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Digital Technology Usage and Associated Socio-Technological Challenges during COVID-19 Pandemic

Shweta J[1], Hitarth K[2] and Meenal D[1]*

[1]Department of Anthropology, University of Delhi, India
[2]Intern, DPS, Dwarka, India

***Corresponding author:** Meenal Dhall, Department of Anthropology, University of Delhi, India, Email: say2meenal@gmail.com

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Abstract

Covid-19 has influenced health care delivery and the whole approach to public health. The traditional health care system could not function at this time. Technology has played an important role in mitigating the effect of this pandemic by taking various measures globally to control the lethality and transmissibility of the deadly virus among communities. New emerging technologies were used for prevention, contact tracing, surveillance, providing medical support at home, and for various other purposes. Socio-cultural, religious, and psychological domains are also influenced by this pandemic. Technology has changed our ways of living our social and working lives, but it has also created challenges. The present article has been written using PubMed and Google scholar databases to identify the emerging digital technology used during the COVID-19 pandemic and the challenges and disadvantages of the same. The paper will identify contemporary technologies and their associated challenges.

Keywords: Technology; Pandemic; Challenges; Covid-19; Mobile apps; Social media; Artificial intelligence

Abbreviations: IoMT: Internet of Medical Things; AI: Artificial Intelligence; AI-CT: Assisted Computed Tomography; PPE: Personal Protective Equipment; NP: Nasopharyngeal; HIPAA: Health Insurance Portability and Accountability Act; IoT: Internet of Things; QR: Quick Response; OTT: Over-the Top; DC: Data Centre; CC: Cloud Computing; CNN: Cable News Network.

Introduction

The outbreak of Corona virus disease 2019 (COVID-19), caused by SARS-CoV-2, was first reported in Wuhan City, Hubei province, China in December 2019, and it spread to other parts of the world. During the early stages of the pandemic, there was no specific treatment for the disease, and scientists were attempting to identify the symptoms and prevent it. Surveillance and containment were the only preventive measures available at the time. By encouraging less physical touch, technology has proven to be an important tool in addressing this issue. Geospatial technology, artificial intelligence (AI), big data, telemedicine, block chain, 5G technology, smart apps, the Internet of Medical Things (IoMT), and robotics were among the emerging trends [1]. The pandemic has had a huge influence on public health systems and infrastructure, businesses, schools, and the economy. It has necessitated the use of innovative technologies in order to survive COVID-19 [2].

The pandemic has ramifications for how information systems and technology are designed, developed, and used. It has created not just opportunities for progress in technology-based solutions, but also a purpose for studying technology research and practice, including information management, work practices, and technology design and use [3]. The rapid adoption of telemedicine, telework, and online education in response to coronavirus serves as a reminder that digital

technology has numerous advantages and can help manage and reduce the dangers associated with the lockdown, both during and after the pandemic [4]. Information systems and information technology (IS/IT) are well-known for their importance in healthcare, clinical decision support, emergency/crisis response, and risk management [5].

Many COVID-19 detection technologies have emerged, among which RT-PCR has long been the gold standard for detection. Other methods are also useful for rapid diagnosis and on-site diagnosis [6]. However, newly developed apps for contact tracing or diagnostic testing kits soon demonstrated fundamental problems by giving false positive tests and not being able to detect asymptomatic cases. The primary role of technology should be to serve the needs of the people, not to serve markets [7]. Advanced and efficient technologies are required to tackle problems caused by the magnitude of the pandemic in the public health systems [5,8]. This paper reviews the use of emerging technologies and associated socio-technological or human behavioural challenges during the COVID-19 pandemic.

Application of Artificial Intelligence and Big Data in Combating COVID 19

Artificial intelligence (AI) is one such technology that may readily track the transmission of this virus, identify high-risk individuals, and aid in real-time infection management. It can also forecast mortality risk by thoroughly evaluating the patients' historical data. AI can assist us in fighting this virus by providing population screening, medical assistance, notification, and infection control recommendations [9]. Using AI and machine learning techniques to find essential pieces of data will help people understand the problem more quickly. AI is being used to combat the COVID-19 epidemic [1]. COVID-19 diagnosis and risk prediction can be aided by artificial intelligence. COVID-19 pneumonia cases are detected in China using a cloud-based AI-assisted Computed Tomography (CT) service. The cases were distinguished from other lung illnesses by using this technology, which speeds up the diagnostic process significantly [10]. The pandemic has also sparked study and the use of artificial intelligence (AI) to combat this new problem. AI technology was utilised to aid clinicians in making a rapid diagnosis of coronavirus pneumonia using lung computed tomography imaging. During the pandemic, an AI-based chatbot played a crucial role in responding to people's emotions and giving online consultation to assist fight mental health illnesses. During the outbreak, some Indian chatbot software saw an increase in users, demonstrating this pattern [11]. Machine learning, image recognition, and deep learning algorithms driven by artificial intelligence (AI) can be utilised for early detection and diagnosis of infection, as well as faster drug discovery for generating novel treatments [12].

Face masks and other Personal Protective Equipment (PPE) for healthcare professionals can be made using 3D printing technology. Mark forged and Neurophotometrics have collaborated to provide 3D printed rayon wrapped nasopharyngeal (NP) swabs for COVID-19 testing. The swabs take less than three minutes to manufacture and can gather virus particles significantly faster [13]. Big Data Analytics can be used to identify people who need to be quarantined based on their travel history, anticipate the COVID-19 curve, accelerate the development of antiviral medicines and vaccinations, and improve knowledge of the COVID-19 spread over time and geography [5]. Individuals in China are screened and directed to appropriate resources using free web-based and cloud-based solutions. In Taiwanese airports, high-performance infrared thermal cameras are utilised to collect thermal images of people in real time, quickly detecting persons with fever. People's temperatures are taken at the entrances to companies, schools, and public transportation in Singapore. The data from the thermometers is analysed and used to locate emerging illness hotspots and clusters where testing can begin [10].

Contact Tracing and Monitoring Through Technology

Arogya Setu, a contact tracing app, has aided in the tracking of the COVID-19 outbreak. Technology has also aided in informing the public about the situation and reminding them to take the appropriate safeguards. Caller songs have been employed by telecom carriers such as BSNL, Jio, Airtel, and others to raise awareness about the pandemic [14]. Even when people are wearing masks, facial recognition technology has enabled them to be precisely identified. It helped in the tracking of isolated individuals' movements. Infected people who break the laws and leave their houses while being isolated have been identified using CCTV cameras with facial recognition capabilities [14]. Big data and artificial intelligence (AI) have helped facilitate COVID-19 preparations and the tracking of people, and therefore the transmission of illness, in various nations. Machine learning models were developed using data from tools like migration maps, which use mobile phones, mobile payment apps, and social media to collect real-time data on people's locations. This data was used to forecast the regional transmission dynamics of SARS-CoV-2 and guide border checks and surveillance. Taiwan launched health screenings for aircraft passengers from Wuhan as soon as China announced the outbreak, combining data from immigration records with its centralised, real-time national health insurance database. Health-care facilities were able to examine patients' travel history and identify individuals for SARS-CoV-2 testing and tracking as a result of this integration [10]. Furthermore, the use of consumer grade wearables was elaborated, the increased interest in these wearables aids in the early diagnosis of symptoms and

the monitoring of physiological indicators from the comfort of one's own home. Given the extraordinarily high volumes and vast variety of health information generated by each device, continuous monitoring with these technologies poses not only potential but also obstacles in data analytics and data management. As a result, these sensor systems must have scalable data backends that can securely transfer, store, process, and make patient data available in a HIPAA (Health Insurance Portability and Accountability Act)-compliant way. Furthermore, the necessity to link these data to other dissimilar sources, such as electronic health records, in order to improve the information content stimulates the creation of interoperability designs. The problem is that digital health data is stored in proprietary forms and systems that are incompatible, resulting in fragmented silos. To merge these diverse data streams, data sharing protocols must span across both consumer wearables and medical grade devices [15].

Usage of Social Media/Mobile Devices and Apps

Smartphone apps and video-conferencing technologies can be used to track people's activities, warn them of COVID-19 hotspots, assist doctors in diagnosing patients through video services and telemedicine/telehealth, and assist people with online shopping, e-learning, online meetings, and telework [16]. To assist healthcare workers and regular people in this situation, a variety of phone and network-powered apps have been developed. For example, the National Science Foundation in the United States gave a grant to Princeton University researchers to develop a mechanism for deploying a firmware upgrade to mobile phones that allows health officials to track their location. The key to the proximity data would be retained on the phone itself to protect users' privacy, and it could only be unlocked when the phone's owner voluntarily supplied it to health officials. Let's say someone tests positive for an illness like COVID-*19. In such a situation, health officials may use* the technology to identify all other cell phone users who were within a specified distance of the infected person for a specific period of time. Health experts could estimate the time and distance based on their understanding of the condition. Healthcare departments can contact anyone who may have been exposed to the disease, inform them of the exposure, and instruct them to get tested for the disease and, if necessary, self-quarantine [5,17]. The most popular technology in the healthcare industry is video-based communication platforms like Zoom, Facetime, and WhatsApp. Other remote services, such as computer or mobile applications, information and datasets, social media, email, and chest x-ray, for example, could be used to provide synchronous and asynchronous support for COVID-19 patients as well as those in need of other conventional healthcare services [18,19]. Video-based communication platforms, such as Zoom, WebEx, Facebook Messenger, and Google Hangouts, have either become the "teaching and working assistant" to prompt conferencing digitally safely and effectively or built bridges to keep the social interaction for daily life in this special time, not only in the healthcare domain, but also for education, work, and daily life use [36]. Health training institutions are being closed as a result of the pandemic. People can keep active by using alternative strategies to continue their health and fitness training while *at* home. Through health and fitness applications, new options have been introduced. Many health and fitness firms have begun offering online workouts and yoga sessions through social media platforms and personal applications. This method of keeping people moving has proven to be effective during the pandemic [14]. Many health and fitness coaches have turned to digital platforms to keep their businesses afloat by offering online training and sessions to their clients. People were able to avoid going to marketplaces during lockdowns because of increased online delivery of essentials via apps and lower delivery prices.

Inclusion of Robots

COVID-19 has shown us the importance of human relationships in making things work. Labour-intensive industries like food, retail, logistics, and manufacturing are severely impacted by the pandemic. COVID-19 has led to a significant drive to implement robot use and to accelerate robotics research. Robots are now being employed to clean sick areas and provide food to people who have been quarantined [14].

The number of COVID-19 cases is rapidly increasing, and the number of individuals who require medical attention is putting enormous strain on healthcare providers around the world. Remote-controlled robots are being employed in a few nations to assist medical practitioners with crucial duties such as collecting mouth swabs for virus detection tests, doing ultrasound scans, and so on [14].

Drones are being used for food deliveries, tracking the population, delivering medical supplies, patrolling public areas, tracking non-compliance with quarantine mandates, transporting test kits, spraying disinfectants, and delivering medicines to quarantine areas, and so on [5].

The coronavirus outbreak has been combated with robots. Hospitals, for example, use robots to transport food and medicine, sanitise rooms, and other hotspots without requiring direct human interaction. According to a Cable News Network (CNN) report, doctors in Seattle utilised a telepresence robot to treat the first confirmed patient in the United States who tested positive for coronavirus [20,5].

Usage of Internet of Medical Things and 5G Technology

Data collection, transport, analytics, and storage are all functional components of the Internet of Things. Data can be collected via IoT sensors mounted on mobile phones, robotics, or health monitors. The data from the sensors would then be transferred to a cloud server for processing, analytics, and decision-making. IoT, for example, can be used to monitor whether patients adhere to quarantine rules. IoT can also be used to take remote patients' temperatures and broadcast the information to clinicians via mobile devices for monitoring, tracking, and alerting while minimising the risk of coronavirus infections [5]. Interconnected medical equipment, smart health applications, and smart sensors are used to apply Internet of Things (IoT) concepts, technologies, and principles in the health and medical sectors [21]. It also entails the creation of smart software and wearable gadgets aimed at improving health-care delivery. Due to limited mobility, the IoMT affects how healthcare services are given during the COVID-19 pandemic, changing physical touch to remote health service delivery. Several IoMT apps that are incorporated into health systems to minimise the burden on healthcare systems demonstrate this. 5G technology is useful for sharing large amounts of data and communicating in real time. It offers the quickest internet speeds as well as a wide band width. In many countries, the use of 5G technology is controversial, but in China, it has been used to overcome challenges such as containing the spread of Covid19 by installing smart cameras and smart thermometers connected to 5G technology, high-speed broadcast, and intelligent robots for taking swabs, among other things [1].

Usage of Blockchain Technology

In the fight against COVID-19, blockchain technology has been used to handle the friction and trust concerns between respecting privacy and meeting public health needs, such as tracking infected patients. It is based on a distributed, robust, secure, privacy-preserving, and immutable record-keeping platform that has the potential to transform the way people trust, share value, and transact [22]. For example, to aid in the fight against the coronavirus epidemic, a smartphone app utilising blockchain technology and AI was built. The software uses blockchain technology to provide each participant with a "digital identity" controlled by a private key that grants access to a digital replica of government-issued certificates. These allow healthy people to leave the house to get food or work [23]. Blockchain has also been used to prevent unauthorised parties from tampering with the data. During the epidemic, a Chinese payment processor and financial services firm employed blockchain technology to track the claims processing and payouts in a more safe and reliable manner [24,5]. It has been stated that a greater emphasis on research and development is required to develop and test robust use cases for blockchain applications and that universities and research institutions should collaborate with industry and business. With their widespread use, these alliances will help to expand the use of blockchain technologies in health care [22].

Online Mental Health Tools/Telemedicine

Mental health support has been provided with the help of Telemedicine. The pandemic increased the demand for its use due to the lockdowns, social distancing, and being apprehensive about the spread of the virus. It has not only halted the traditional face-to-face visits at hospitals and clinics, but also reduced the burden on health professionals and their fear of contacting infected people. In addition to this, helpline numbers and other online platforms have been developed, especially for frontline workers, to help mitigate the trauma caused by Covid19 [25]. From the beginning of the pandemic, the demand for telemedicine has been gushed. As around the world, clinics stopped treating infected patients physically, they turned to online consultations [25]. Several apps and virtual care platforms have been developed to reach out to infected patients and provide assistance via video conferencing and digital monitoring in order to reduce patient exposure to healthcare workers and professionals. It instinctively limited the covid 19 virus's entry into health-care facilities. As a result of the COVID-19 epidemic, there has been a significant shift in healthcare delivery using telemedicine. This rapid transformation is leaving individuals without access to digital tools behind and worsening disparities on a variety of fronts. Education, income, internet availability, information-seeking skills, and rural residency are all long-standing barriers to digital inclusion that may have an impact on eHealth uptake [26].

Usage of Technology for Education

As a result of the outbreak, a considerable portion of the population was forced to study remotely in order to comply with the international stay-at-home edict. The majority of educators and students prefer to continue their education via video-based devices and platforms. Because of the epidemic, they are becoming the second largest group of digital technology users. Teachers must adjust to the pace of online teaching and devote more time to preparing for online courses, innovating, designing lessons, and patiently transforming students from passive recipients to engaged learners [19]. Augmented reality, 3D printing, virtual reality, and artificial intelligence-enabled robot teachers are among the technologies employed in distance learning. Online lectures for education can be conducted using platforms

such as GitHub, Blackboard, Coursera, and others, which provide venues for knowledge distribution. Teaching remotely utilising a video-based technique, such as using a technology like VoiceThread to record short films presenting the subject of the lesson, is one example [27]. Telework technologies, such as email, online polls, Google Sheets, and others, use digital information to exchange virtual services at work. Furthermore, social media platforms such as Twitter, Instagram, Facebook, and YouTube, as well as tools and applications like Google Trends and Geographic Information Systems, assist in tracking, locating, and analysing outbreaks in everyday life [19].

Quarantine and Self-Isolation

In numerous countries, indiscriminate lockdowns for infection control have had serious economic implications. Individuals who have been exposed to or infected with the virus can be quarantined via digital technology, with less stringent limitations enforced on other residents. The quick response (QR) code system in China allows authorities to monitor health and limit movement by requiring individuals to fill out a symptom assessment and record their temperature. The QR code functions as a COVID-19 health status certificate and travel pass, with colour codes indicating low, medium, and high risk; those with green codes are allowed to move freely, while those with red codes must self-isolate for 14 days. China also monitors and restricts public gatherings with AI-powered surveillance cameras, drone-borne cameras, and portable digital recorders [10]. International visitors were confined in hotels upon arrival in Australia, with those from Wuhan being held off the Australian continent. Individuals who violate quarantine will be required to wear tracking devices under new regulations, with fines assessed for subsequent violations. In Taiwan, electronic monitoring of home-quarantined individuals is assisted by government-issued mobile phones that are GPS-tracked; in the case of a quarantine breach, this so-called digital fence sends messages to the individual and imposes fines. Individuals in self-isolation in South Korea are required to download a mobile phone application that warns authorities if they leave their isolation area. People under self-isolation in Hong Kong are compelled to wear a bracelet that is connected to a database via cloud technology and warns authorities if the quarantine is breached. Iceland has developed a mobile phone application to track COVID-19 patients and ensure that they remain in self-isolation [10]. If people leave their quarantine zone without their phones, mobile phone solutions for quarantine enforcement can be avoided. Self-reported surveys, such as those employed in QR code systems, are only effective when people are unwell and accurately report their symptoms. However, when used in conjunction with other tactics, such technical improvements may be beneficial [10].

Technology for Amusement during Pandemic

Implementation of lockdowns and social distancing during a pandemic has shut down the entertainment industries too. which has altered the way of content generation, distribution, and streaming over top platforms like Amazon Prime Video, Hotstar, Netflix, Zee5, Voot Select, etc., which take care of the varied interests of the audience and provide diverse content all over the world. The use of these Over-the Top (OTT) Media Services platforms has been increased tremendously for live streaming shows and concerts. Film producing industries have also started to release their movies on these platforms. People can now easily view content on these platforms. Lockdown has changed people's accessibility to watching their favourite shows on a daily basis. OTT platforms showed a significant rise in app downloads and their subscribers. Many games have also become famous and their user base has increased, like PubG, Ludo, and Amongus etc. in India. Significant growth in the gaming sector has been reported, and the duration of playing games during lockdown has increased. People are using gaming as an option to deal with stress and tedious days [14].

Cloud Computing Application for Data Storage

CCE is an application, IT infrastructure, and network services-based solution. It makes advantage of data centre (DC) resources that can be shared thanks to virtualization technologies. On-demand, elastic, or immediate services and pricing are used in this way. Working from home relies heavily on cloud computing (CC) applications to help employees do their jobs quickly and efficiently. Cloud computing (CC) applications have increased the amount, velocity, and/or variety of data generated every minute from numerous services and applications all over the world. The data that is generated could be structured, semi-structured, or unstructured. Due to the huge amount of data flowing at high speed, it is stored in various forms that are difficult to combine [28].

Challenges with Existing Technologies

Apart from the lack of previous training data, social media and other Internet traffic have added noise to massive data sets, potentially resulting in over fitted or "lucky good fit" models. Before reliable patterns and projections can be discerned, this noise must be filtered. When analysing projections, the correctness, validity, and reliability of each AI forecast should be evaluated [10]. However, inaccuracy, a lack of advice, and information leakage are some of the

issues that digital media faces. We support expanded use of digital media in facility-based locations with an emphasis on strengthening trust, developing social solidarity, minimising turmoil, educating the public on prevention measures, and lowering the medical burden [11]. Security, privacy, biases, ethics, and the digital divide are all issues that arise while using technology to combat the epidemic [5]. To better comprehend the emerging epidemic and make collaborative decisions on how to address it, public health experts, epidemiologists, and government officials must be connected via integrated systems with connected data. Because people are so important in the fight against COVID-19, it's critical to use new and integrated technology to connect, coordinate, and support numerous stakeholders [5]. Technology and information systems Scholars can also assist in the identification of best practises for implementing responsible data collecting and processing, as well as achieving a balance between privacy and use of proposed technologies [5].

Human Behaviour towards Technologies

As more COVID-19-related technologies are produced, integrated, and used by governments, companies, and people, it is critical to understand human behavior when developing, creating, and using technologies. Many efforts to battle the pandemic make use of new technological advancements and ways to integrate multiple systems and technologies [10]. Social media provides us with an enormous amount of information, which becomes an important source of anxiety. According to the World Health Organization (WHO), social media is causing an infodemic, which is defined as "an oversupply of information—some true, some not," which makes it difficult for individuals to access trustworthy sources and dependable assistance when they need it. Additionally, overuse of virtual videoconferencing platforms is causing a new phenomenon: weariness, anxiety, or worry as a result of increased use of video conferences and meetings. The technological inadequacies of video calls—delays, lack of eye contact, restricted nonverbal cues—take so much more energy out of a person than meeting face to face, resulting in technological exhaustion [29]. Material response, behavioural change, and human capacity have been proven to be remedies for tackling the pandemic [7]. Instead of automating human decision-making, the role of AI technologies would be to augment and enhance human intelligence and advance decision-making processes above and beyond what is possible by either humans or machines on their own [30]. In addition, marriages, birthday celebrations, family functions, and many other functions are all played out across the online platforms. The details of each begin to blur for many people due to feelings of lack of connection, and they are not able to observe body language and eye contact with peers. Psychologists Gabriel Radvansky and Jeffrey Zacks have described the crucial role of "event boundaries" in memory formation and cognition [31].

Negative Impact/Risks of Digital Technology

Lacking protective material resources, the human capacity for contact tracing, or understanding of the disease, policymakers in higher-income countries turned to technology for a miracle. False negative results by contact tracing apps and diagnostic techniques have created a lack of trust among people, and this has been compounded by the inefficiency of tracing asymptomatic cases. Technology is critical to pandemic response, but it must serve as a support rather than to lead [7]. Digital health initiatives can amplify socioeconomic inequalities and contribute to health-care disparities. Digital technology typically involves the use of the internet and mobile phones. Although 4 billion people used the internet worldwide in 2019, usage was disproportionally higher in high-income areas than in low-income and middle-income areas (82% in Europe vs 28% in Africa). Even within high-income countries, susceptible groups, such as those in low-income neighbourhoods or remote regions, might not have access to broadband signals, smartphones, or wearable technology such as smart watches. To effectively implement digital technology globally, interventions should be tailored to the target regions; broadband access requires federal and private sector investment in technology and infrastructure. At a regional level, subsidised mobile phone plans, loaner devices, free Wi-Fi hotspots, and training programmes could provide temporary solutions to these disparities. In regions without infrastructure or sufficient funds to support cellular and data coverage, automated applications and devices that do not require continuous network access should be considered [10].

Lack of Trust, Awareness and Accessibility

Social media platforms have the potential to supplement emergency warnings, crisis response actions, information seeking and broadcasting, donation collection, and hierarchy-free collaboration. At the same time, social media communication might also produce an adverse impact on meaning creation and decision-making due to their personalisation of information; haphazard facilitation of convergence behaviour; and enablement of anti-social behaviour. In the case of COVID-19 epidemic management, one of the key concepts critical to containment of the virus is that of 'social distancing'. It is a social practice, however, that relies on the trust and responsibility of individuals taking action and the disruption of their day-to-day activities. It also relies on culturally appropriate messaging (including language translation) to ensure that everyone understands what social distancing entails. However, in Australia it was delayed because the social distancing message was not as effective as it might have been [32]. A key disadvantage of

telemedicine, as with any growing technology, is a lack of customer understanding of its availability, services, and cost. Barriers to telemedicine that have been identified include a lack of education about the efficacy and safety of telemedicine in light of current circumstances, patient preferences for seeing their own provider rather than someone with whom they have no established relationship, and patient preferences for seeing their own provider rather than someone with whom they have no established relationship, a lack of understanding of how to obtain telemedicine visits, as well as a lack of awareness that telemedicine visits are available. People who are older, reside in remote areas, have less education, and suffer from more chronic illnesses are less likely to have access to the internet than their peers [33].

Data Privacy Issues

During the covid 19 pandemic, a massive amount of data has been generated. Patients' data, the virus genome, pharmaceutical and clinical trials data, social media data, and even facial recognition data are all collected for healthcare [28]. The ethical implications of algorithms, cloud computing, and information transparency are crucial for the present social transformations driven by digital technologies, yet these implications are modest and uneven in practise [34]. Several digital health treatments, particularly those that track individuals and enforce quarantines, might violate privacy. Government-enforced surveillance and control can instil dread and jeopardise civil liberties. To strike a compromise between the necessity for contact tracing and privacy, European authorities have proposed that data be kept for only 14 days, the time it takes for a virus to spread, and that non-essential digital safeguards be lifted once the pandemic is over. A smartphone tracking programme with anonymized data, no central database, and no Global Positioning System (GPS) information is being used in some European nations. Concerns regarding privacy and data security may be mitigated by allowing a return to a normal routine without a recurrence of infections [10].

Economic Inequality or Expensive Technology

The crisis has disproportionately affected people with the lowest incomes and educational attainment. This will exacerbate the challenges of achieving inclusive growth and may increase income inequality [35]. Small and midsize businesses and communities of colour, already more severely affected by COVID-19, are also more vulnerable to disruption from increased automation. Systematic screening technologies are costly and require trained workers, which prevent many countries from adopting them [36]. Because of the long incubation time and the relatively high prevalence of asymptomatic illness compared to other infectious diseases, digital systems that monitor vital signs or self-report symptoms are ineffective. Because of these characteristics, researchers at the European Centre for Disease Prevention and Control believe that the majority of passengers from Chinese cities would be missed by screening [10]. Economically disadvantaged Americans with household incomes of $40,000 or less are far less likely to use telemedicine to seek medical attention if they develop symptoms that could indicate the onset of the virus; instead, they are far more likely to seek care at an ER or other facility where they may be at risk [26]. In the wake of the COVID-19 epidemic, as employees use teleworking and students enrol in online programmes, IT infrastructure costs have increased. The surge in hard costs of IT infrastructure associated with servicing increasing demand must be understood. IT infrastructures must be improved as the epidemic progresses in order for personnel to execute their responsibilities securely and healthily [37].

Conclusion

Technology innovations during the COVID19 pandemic have been proven to be of immense help in managing the critical situation in a systematic and timely manner. During the COVID19 pandemic, society's reliance on technology is growing, resulting in social and vocational changes that may last long after the current crisis has passed. As a result, it's critical to make thoughtful and deliberate decisions about how to use technology to better our lives, reduce stress, and promote mental health [38]. The approach of different countries with technological amalgamation in COVID-19 management and response is a unique feature in flattening the incidence curve and maintaining a low mortality rate. Human resources for designing and development of more efficient technological innovations or for better implementation of these technologies in the healthcare system are required. The usage of technology creates a huge amount of online data available. The transparency and managing of big data on one platform that should be easily available for applying AI models to create new measures for managing the pandemic is important. Researchers should also focus on the negative effects of technology and ethical concerns about data privacy [39]. Technology should be accessible to each and every citizen of the country without facing any financial limitations or lack of awareness. Immediate technological actions, while considering human behaviour patterns, to combat the pandemic are of great importance for safety and risk management.

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References

1. Mbunge E, Akinnuwesi B, Fashoto S, Metfula A, Mashwama P (2020) A critical review of emerging technologies for tackling COVID -19 pandemic. Human Behavior and Emerging Technologies 3(1): 25-39.

2. O'Leary D (2020) Evolving Information Systems and Technology Research Issues for COVID-19 and Other Pandemics. Journal of Organizational Computing and Electronic Commerce 30(1): 1-8.

3. Sein MK (2020) The serendipitous impact of COVID-19 pandemic: A rare opportunity for research and practice. Int J Inf Manage 102164.

4. Richter A (2020) Locked-down digital work. Int J Inf Manage 102157.

5. He W, Zhang Z, Li W (2021) Information technology solutions, challenges, and suggestions for tackling the COVID-19 pandemic. International Journal of Information Management 57: 102287.

6. Han T, Cong H, Shen Y, Yu B (2021) Recent advances in detection technologies for COVID-19. Talanta 233: 122609.

7. Taylor L, Aarts E, Fleuren H, Sitskoorn M, Wilthagen T (2021) There Is an App for That: Technological Solutionism as COVID-19 Policy in the Global North. The New Common, pp: 209-215.

8. Javaid M, Haleem A, Vaishya R, Bahl S, Suman R, et al. (2020) Industry 4.0 technologies and their applications in fighting COVID-19 pandemic. Diabetes Metab Syndr 14(4): 419-422.

9. Vaishya R, Javaid M, Khan IH, Haleem A (2020) Artificial Intelligence (AI) applications for COVID-19 pandemic. Diabetes Metab Syndr 14(4): 337-339.

10. Whitelaw S, Mamas MA, Topol LE, Van Spall H (2020) Applications of digital technology in COVID-19 pandemic planning and response. The Lancet Digital Health 2(8): E435-E440.

11. Bao H, Cao B, Xiong Y, Tang W (2020) Digital Media's Role in the COVID-19 Pandemic. JMIR Mhealth Uhealth 8(9).

12. Brohi SN, Jhanjhi NZ, Brohi NN, Brohi MN (2020) Key applications of state-of-the-art technologies to mitigate and eliminate COVID-19.

13. (2020) Markforged's Response to COVID-19.

14. PN B (2020) Role of Technology in the Era of COVID-19 Pandemic.

15. Jeong H, Rogers JA, XU S (2020) Continuous on-body sensing for the COVID-19 pandemic: Gaps and opportunities. Sci Adv 6(36): eabd4794.

16. MARR B (2020) Coronavirus: How Artificial Intelligence, Data Science and Technology Is Used To Fight The Pandemic. Forbes.

17. WHO (2020) Digital technology for COVID-19 response. Department news, Geneva.

18. Keesara S, Jonas A, Schulman K (2020) Covid-19 and health care's digital revolution. N Engl J Med 382(23): e82.

19. Vargo D, Zhu L, Benwell B, Yan Z (2021) Digital technology use during COVID-19 pandemic: A rapid review. Human Behavior and Emerging Technologies 3(1): 13-24.

20. Chavez N, Kounang N (2020) A man diagnosed with Wuhan coronavirus near Seattle is being treated largely by a robot. CNN health.

21. Swayamsiddha S, Mohanty C (2020) Application of cognitive Internet of Medical Things for COVID-19 pandemic. Diabetes Metab Syndr 14(5): 911-915.

22. Khurshid A (2020) Applying blockchain technology to address the crisis of trust during the COVID-19 pandemic. JMIR Med Inform 8(9): e20477.

23. Sinclair S (2020) Spanish Researchers Working to Curb Coronavirus Spread With Blockchain App.

24. Pressgrove J (2020) Blockchain Emerges as Useful Tool in Fight Against Coronavirus. Government technology.

25. Hawkins L (2020) Top 10 benefits of technology for healthcare during Covid-19. Healthcare Global. Healthcare.

26. Khilnani A, Schulz J, robinson L (2020) The COVID-19 pandemic: new concerns and connections between eHealth and digital inequalities. Emerald Insight 18(3).

27. Gewin VJN (2020) Five tips for moving teaching online as COVID-19 takes hold. Nature 580(7802): 295-296.

28. Alashhab ZR, Anbar M, Singh MM, Leau YB, Alsai ZA, et al. (2020) Impact of coronavirus pandemic crisis on technologies and cloud computing applications. J. J. O. E. S. & TECHNOLOGY 19(1): 25-40.

29. Riva G, Mantovani F, Wiederhold BK (2020) Positive technology and Covid-19. Cyberpsychol, Behav Soc Netw 23(9): 581-587.

30. Marjanovic O, Cecez-Kecmanovic D, Vidgen R (2021) Algorithmic Pollution: Making the Invisible Visible. Journal Of Information Technology.

31. Rosen C (2020) Technosolutionism Isn't the Fix. The Hedgehog Review.

32. Mirbabaie M, Bunker D, Stieglitz S, Marx J, Ehnis C (2020) Social media in times of crisis: Learning from Hurricane Harvey for the coronavirus disease 2019 pandemic response. Journal of Information Technology 35(3): 195-213.

33. Kichloo A, Albosta M, Dettloff K, Wani F, El-amir Z, et al (2020) Telemedicine, the current COVID-19 pandemic and the future: a narrative review and perspectives moving forward in the USA. Fam Med Community Health 8(3): e000530.

34. Nicolescu R, Huth M, Radanliev P, De Roure D (2018) Mapping the Values of IoT. Journal of Information Technology 33(4): 345-360.

35. Willcocks L (2020) Robo-Apocalypse? Response and outlook on the post-COVID-19 future of work. Journal of Information Technology 36(2): 188-194.

36. Papadopoulas T, Baltas KN, Balta ME (2020) The use of digital technologies by small and medium enterprises during Covid-19: Implications for theory and practice. International journal of information society 55: 102192.

37. (2020) CISA Releases Version 3.0 of Guidance on Essential Critical Infrastructure Workers During COVID-19. Cyber Security & Infrastructure Security Agency United State of America.

38. Garfin DR (2020) Technology as a coping tool during the COVID-19 pandemic: Implications and recommendations. Stress Health 36(4): 555-559.

39. Mbunge E (2020) Integrating emerging technologies into COVID-19 contact tracing: Opportunities, challenges and pitfalls. Diabetes Metab Syndr 14(6): 1631-1636.