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Impacts of the Global Health Crisis on the Use of Information Technologies

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Abstract

The 2020 novel coronavirus pandemic has impacted our lives in many ways. This article examines the rapid adoption and use of traditional and "state-of-the-art" information technologies intended to help cope with the pandemic. People and organizations have adopted and used IT tools for collaboration, communication, surveillance and monitoring, remote working, and cloud-based applications for one major reason – necessity. There is no viable alternative to maintain our civilized society. These and other information technologies have helped people continue to work, to socialize, to communicate, to entertain, to visit doctor's office, to shop, and live. Experience with these technology adaptations has demonstrated that we need more and better IT solutions, more technology literacy, better public health surveillance, and better preventative measures to minimize harms from health crises to find a new normal. In the future, many people will likely choose to work and learn remotely, and organizations and governments must upgrade their digital capabilities and the skills of employees. IT can increase the robustness and adaptability of our economic and social systems as well as our well-being.

Keywords: Pandemic, rapid change, Information Technology adoption

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1. Introduction

One year ago, Hadidi and Power (2020) asserted that the technology adoption rate is becoming much faster, and that technology adoption has "changed from an approximately normal curve to a skewed curve with more people adopting new technology quickly." On March 11, 2020, the World Health Organization announced that COVID-19 is a pandemic. The health crisis has encouraged and promoted faster adoption of innovative technologies. Our personal, organizational, and societal experiences during 2020 reinforce our conclusions about technology adoption. A major external disruptive event can significantly alter technology adoption. A global pandemic is a serious, unexpected event. The magnitude of the current disruption is hard to comprehend. In 2020, there were globally more than 85.5M cases of the Coronavirus disease, 60.4M people recovered, and 1.85M people died (https://www.worldometers.info/coronavirus/ accessed 1/3/2021). These are conservative numbers. Some would call the Coronavirus Pandemic a Black Swan event (Taleb, 2007); others would call it an unanticipated disaster. This article reviews major changes that have occurred from the rapid adoption and increased use of Information Technology (IT).

In the past 25 years, we have experienced smaller-scale health crises like Ebola virus disease (EVD) and the human immunodeficiency virus (HIV/AIDS). More than one hundred years ago, the often-mentioned Spanish flu or the 1918 flu pandemic caused by the H1N1 influenza A virus was much deadlier and more widespread. The 1918 flu pandemic lasted from February 1918 to April 1920 and infected 500 million people – about a third of the world's population in four successive waves. Estimates are that 50 million people died during the 1918 pandemic in 26 months. The Black Death plague of 1347 to 1351 was the deadliest pandemic recorded in human history. The Black Death pandemic resulted in the deaths of 75–200 million people in Eurasia and North Africa, cf., en.wikipedia.org/wiki/Black Death.

Society survived the Black Death and the 1918 flu without IT, but with a tremendous loss of lives. The current pandemic has been far less virulent than either of those global health crises, but our response has not been rapid and robust. Our current systems and processes that incorporate IT are more robust than 100 years ago and our medical and genetics knowledge are much more sophisticated, but we can and are making improvements. Implementation of Information Technology is reducing some of the negative consequences and reducing our vulnerability from a rapidly spreading, deadly virus.

The novel coronavirus pandemic has impacted our lives in many ways. This article narrowly examines only the first and second-order changes from the rapid adoption and use of traditional and "state-of-the-art" information technologies.

2. Impacts on Individuals

The pandemic has affected young and old alike. In particular, when it comes to the social, and physical well-being and education of children, this pandemic has been devastating. Technology has helped somewhat to remedy some of the difficulties. However, the availability and utilization of technology by children is neither uniform nor consistent across various geographic areas and the economic status of families. High speed Internet simply is not available to all families and in all geographic areas around the country. For children with disabilities, this situation is even much worse. During this time of social distancing and isolation, we need to take steps and be more prepared for future pandemics and make sure the needed technologies are more widely available and accessible to all individuals and families and, in particular, families with fewer resources and younger children.

More students will continue learning through hybrid IT-based instruction, perhaps alternating between classes in person and virtually on Zoom or other platforms. Teams are using more collaboration and scheduling tools. Distributed teams are more widely accepted. Teleworking has increased significantly (Messenger, Vadkerti, and Uhereczky, 2020). The increase in telework has resulted in expanded data collection from monitoring remote workers and remote students. Many people have had to rapidly acquire new skills to be able to learn and work at home. Working and learning from home will likely continue as a popular alternative once the pandemic subsides. It will be interesting to study and see the long-term implications of using new technologies in real estate, transportation, retailing, environmental sustainability, and other domains of commerce.

More people in businesses, agencies, and other organizations are having synchronous decision-making meetings. Zoom, Microsoft Teams, Google Meet, Go To Meeting, and other conferencing tools have increased in popularity and use. Videotelephony is widely accepted and understood. Working from home or remote locations using technology is more widely accepted. Evidence shows that use of conferencing tools has significantly increased in the past year. For example, Zoom launched in 2011 and had 30 million users in 2014 according to: https://usefyi.com/remote-work-statistics/#863. Zoom surpassed 300 million daily Zoom meeting participants in 2020, a 50% increase from the prior month (200 million). For comparison, in December 2019, Zoom reported 10 million meeting participants (https://usefyi.com/remote-work-statistics/#851).The Zoom Cloud Meetings app on the App

Store ranked #3 worldwide among the non-gaming app publishers (Statista). Table 1 summarizes some usage statistics for Zoom.

Number of People Using Zoom	300 Million Daily Meeting Participants
Number of Users	200 Million
Number of Corporate Customers	265,400
Number of Schools Using Zoom	100,000
Number of Zoom Customers with more than 10 Employees	81,900
Number of Zoom Installs in June 2020	71.2 Million
Number of times Zoom was downloaded from the App Store in Q2 2020	94 Million

Table 1. Zoom facts (as of July 2020), source https://expandedramblings.com/index.php/zoom-statistics-facts

Data shows that there are more apps for ordering food products and for other types of shopping. The delivery economy is growing, especially in large cities. Online to offline food delivery has facilitated consumer access to prepared meals and enabled food providers to keep operating (Li, Mirosa, and Bremer, 2020).

Location aware apps are assisting with contact tracing. Healthcare professionals and patients have embraced telemedicine and app-based monitoring of wellness information. The findings of a recent study suggest that "telemedicine and virtual software are capable of decreasing emergency room visits, safeguarding healthcare resources, and lessening the spread of COVID-19 by remotely treating patients during and after the COVID-19 pandemic" (Bokolo, 2020, p. 1). Hakim, Kellish, Atabek, et al (2020) suggest that telemedicine and virtual software platforms may be helpful to manage the pandemic. In this crisis, information technology has opened a new frontier in mental health support and data collection. There are thousands of mental health apps available in the iTunes and Android app stores. Torous, Myrick, Rauseo-Ricupero, et al (2020) suggest that increasing investments in digital mental health today will improve access to mental health care in the future.

Rapid adoption of thermal imaging and video surveillance systems monitor temperatures, enforce mask restrictions, and detect social distancing violations, cf., Lopeztello and Wulffson (2020). Sensors for temperature checks are more widely used in airports and office buildings. There is greater interest in Internet of Things (IoT) enabled sensors and devices that are used to increase the efficiency of the appliances in a smart building and make it more efficient, sustainable, and safer. IT is increasingly used for automatically controlling heating, ventilation, air conditioning, lighting, security and other systems of a building.

Barcoding allows vaccine information to be documented in an Electronic Health Record (EHR) instantly and accurately. Immunization Information Systems (IISs), otherwise known as immunization registries, are confidential, population-based, computerized databases that record all immunization doses administered by participating providers to persons residing within a given geopolitical area. They offer an opportunity for confidential, secure, centralized, and immediate access to immunization records for authorized providers.

More seniors over age 65 are adopting information technologies. Etkin (2020) asserts "In 2020, many older adults' own devices with Internet capabilities and are able to use them to video chat with family members and friends, order groceries, consume content online and even exercise." Families are having FaceTime and Zoom gatherings. Virtual events have provided some new social activities.

3. Impacts on Organizations

Health organizations are increasing the use of IT. For example, bioinformatics is an important, interdisciplinary field that develops methods and software tools for understanding biological data, especially large and complex data sets. IT is used for gene sequencing and genetic engineering of vaccines. McCullers and Dunn (2008) noted "The introduction of genetic engineering has fueled rapid advances in vaccine technology and is now leading to the entry of new products in the marketplace." Increased adoption of health information technologies has been a major consequence of the health crisis. Health IT provides many opportunities for improving and transforming healthcare. Adoption of health IT is reducing human errors, improving clinical outcomes, facilitating care coordination, improving practice efficiencies, and collecting and tracking data over time, cf., https://www.ncbi.nlm.nih.gov/pmc/.

Robotic process automation is changing workflows, including document generation and payment processing. Industrial robots and automated manufacturing are changing production and distribution processes.

There is greater use and acceptance of Artificial Intelligence. According to McKendrick (2020), "KPMG is applying AI approaches to rapidly analyze contractual obligations and termination clauses, as industries face supply chain delays, cancelled events and other roadblocks. ... KPMG also reports developing AI-based tools to supplementing employee and customer call centers to analyze and triage issues and questions."

More government services are provided online rather than in person. For example, online portals, increased social media use, AI and robotics, cf., Charlton, 2020. Governments have employed digital platforms, and big data analytics.

Organizations are adopting many information technologies including online health care; blockchain-based epidemic monitoring platforms; robots that deliver food and medications and that screen people's temperatures; online education platforms and home-based working solutions; and robotics and 3D-printing technologies to manage social distancing in manufacturing plants.

The impacts of COVID-19 on organizations are deep, broad, and potentially permanent. The impact is not limited to the increase in the use of technology and how employees continue doing their jobs. The pandemic is impacting consumer behavior, marketing, human resource management, competition, supply chains, and possibly even corporate social responsibility and sustainability.

As the pandemic forced organizations' employees to work from home, their consuming habits changed. No longer could people easily go to restaurants at their work locations or close by. Their shopping habits changed. Online shopping significantly increased and this could become a permanent habit for many consumers. Shops have to modify their marketing strategies to fit the consumers' behavior during and possibly even after the pandemic. Organizations need to be aware of implications for their human resources activities including leave policies, remote work policies, technology training, and mental health issues. The pandemic has significantly increased competition between online and brick and mortar entities. Due to altered consumer habits, the practice of online shopping could potentially remain very strong even after the pandemic. We have all experienced supply chain issues for many essential products. Let us hope that companies learned a lesson to incorporate newer technologies in their supply chain operations and move towards smart supply chain platforms. Let us also hope that at least some good will come out of this devastating pandemic in areas such as corporate social responsibility and sustainability. He and Harris (2020) clearly articulate the potential movement of organizations toward more robust corporate social responsibility and sustainability.

4. Conclusions

Clark (2020) notes "When we look back on the current health crisis, there's no doubt that we'll learn that it resulted in a number of innovations: new drugs and medical devices, improved healthcare processes, manufacturing and supply chain breakthroughs, novel collaboration techniques." He argues "crisis demands movement and change – the pace of ideation, decision making, and implementation all increase dramatically." The increased use of information technology is likely a permanent change. Our new normal will be a mix of both face-to-face and information technology-mediated activities. Better supply-chains, more automation, and Artificial Intelligence will create a more flexible economy.

Information technologies have helped people and organizations continue to function. IT helps us to work, to socialize, shop, and live. Experience with these technology adaptations and supports has demonstrated that to find a new normal we need more and better IT solutions, more technology literacy, better public health surveillance, and better preventative measures to minimize harms from any future health crises. In the future, more people will likely work and learn remotely, and organizations and governments must upgrade their digital capabilities and the skills of employees.

As a species, we have an extreme dependence upon human contact which is both an economic and social strength and weakness. We have observed how an infectious disease can spread by human contact. The deadlier the disease the more we need to isolate, quarantine, and use Information Technology intermediation. At some point the disease will be "controlled", but we cannot return to the processes and behaviors of the past. Businesses, schools, and colleges are reopening, but life will never return to the old normal. Society will fashion a new normal that makes greater use of IT.

Unfortunately, the impact of the COVID-19 pandemic will last a very long time. Let us hope that during these terrible times of death, sickness, and lost livelihoods, we have all learned a significant lesson. Information Technology is important and relevant for the well being of all of us.

5. Overview of the Contents of this Issue

This issue of the journal includes three traditional research articles and a tutorial.

Joey George and Alastair Robb, in a very timely article, look at deception detection in digital communication among people. In particular, they look at individuals in the US and Australia to determine if people in one culture can detect deception of people in the other. They look at full audiovisual, video only, audio, and text communication. Their study finds that both Americans and Australians can detect deception at approximately the same rate across both cultures. Further, their study finds that individuals were able to more accurately detect deception for full audiovisual types of communication.

John Muraski, Jacob Iverson, and Kimberly Iverson, look at the challenges organizations are facing in finding skilled IT talent. Specifically, they look at the Northwest Wisconsin region and the creation of a "New Digital Alliance." This innovative initiative is funded by local companies and universities. The main purpose of this collaborative alliance is to attract, develop, and retain IT talent for the Northern Wisconsin region. This collaborative network could potentially serve as a model for other regions in the country.

Loknath Sai Ambati and Omar El-Gayar investigate the performance of machine learning (ML) techniques used in human activity recognition (HAR). They specifically look at the more commonly used approaches of Naïve Bayes, Support Vector Machine, K-Nearest Neighbor, Logistic Regression, Stochastic Gradient Descent, Decision Tree, Decision Tree with entropy, Random Forest, Gradient Boosting Decision Tree, and NGBoost procedures. This study evaluates the ML techniques using accuracy, precision, recall, F1 score, support, and run time performance measures on several HAR datasets. The authors highlight the importance of adopting an appropriate ML technique based on the specific HAR requirements and the characteristics of the associated HAR datasets.

Vlad Krotov and Matthew Tennyson in their tutorial demonstrate how to use "rvest" and "xm12" packages for Web Scraping. Specifically, they use simple examples to demonstrate how these R-based packages can be used to retrieve data from sites such as Bayt.com which is a prominent employment Web site in the Middle East.

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