

A Contrasting of the Pernicious and the Salubrious: An Assessment of the Global Impact of the Covid 19 Pandemic on Technology and Information.

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Abstract:

In this paper, we do an assessment of the global impact of the Covid 19 pandemic on Technology and Information. Technology is assessed through the indicators of Robotics, 3D printing, Internet of Things (IoT), Artificial intelligence (AI) and Biotechnology. Information is assessed through the indicators of Access/Privacy, Data growth, False news and social media and Knowledge and learning. There has been a heightened interest in Robotics due to public health and labour shortages. In the long term, this could translate into increased replacement of human labour across sectors like agriculture, food and healthcare. The pandemic has stimulated rapid manufacture of medical components through the accelerated adoption of 3D printing technology. Going forward, there is a high probability of an accelerated replacement of traditional manufacturing processes with 3D printing technologies. This is more so in healthcare. IoT usage remains high in the pandemic. Certain sectors have witnessed dramatic increments in quantum of data flows. Going forward, there will be an increased dependence on IoT in everyday use. This will be particularly true for health monitoring and surveillance. The pandemic has seen a massive uptick in the adoption of AI chatbots and other AI applications. In the long term, AI will see increased spending on Research and Development. Adoption timelines will shorten. In hot pursuit of the development of Covid 19 related vaccines and therapeutics, the synthetic biology industry has seen a surge in investment. In the long run, the global competition for leadership in biotechnology will only become more fierce. The pandemic has broadened the use of digital surveillance. Going forward, companies and countries will likely expand digital surveillance. Social and commercial activities have seen digitalisation on a large scale. The future is likely to see a significant shift to an online first culture and an increase in the rate of growth of data volume. The pandemic has facilitated the creation of a fertile environment for fake news. Going ahead, there are heightened prospects of an intensification of the existing geopolitical

competition in misinformation. The pandemic has widened the adoption of online learning. Moving ahead, this could have the unfortunate consequence of widening the existing digital divide in society, which in turn could perpetuate inequity.

Key words:Covid 19, Technology, Information, Robotics, 3D printing, Internet of Things (IoT)

Methodology: Narrative review

Introduction

In this paper, we do an assessment of the global impact of the Covid 19 pandemic on Technology and Information. Technology is assessed through the indicators of Robotics, 3 D printing, Internet of Things (IoT), Artificial intelligence (AI) and Biotechnology. Information is assessed through the indicators of Access/Privacy, Data growth, False news and social media and Knowledge and learning.

Robotics

Covid 19 has laid the ground for the acceleration of Robotic technology adoption.¹In an Oxford Economics study done before Covid 19, it was estimated that by 2030, robotic technology could take over 20 million global manufacturing jobs.² Research tells us that automation and technology adoption sees significantly faster growth in economic downturns.³ The greatest fall out is on lower skilled jobs which typically account for the bulk of global employment.⁴ Robots are performing yeoman service in the pandemic itself. They have been of considerable assistance to authorities in critical tasks such as disinfection and the mitigation of virus spread. Hospitals are witnessing an increasing incorporation of robotic technology in their day to day operations. This is a historic opportunity to drive quantum leap improvements in patient care across the domains of diagnostics, therapeutics and rehabilitative care. A pertinent example is the research interest in robots that can perform remote mouth swab and blood sample collection.⁵

In the grocery industry, in addition to providing contactless deliveries, robots also arrange inventory on store racks and wipe shop floors.⁶The rate of implementation of robotic technology at fulfilment centres at service sector goliaths Amazon and Walmart has increased significantly in the pandemic era.⁷ This has corresponded to a sizable surge in online orders with consumer shopping behaviour tilting considerably towards shopping on the internet.⁸ Other areas in which robots have made positive impacts are in screening potentially Covid 19 infected people with thermal imagery, ensuring the enforcement of quarantine measures and public health IEC (Information, Education and Communication).⁹

3 D printing

3 D printing is a technology that has shown potential to respond to the exigencies of the pandemic. It has demonstrated value to the healthcare industry. Post the outbreak, medical supply chains have been visibly struggling with world wide disruptions. Medical suppliers have been distraught at being unable to cater to existing and emerging needs. It is in this pain suffused environment that 3 D printing has proven to be a saviour in many ways. It has been able to produce medical components like personal protective equipment, prosthetics, ventilators and anatomical structures. As the pandemic induced crisis intensified, organisations in the US and in other parts of the world took recourse to 3 D printing to plug

supply chain disruption induced shortages. A platform was set up to generate cohesion in efforts by 3D companies.¹⁰ This is commissioned with the objective of ameliorating shortages.¹¹ The US has been at the forefront of this initiative with the USFDA (US Food and Drug Administration), Department of Veteran affairs and National Institutes of Health initiating a public private partnership with 3D printing companies to reduce medical device shortage induced pain.¹² Safety goggles are being mass produced by the Chinese using 3D printing technology.¹³

Internet of Things (IoT)

Paradoxically, IoT has not taken off in quite the fashion that technology watchers would have expected it to. IoT has largely remained unaffected by the churns produced by the pandemic. This unaffectedness is in sharp contrast to the substantial scaling up of Video conferencing, VPN networks and work from home infrastructures. With digitalisation rates soaring in the post pandemic scenario, it would have been reasonable to expect higher uptake and adoption of IoT technology, but this has not been the case. The data for IoT shows more than one trillion connected devices spanning the globe, across diverse industries. Post Covid 19, the metrics tell us that the amounts of data being transmitted across the IoT network are similar to the pre covidquantums. This could also be an indicator that the rate of adoption and consumption of IoT technology is already at maximum.¹⁴ However, all this does not mean that there will be no long term impact of the pandemic on IoT analytics in healthcare. A notable example is the surge in demand for interactive healthcare digital portals, with increase in telehealth consumption sometimes as high as 500 to 600 percent.¹⁵ This trend is highly unlikely to reverse. Demand for virtual tele healthcare will only rise, increasing adoption and uptake of IoT. IoT has already proven its value in public healthcare by detecting emerging pandemics of Zika and H1N1.¹⁶ In the current situation, IoT technologies have been deployed in the battle against Covid 19. This is being done through virus tracking and contact tracing by real time analysis of vast amounts of gathered data.¹⁷

Artificial intelligence (AI)

The size of the AI market in 2030 could be over 15 trillion dollars.¹⁸ The available evidence strongly suggests that the pandemic has given further impetus to innovation in AI which was already growing at a fast clip. In all probability, the sector that will see the maximum growth of AI will be healthcare.¹⁹ The pairing of robotics and AI has helped create systems that are autonomous and have the capacity to interact with the physical world. These systems can monitor virus infection rates and virus spread, do contact tracing and appraise policy makers with the data and information required to make policy decisions. Digital assistance adoption and usage has surged. Chatbots in WHO and CDC apps and websites²⁰; conversational banking in e commerce²¹; and the call centre service industry are prominent examples of this.²²

At the same time, the pandemic has thrown light on the obstacles in the path to achieving fully automated systems that can manage themselves. It is now apparent that this final destination is decades away. The evidence currently available tells us that seemingly abstruse behaviour triggered by the pandemic, such as panic buying and hoarding of toilet paper and garden equipment, causes confusion to AI.²³ The learnings from this could lead AI makers to build in learnings from previous crisis moments in human history into AI. These moments could be the Great depression of a century ago and the Global financial crisis of this century. This might help in the better prediction of the behaviour of humans. In March and April 2020, the stock markets oscillated wildly. This has been suggested to be attributable in large

part to the AI algorithms overreacting to a rapidly changing environment, one for which the AI could not mine any relevant context or back story.²⁴

Biotechnology

The 21st century had already been billed the century of biotechnology. The pandemic has accelerated this development. In terms of the response to Covid 19, Biotechnology is at the very forefront, with rapid progress and novel initiatives in prevention with the development of vaccines, diagnostic tools and treatment alternatives. The pandemic has provided stakeholders with clarity regarding the requirements for achieving industry leadership positions in the biotechnology domain. It has also provided clarity on the role that biotechnology will play in the economic competitiveness and national security concerns of nation states. AI and cloud computing are force multipliers for Biotechnology. Even before the outbreak of Covid 19, multinational companies in the synthetic biology industry were forecast to grow to a market capitalisation of more than 20 billion dollars by the year 2022. In the midst of the pandemic, the market capitalisation of some companies that are working on developing vaccines has increased tremendously.²⁶

There is a great race on among synthetic biology companies to develop and release a Covid 19 vaccine. Biotechnology has proven to be significantly faster than traditional techniques in developing vaccines rapidly and progressing to the human testing stage of vaccine development. Some of the companies at the forefront of this charge are Inovio Pharmaceuticals, Moderna Therapeutics and CureVac.²⁷ Efforts are on by a company called Distributed Bio to develop a universal flu vaccine using a biotechnology tool called Computational immunology.²⁸ Genscript has come up with a sophisticated diagnostic test that uses DNA tools to identify and quantify the burden of the Coronavirus in blood samples.²⁹ Use is being made of cell free biotechnology to increase the pace of covid-19 therapeutics and to increase the speed of antibody production by up to 10 times more than what is currently feasible.³⁰

Access and Privacy

Almost half of the global population has online access today. By 2030, almost the entire global population will have online access. Covid 19 has accentuated the importance of the role that digital connectivity can play, acting as a critical link in the midst of social distancing and lockdowns. While there is no doubt that the internet is a positive social force, it is also true that it has facilitated the spread of surveillance and security measures by governments and corporations. This is likely to have long lasting implications on individual privacy and civil liberties.

Both democratic and authoritarian governments in more than 25 nations have increased the scope of their utilisation of surveillance technologies in the Covid 19 pandemic.^{31,32} This use includes the use of GPS tracking for compliance enforcement, the gathering of mobile phone data from telecom companies and the analysis of this data to assess compliance with public health guidelines, and publicly providing confidential information about those infected with Covid-19, which in normal times would have been considered a violation of confidentiality. The rapid development of technologies that can operationalise health surveillance has been done by private corporations. Apple and Google, two tech behemoths, are working together on an app that does contact tracing using Bluetooth. The app assesses past proximity to individuals who might have been infected days or weeks prior to diagnosis.³³ The Chinese e commerce mammoth, Alibaba, has developed a health tracing technology that documents the health status of individuals and shares that data with law enforcement.³⁴ The Tracking the Global Response to Covid 19 is a project by Privacy

International that documents a broad spectrum of initiatives that are putting surveillance to use beyond public health.³⁵ This includes an initiative to create immunity passports and the use of contact tracing apps. The twin tower terror attacks in the U.S. in September 2011 ushered in an era of heightened security systems and high tech security technology. These have persisted to this day. Parallels can be drawn from this to the present day Covid 19 situation. The Surveillance measures put in place now for Covid-19 will in all likelihood outlast the pandemic. Surveys tell us that the pandemic has increased people's concern for health security and decreased their concern for privacy as compared to before the onset of the pandemic.^{36,37} There have been concerns that the pandemic is providing legitimacy to grave abuses of power that could soon become the new normal.³⁸

Data growth

The growth of data consumption globally will be driven by the covid 19 pandemic stimulated large scale digitalisation of social and commercial activities, services and industries. The increasing adoption of IoT and AI will be substantial contributors to this increase in data consumption. With the virus and subsequent lockdowns pushing people online, hundreds of millions are logging in for work and entertainment. This is causing huge spikes in the volumes of data consumption. These phenomena demonstrate the critical importance that digital infrastructure holds for the future of economies and human societies. Compared to 2019 March, data usage in homes saw an increase of 18% in 2020.³⁹ The average daily usage saw an increase of 38 % to 16.6 GB compared to 12 GB in 2019.⁴⁰ The surge in internet traffic has been to the order of 70%.⁴¹ Telecom majors are witnessing a 50% rise in data usage.⁴² Numerous technology platforms are seeing significant usage surges. The number of people using Zoom on a daily basis has increased by 378 percent from the previous year.⁴³ Data usage has increased by more than 100 percent.⁴⁴ Whatsapp and Microsoft Teams have seen a 45 percent increase in traffic.⁴⁵ All these developments indicate that while there is the possibility of a decrease in the data use of some technologies post the Covid 19 pandemic, there is also a very strong likelihood that data consumption growth globally will pick up pace.

False news and social media

In January 2020, almost half of the global population-3.8 billion people were active consumers of social media.⁴⁶ This number is 9 % (321 million) more than in 2019. In the short term, the pandemic has led to an increase in the amount of time spent on social media. There has also been a significant increase in the exposure to false news. The evidence suggests that people whose primary source of information is social media have a higher likelihood of coming across misinformation about the pandemic.^{47,48}

There has been a proliferation of disinformation and misinformation surrounding the virus. The difference between the two is that disinformation is information that is intentionally false while misinformation is information that is inadvertently false. Fake information is by no means a new phenomenon, but it is now turbocharged in scale and speed by 3 potent factors: information technology, state of the art deep fakes/synthetic media, and governments out to twist the facts. Health misinformation has been seen in the past, a prominent example being the 2016 Zika outbreak, where the pace of misinformation was much higher than credible sources of information. A critical factor in this ecosystem is the capability of false news to spread faster, farther and wider than credible news.⁴⁹ Experience from previous outbreaks confirms the negative impacts of epidemiological misinformation.

This trend will in all likelihood stay with us. Evidence for this is the visible struggle of governments, societies and corporations to stay on top of the rapidly spreading

misinformation. This phenomenon has been described by the WHO as an infodemic. An unfortunate offshoot of this is the deliberate weaponising of misinformation by nation states to achieve their geopolitical goals. China, Russia and other nations are spreading disinformation to generate uncertainty, chaos and fear in the US and Europe, in the process deflecting attention from their own struggles with the pandemic.^{50,51} In February 2020, an elaborate campaign was launched by Russia⁵² to engineer multiple Covid 19 infodemics, even pushing conspiracy theories that the US created the virus. China has adopted an exceptionally aggressive approach, being confrontational at times. The Chinese have even gone to the extent of using government linked accounts to facilitate the spread of conspiracy theories. In what experts have assessed to be a new tactic, the Chinese have even sent disinformation messages directly to American mobile phones.⁵³ The US has had its senior officials in administration and Congress members articulate and support unproven theories with no evidence about the intentional or unintentional release of the Covid 19 virus from Chinese laboratories.

Learning and Knowledge

The pace of adoption of online education has experienced a Covid 19 induced quantum leap. A significant proportion of schools and universities globally have adopted online education in the pandemic scenario. This has not been without pain. Inequalities in access to technology have become apparent. The emergence of a new model of education looks imminent. This model will be hybrid in nature. It will look to synergise the advantages of in person education with online learning. Online education has been on the ascendant since 2012. By 2018, the percentage of US students who were enrolled in at least one online class was over 34 percent.⁵⁴ Many large government funded universities have operationalised a hybrid education model: Between 2015 and 2018, online enrollments in Arizona State University increased by nearly 100 percent. Online enrollments at Florida International University increased by 44 percent.⁵⁵ These numbers assume greater importance in the backdrop of falling enrollments across Universities in the US. In the past 8 years, enrollments at US universities have decreased by 11 percent.⁵⁶ This decline will in all probability not be arrested without the affordability and accessibility that online education offers. Online education has the potential to cut tuition fees and other expenses as online technology reduces costs on buildings, staff and faculty.⁵⁷ Online education also allows for larger classes.

But everything in this space may not necessarily be positive. The pandemic may bring about a better understanding of factors that reduce the effectiveness and footprint of online education. These factors may include inadequate administrative and marketing support, inadequate comprehension and internalisation of the requirements of online learning by teachers and professors, and very importantly, the negative perception among employers of degrees acquired online. All these factors may lead to a drop in demand for online degrees. This development in turn may make universities rethink course fees.⁵⁸ The limits of online education may be unveiled.

Conclusion:

There has been a heightened interest in Robotics due to public health and labour shortages. In the long term, this could translate into increased replacement of human labour across sectors like agriculture, food and healthcare. The pandemic has stimulated rapid manufacture of medical components through the accelerated adoption of 3D printing technology. Going forward, there is a high probability of an accelerated replacement of traditional manufacturing processes with 3D printing technologies. This is more so in healthcare. IoT usage remains high in the pandemic. Certain sectors have witnessed dramatic increments in

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