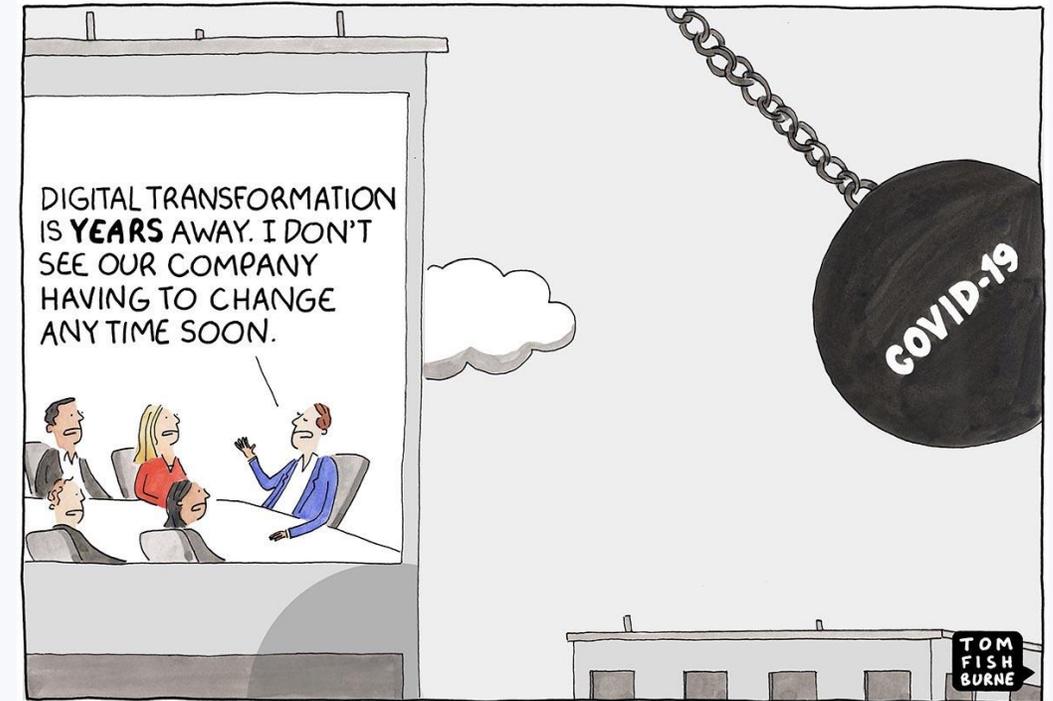
Overnight Digital Transformation Everywhere

Who led the digital transformation of your company?

A) CEO

B) CTO

C) COVID-19

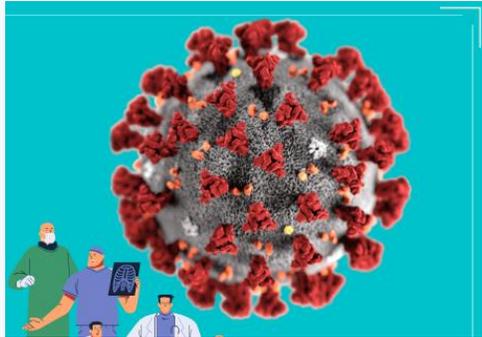


© marketoonist.com

- The rush was on to digitally transform everything, within days or 1-2 weeks.

Further information: [1](#)

Information Technologies Being Harnessed



IT is helping the fight against the Covid-19 assisting health professional and government. -- **Use of IT has become a necessity,**

- Cloud computing
- Artificial Intelligence
- Drones
- Robots
- Telemedicine
- Geo-fencing (location-based service)
- Chatbots
- Autonomous systems
- Virtual dashboards
- The Internet and VPN
- IoT
- GPS
- GIS
- Big data
- Thermal cameras
- Facial recognition

Global Impact and Transformation Caused by the Coronavirus -1

Industry	Impact	Transformation	Supporting Technologies
Education	Closure of educational institutions; access to labs is restricted; projects have been mothballed; and fieldwork interrupted	Virtual learning environment (online teaching, presentation, assessment, and consultation); convocation online	Learning management systems, e-learning, m-learning, online video conferencing tools, virtual labs on cloud,
Healthcare	Overcrowded hospitals, ;inability to meet demands on them; risk of contacting the virus	<u>Contact tracing</u> , forecasting resource requirements, allotment of scarce resources based on a patient's survivability, COVID-19 vaccine development, telehealth (consultation with a doctor or medical professional), automated diagnosis	<u>AI</u> , ML, cloud computing, <u>robots</u> , chatbot

Global Impact and Transformation Caused by the Coronavirus -2

Industry	Impact	Transformation	Supporting Technologies
Business	Closure of business, avoidance of retail shopping	Adherence to social distancing, services online	Chatbot, drone delivery, self-driving vehicles , online meeting software, virtual office/desktop, remote access to work
Industry	Closure of some industries	Work from home, remote operations, automation and autonomous operation	Robots, automation, 3D-printing
Retail	Stores closed, only online service, avoidance of retail shopping	Online shopping, home delivery	The Web, online payment, contactless payment

Global Impact and Transformation Caused by the Coronavirus -3

Industry	Impact	Transformation	Supporting Technologies
Government	Spike in demands from citizens for assistance, disruption to normal operations	Migration to online services	Cloud, the Web, online meeting application
Entertainment	Entertainment venues (parks, cinema, closed), sports without spectators	Online shows	Audio and video streaming, virtual reality
Personal life and social interaction	Lockdown	Indoor activities	Phone, audio and video chats, streaming, online gaming
Spirituality and religious practices	Places of worship closed	Online participation, prayers from home, worship through livestream	Audio and video streaming, virtual reality
Conferences	In-person conferences banned; virtual conferences	Online presentation and discussion	Video streaming, virtual conference software

AI Plays Key Roles in Several Applications

- Predicts places of outbreaks
- Traces patients and warn about the disease spread
- Outlines treatment priorities and other interventions
- Flags high-risk covid-19 patients
- Helps to maintain social order, social-distancing
- Detects whether a person wears a mask
- Controls social media rumours and fake news
- Diagnoses the causation and possible prescription
- Creates dashboards and their analysis
- Issues travel alerts and other precautions

Digital Health Apps to Use During the COVID-19

▪ Use of AI

- Quick diagnosis from X-ray
 - Choosing patients that need specific facilities
 - Virtuality application to depression of medical professional (Italy)
 - New drug development
-
- <https://medicalfuturist.com/digital-health-apps-to-use-during-the-covid-19-quarantine/>

Use of Algorithms to Tackle the Coronavirus Test Shortage

- Engineers and computer scientists consider whether algorithms could supercharge COVID-19 testing – pooled testing.

For details see *IEEE Spectrum* [article](#).

Covid-19 Will Accelerate the AI Health Care Revolution

- AI in disease diagnosis, drug discovery, robot delivery is only the beginning. Further intense research and applications will follow.
 - Availability of large machine accessible data set
 - Collaboration among computing and health professional
 - Information sharing
- 20% of all patient interactions will involve some form of AI enablement within clinical or nonclinical processes, up from less than 4% today, according to Gartner findings.
 - <https://www.wired.com/story/covid-19-will-accelerate-ai-health-care-revolution/>

Telehealth



- Telemedicine (digital linking of physicians and patients) in spotlight
- Patients today are enjoying the freedom of seeing their doctors over their smart phone, tablet or home computer.
- Doctors are able to diagnose and treat new spinal conditions and to keep tabs on existing long-term conditions

[How Telehealth Is Improving Healthcare Efficiency and Breaking the Existing Barriers](#)

[Telemedicine soars amid COVID-19: Will virtual healthcare be the new normal?](#)

Digital Contact Tracing Slowed Covid-19 in East Asia



- East Asian countries had good success flattening the Covid-19 curve.
- The key is aggressive **application of mobile contact-tracing technologies**
 - either voluntary or mandatory
 - a collectivist spirit that encourages a civic-minded embrace of them
 - a more willing compliance with governments' infection control efforts
- These technologies work, but require privacy violations that western democracies may be unwilling to accept.
- Technologies that preserve privacy while permitting effective tracing is part of the solution.
- [How Digital Contact Tracing Slowed Covid-19 in East Asia](#), HBR, 2020

Voice Assistants Can Help You

- Amazon's Alexa voice assistant can help users determine their risk level for having contracted the COVID-19 coronavirus [[1](#), [2](#)]
 - You can ask Alexa questions like, "Alexa, what do I do if I think I have COVID-19?" upon which Alexa will begin triaging them.
 - Once one of the above questions is asked, Alexa will ask the user about their symptoms, travel history, and any possible exposure they may have had to someone infected with the disease. Depending upon the user's response, Alexa will offer the user guidance that comes directly from the Center for Disease Control and Prevention about what they should do next.
- Apple offers [an update to Siri](#) that allows users to ask, "Hey Siri, do I have the coronavirus?" Siri will then ask the user a number of questions and suggest whether they should seek further medical help.
- Microsoft and CDC offer a bot called [Clara](#). The bot will ask you a series of questions, which aims to determine if the symptoms you are experiencing mean you should seek immediate medical help [[Ref.](#)]

Robots are unsung heroes during this crisis



- Robots are unsung heroes
- They have been used for everything from disinfecting hospitals to walking the stage for graduation.
- Swiss start-up developing [UV disinfection robot for offices](#) and commercial spaces.
 - The autonomous robot can map its 3D environment with lidar and then targets its UV-C disinfection system only on surfaces that humans are likely to touch -- desktops, counters, handles and handrails, and equipment in common spaces.
- Boston Dynamics Robots help frontline health workers. See also this [article](#)

How Robots are Helping in Different Ways

Reported Use of Robots (Ground, Aerial) Worldwide for COVID-19 as of 20 April 2020

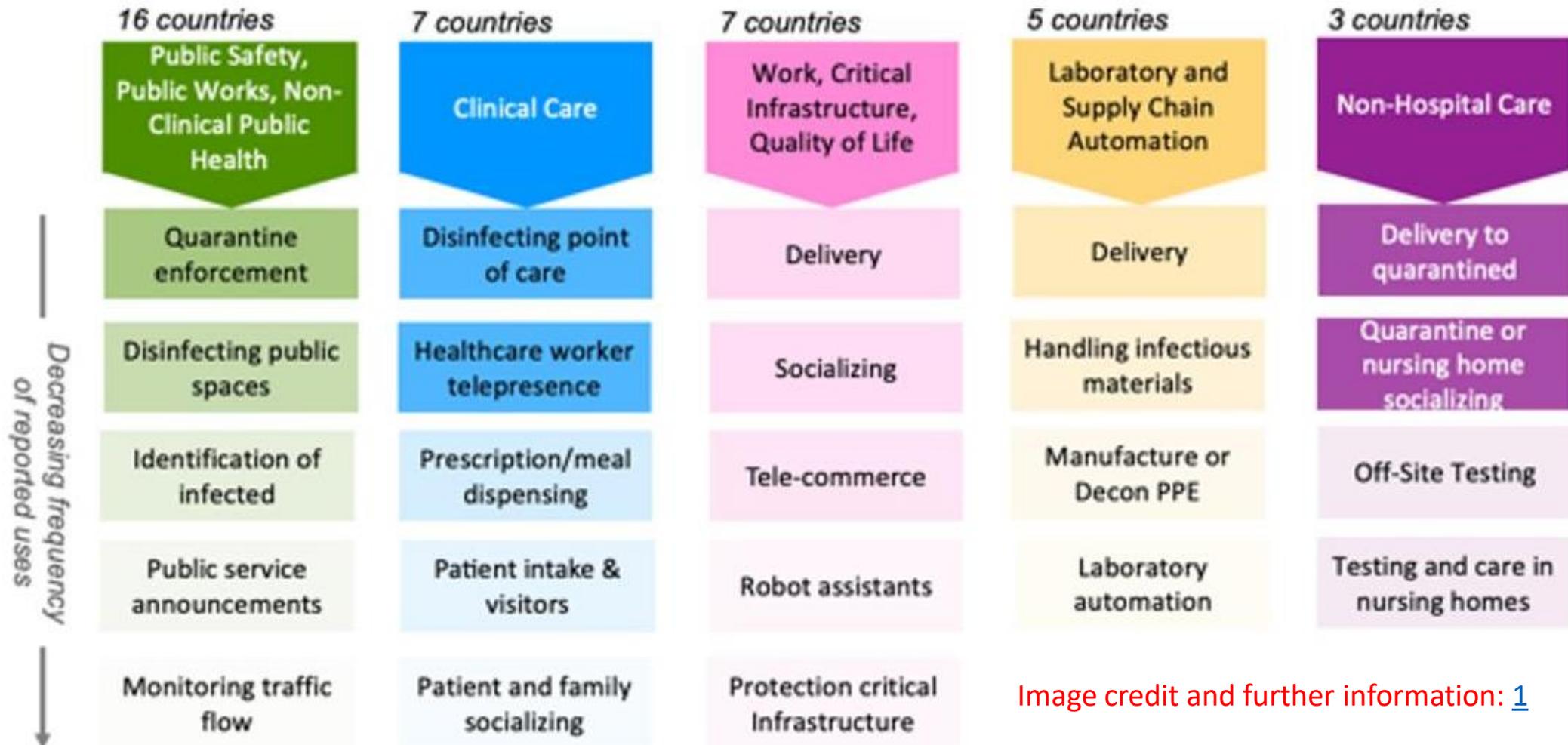


Image credit and further information: [1](#)

Immersive Technologies are Empowering the Fight Against COVID



- VR is empowering doctors and care providers
 - Virtual reality enables one to engage in global exploration, virtual family get-togethers, gaming, and more with a VR headset.
- [How Immersive Technologies are Empowering the Fight Against COVID](#)
 - [Smart Technologies Help Keep Cities Safe and Running During COVID-19](#)
 - [Can virtual reality help get you through lockdown?](#)

Gaming for Hospital Staff



- NHS staff are being gifted free access to video games to say thank you for their work during coronavirus.
- <https://time.com/5830162/iphone-mask-face-id/>

- Games for Carers, NHS - All NHS workers need to do to get access is visit the dedicated [Games for Carers website](#) and enter their NHS email address - although due to the level of interest after launch, the site went down for a short time.
- During the coronavirus pandemic, the UK games industry has helped share the government's Stay Home, Save Lives message in popular games like Fifa and Fortnite.
- **NHS staff are being gifted free access to video games to say thank you for their work during coronavirus.**

Deliveries



- Transporting of goods must continue under COVID-19 social distancing protocols in order for us to receive life-sustaining products, such as food and medical supplies.
- Autonomous delivery vehicles, robots, drones
- <https://transmitter.ieee.org/autonomous-vehicles-keep-important-deliveries-moving-in-the-age-of-covid-19/>

3D-Printing



- Technologists are employing innovative 3D printing technologies that produce masks, ventilators and shields, at a faster rate than some traditional manufacturing procedures.
- This 3D-printed ventilator could support up to 20 COVID-19 patients at one time
 - Developed by a Sudanese engineer, the ventilator uses recycled air.
 - In severe cases of COVID-19, the virus causes respiratory distress, making it difficult for patients to breathe. To alleviate this, a ventilator is used to push oxygen into the lungs.
- 3D-printing allowed for on-demand manufacturing, rapid changes and customizations.
<https://bit.ly/3du6wcj>

The Digital Transformation of Supply Chain Management

- There is a flurry of innovation
- Hundreds of companies developing digital tools to address aspects of every segment of supply chain management



- While warehousing and transport have the most activity, **planning and forecasting and platforms have outsized importance.**

Workplace

- **The coronavirus pandemic has driven the workplace transformation**
 - **In just two months**, COVID-19 has made possible what AI and automation once promised to do within years
 - Robotic process automation
 - Virtual assistants (chatbots)
 - Work from home (WFH), remote work*
 - Video conferencing, virtual meetings (Zoom, Google Meet,)

<https://tinyurl.com/y9ccvlcv>

- * [Work-from-home is so much more hectic than work-from-work](#), Japanese don't prefer WFH

Workplace: Permanent Work-from-Home Trend

- Facebook and other major companies are joining permanent work from home trend.
 - “Facebook could have about 50 percent of its 45,000-person company working remotely in the next five to 10 years.” -- Chief executive Mark Zuckerberg [[1](#)].
 - [Several major companies](#) want workers to work from home.

The Pandemic's Impact on IT

- Impact has been largely positive.
- IT, businesses, start-ups and individuals rose to the occasion.
 - Innovation
 - Competition
 - New business models – everything as a service (Google Meeting free from now)
 - Emergence of new business collaboration and potential new business strategy among even bitter rivals*.
- However, there were a few negative impacts as well
 - Increased and newer cyber security threats and risks,
 - Performance issues due to significantly increased workload ([digital congestion](#))
 - Business continuity, agility issues
- It also exposed [weakness](#) and vulnerabilities of our current IT systems and IT planning and implementation.

* [How a handful of Apple and Google employees came together to help health officials trace coronavirus](#)

How did the Internet and Cloud Handle the Pandemic?

- Digital platforms for remote work, online apps, virtual meeting and streaming services, online entertainment and gaming services, and have gained massive adoption, popularity-and traffic.
- The COVID-19 pandemic presented a true stress test for all of our systems
 - Servers, clouds, the Internet, mobile communication
 - Health care
 - Logistics
 - Government agencies

Sources: [1](#), [2](#), [3](#)

The Internet

Coronavirus

[Live updates](#)

[U.S. map](#)

[World map](#)

[FAQs](#)

[Newsletter](#)

[Your life at home](#)

[Your money](#)

Technology

Your Internet is working. Thank these Cold War-era pioneers who designed it to handle almost anything

Coronavirus may have forced people to stay at home, but the Internet these scientists envisioned long ago is keeping the world connected

The Washington Post
Democracy Dies in Darkness

Business Continuity and Agility

- Business continuity
 - Hardware; software
- Meeting new requirements quickly
 - US Govt Departments inability to process and pay unemployment claims
 - Legacy US Government computing systems
 - Legacy software written in COBAL
 - Difficulties in finding programmers to update the system [[Ref1](#), [Ref 2](#)]

Coronavirus and Cybersecurity

- Coronavirus disruption offered a ripe environment for those with malicious intent.
- There has been increased cyber activity **exploiting the confusion and fear surrounding people and employees.**
- Government agencies, businesses and security professionals needed to keep monitoring evolving threats and taking protective action.
- Malicious actors targeted people.
 - They are masterful at **playing on human emotion.**

How Hackers Took Advantage of Coronavirus

Increased cyber attacks

- Phishing mails
- Malicious apps
- Attacks on information systems and websites – slowing servers
- <https://www.cshub.com/attacks/articles/incident-of-the-week-how-hackers-are-taking-advantage-of-coronavirus?>

False News

- False information
- Hate messages
 - Facebook is using AI to Fight COVID-19 misinformation
- Deep fakes
 - To beat deepfakes, we need to prove what is re
- “Infodemics” - WHO

WhatsApp Says Viral Message Forwarding Has Reduced 70% Since Implementation of New Restrictions

AUTHOR
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PUBLISHED
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After implementing new restrictions on how many times messages can be re-shared by users [earlier this month](#), WhatsApp says that it's seen a major reduction in the distribution of forwarded content, significantly reducing the spread of misinformation within the app.

As explained by WhatsApp (via [Business Standard](#)):

"WhatsApp is committed to doing our part in tackling viral messages. Since putting into place the new limit, globally, there has been a 70% reduction in the number of highly forwarded messages sent on WhatsApp. This change is helping keep WhatsApp a place for personal and private conversations."

Conspiracy Theories and Pseudoscience

- [Coronavirus and 5G Technology](#)
- [Pseudoscience and COVID-19](#) – *Nature* magazine Editorial
 - “Cow urine, bleach and cocaine have all been recommended as COVID-19 cures.”
 - If this pro-science response is to endure, all scientists — not just a few of us — must stand up for quality information.

Need for Resilience: What COVID-19 Teaches Computing

- Resilience -- the capacity to adapt to disruptive changes in the environment
- “Creating resilient systems means thinking hard in advance about what could go wrong and incorporating effective countermeasures into designs.”
- How can we make our algorithms and systems more resilient?
- “We have educated generations of computer scientists on the paradigm that analysis of algorithm only means analyzing their **computational efficiency**.”
- “... computer science has yet to internalize the idea that resilience, which to me include fault tolerance, security, and more, must be pushed down to the algorithmic level.”
- It is time to develop the discipline of **resilient algorithms**.
 - Is there a trade-off between efficiency and resilience?

Moshe Y. Vardi, [Efficiency vs. Resilience: What COVID-19 Teaches Computing](#), *Communications of the ACM*, May 2020

Our weird behavior during the pandemic is screwing with AI models



- Machine-learning models trained on normal behavior are showing cracks —forcing humans to step in to set them straight.
- <https://www.technologyreview.com/2020/05/11/1001563/covid-pandemic-broken-ai-machine-learning-amazon-retail-fraud-humans-in-the-loop/>

Scientific publishing

High-speed science

The pandemic has caused scientists to work faster. That should be welcomed

Research papers about covid-19

Preprint and peer-reviewed, 2020



- As the deluge of work on COVID-19 has shown, **fast, free flow of information is vital for progress.**
- The virus changed the way scientists do their work and talk to each other, we hope for good.

COVID-19

YOUR IEEE RESOURCES

<https://spectrum.ieee.org/static/covid19-ieee-resources>

<https://spectrum.ieee.org/static/free-resources>

- Stories about [IEEE members](#) working on developing technologies to assist with fighting the COVID-19 pandemic.
- They are designing respirators, ventilators, thermal imaging cameras, temperature check stations, robots, and other devices.
- There are also some [first-hand stories](#) of how members are dealing with the pandemic.
- In addition, you can read Spectrum's COVID-related news and features.

The New Normal: A Look Ahead

- Pandemic has accelerated changes and transformation that were already underway
- Things will change in profound ways
- A New World -- new opportunities, new life, and new issues and challenges
- It'll be a VUCA world -- volatile, uncertain, complex and ambiguous
- It'll be both exciting and scary.
- We need to get ready to face it and get adjusted to it. **Are there other options?**

Post-Covid-19 Technology Trends



- **Business continuity planning.** Focus on how to plan for security outages, power failures, natural disasters, and now pandemics.
- **Resiliency.** creative approaches to provide continuous availability, workforce mobility, and flexible access to compute and storage for both planned and unplanned events.
- **Cloud push.** Projects to support hybrid cloud, multi-cloud, and private clouds will accelerate. Clients investing in self-reliance and redundancy will enhance capabilities to their private cloud environment.
- **Analytics and precision decisions.** Demand for accurate, rapid forecasting; analytics and precision decisions business planning, forecasting
- **AI, automation and autonomous.**
- **Cybersecurity.** Improved security to protect work from home access as well as other attack surfaces.
- **Privacy.**
- **Digital acceleration.** Push to digital business models.
- **Remote employee tool kits.** Like crash kits in healthcare, IT teams are building tool kits that include software, hardware, processes, and access to improve the work from home experience.

• <https://blog.softwareinsider.org/2020/04/06/mondays-musings-why-every-organization-must-build-a-post-pandemic-playbook-covid19-coronavirus/>

Important Ways the Coronavirus Will Change the IT Industry

- **Moves to the cloud will accelerate** to gain the flexibility needed to handle any eventuality and to decrease technology operating expenses.
 - Businesses had been gradually shifting computing workloads from on-premises hardware into the cloud. Yet most businesses had only shifted about [20% of their workloads into the cloud](#) – with the remaining 80% remaining within on-premises legacy solutions – McKinsey
- **Flexibility in its operation**
 - Flexible working hours, multiple modes of working
 - Standardized IT policies and solutions to support bring-your-own-device (BYOD) and other flexible technology initiatives.
- **Network-wide stress testing and end-to-end security provision** will become standard operating procedure for the majority of businesses and the IT professionals that manage their networks
- IT will be considered as “**mission-critical**”.
- **Remaining proactive — even in reactive mode**
Need to work collaboratively with other functional divisions

<https://www.computer.org/publications/tech-news/trends/the-5-most-important-ways-the-coronavirus-will-change-the-it-industry?>

Ethical Implementation of Artificial Intelligence Systems for Addressing the COVID-19 Pandemic

- Some of these applications increase surveillance of individuals and populations and undermine fundamental human values such as privacy and human agency
- As we lean on AIS technology, it is important to carefully navigate the possible tension between basic **ethical principles and fundamental rights and values**
 - The principles developed in non-crisis times need to address major public health and individual safety issues in this crisis.
- The IEEE Global Initiative on Ethics of Autonomous and Intelligent Systems addresses 10 issues. <https://tinyurl.com/y7qn2yqb>
- [*Ethically Aligned Design*](#), IEEE

On Research and Development Objective

- “Technology has value only if you can do something useful with it.”
- Technology can **make the world a better place**. With great power on our hand comes great responsibility.
- Work on solutions that **address real-world problems and issues** that impact business and society.
- **“Do Responsible Research and Development”**

Research and Development Opportunities

1. Focus on R&D that address real-life problems that benefit people, industry and society.
2. Most work will be multidisciplinary in nature.
3. Autonomous systems, data analytics, robotics, AI/ML, supply chain management, healthcare
4. Opportunities are abound for researchers, developers, and IT industry.
5. We need to develop and adopt a new mindset - **think differently!**

Bill Gates on Pandemic Preparation



- “When historians write the book on the covid-19 pandemic, what we’ve lived through so far will probably take up only the first third or so. **The bulk of the story will be what happens next.**” [1]

[1] Bill Gates, in “[Bill Gates on how to fight future pandemics](#),” The Economist, 23 April 2020

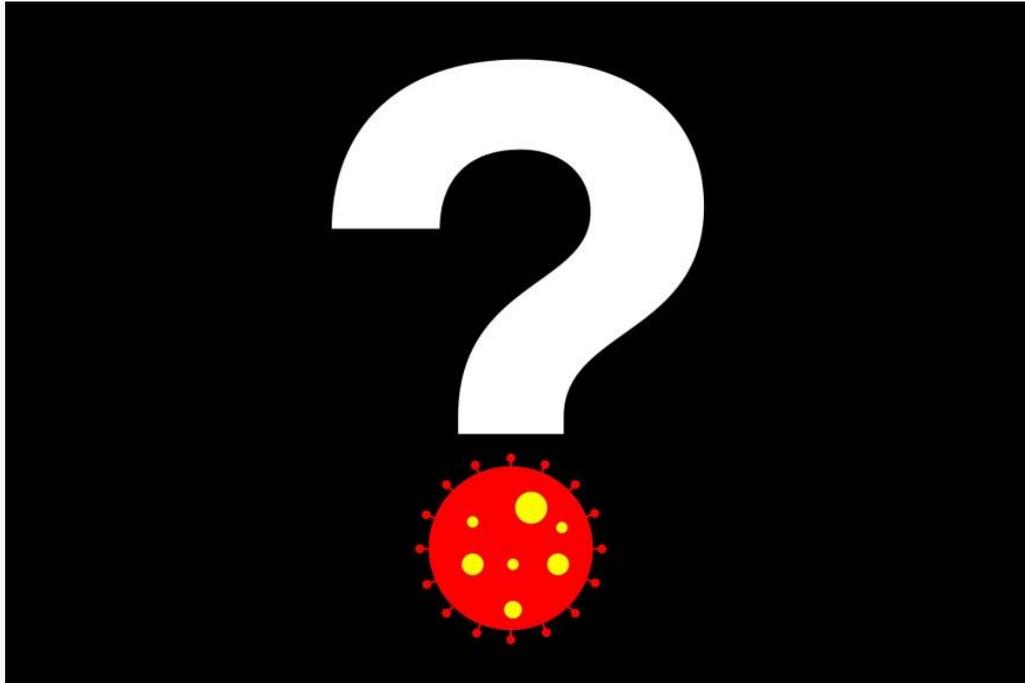
[2] Gates’ 2015 Ted Talk: [The Next Pandemic? We’re not ready ...](#)

A Crisis Can be a Catalyst for Change

- **Crisis is an opportunity to change -- and change quicker.**
- As Winston Churchill said: “Never waste a crisis.”
- **“Specifics cannot be foreseen; so, flexibility and adaptivity are critical.”**

Planning for the Post Covid-19 Era

- The Coronavirus pandemic is a wakeup call to all of us. It has also established that **'necessity is the mother of invention!'**
- Our life and work pre-corona and [post-corona](#) will not be the same.
- Business wouldn't be 'as usual' and we may have to continue with new ways of working and offering various services.
- History shows that changes that we adopted in a crisis are not always temporary— crises can fundamentally [reshape not only our beliefs and behaviours](#) but also business and industry in many ways.
- IT will play even more major and crucial role in the post-COVID era.



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Thanks for
listening

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