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Pandemics within the pandemic: confronting socio-economic inequities in a datafied world

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ABSTRACT

The pandemic has brought to light and exacerbated inequities that have plagued the world even before COVID-19 spread. Despite its medical and technological advances, much of the western world was unprepared for what its people faced. With a death toll and mortality rates unseen in modern times, the datafied world amidst some populist regimes witnessed additional pandemics within the pandemic of raging infections. In the changing world broadband internet access is becoming more essential to enabling people to lead their lives while locked-down and/or in quarantine. People become accustomed to accessing healthcare information, resources and providers through mobile and or other devices for their COVID 19 information, while tracking and tracing is being carried out using mobile applications. Those at the margins become vulnerable to digital biopolitics or efforts by governments and corporations to maximize knowledge and control of populations using digital means for political and economic power. In this the datafied society, increased data surveillance offered cause for activism and fight for human rights and freedoms. This also referred to as the datafied pandemic in which life revolves on the internet more than ever through access to tools, basic services, and social environments. Within these digital divides, the forces of globalization forge ahead with perils and promises. These issues are explored in this editorial and ways of tackling the pandemics offered in the light of papers in this issue. ICT4D research offers ways in which we may together create a better world for all.

1. Introduction

Over a year ago a virus spread out of Wuhan, China and changed the world as we have known it. A destructive pandemic rears its head once in a century. This world with all its technological advances was not prepared for what it faced. A public health emergency declared on January 2020 by the World Health Organization (WHO) of coronavirus disease 2019 – it is known as COVID-19 because it was discovered on November 2019. The world has been no match for this severe acute respiratory syndrome (Gostin, 2021). At the time of writing this, the World Health Organization reported that there had been 126,359,540 confirmed cases of COVID-19, including 2,769,473 deaths worldwide. As of March 2021, a total of 462,824,374 vaccine doses had been administered globally (WHO, 2021). According to the WHO (2021) the majority of reported confirmed cases are in the Americas (55,243,776 cases) and Europe (44,181,716 cases), while South-East Asia (14,619,886 cases), Eastern Mediterranean (7,392,128 cases), Africa (3,061,438 cases) and the Western Pacific (1,859,851 cases) are doing better in combating the virus due to the strength of their public health infrastructures

and experiences with similar infectious diseases. The countries reporting the largest numbers of cases and deaths are the United States leading the world with 29,859,706 cases and 543,003 deaths; and Brazil, 12,404,414 cases with 307,112 deaths; where community transmission is the cause of increase in infections. In third place is India with 11,971,624 confirmed cases and 159,044 deaths; and in fourth place is the Russian Federation, 4,519,832 confirmed cases and 97,740 deaths, where transmission is through clusters of infection. In Europe, the United Kingdom with 4,329,184 confirmed cases and 126,573 deaths; France (4,435,057 cases with 93,884 deaths), Italy (3,512,453 confirmed cases and 107,636) and Spain (3,247,738 confirmed cases and with 74,420 deaths). UK and France lead in community transmission and in Italy cluster of cases is the cause of spread in infections. Cases and deaths were on the rise at the time of writing this, editorial. Some of the countries stand out in their mortality rates (deaths per population) and are discussed in the Pandemics within the Pandemic section.

Underlying this data on the largest numbers of cases and deaths are socio-economic inequities within their populations. Lock-downs by governments tend to exacerbate clusters of cases while inequities in socio-economic status tend to drive community spread. People living in communities with low socio-economic status are unable to access the resources they need to remain healthy and stay alive. Socio-Economic Status (SES) is defined as a measure of the combined economic and social status of an individual and tends to be positively associated with better health where there is a causal relationship between socio-economic status and health (Adler & Ostrove, 1999; Baker, 2014; Marmot, 2007). Adler and Ostrove (1999) suggest that there are many ways in which socio-economic status determines the health outcomes of people. The pathways through which health and socio-economic status interact include economic contexts, social environments, individual psychological and behavioral factors and biological predispositions. While socioeconomic status may be a prominent predictor of health, trends in life expectancies are directly related to educational attainment and annual income rates. The demographic, geographic, and socioeconomic conditions that influence a population's health outcomes have come to be known as the social determinants of health (Marmot, 2007).

Low SES limits the ability of people to access and use the basic resources they need for survival and wellbeing. Poverty is defined by lack of income measured in purchasing power parity (Heeks, 2017). Economic growth can help address absolute poverty as long as people are living below a certain income level, but the size of this effect varies considerably depending upon their socio-economic status. When economic opportunity is limited, and restricted by health emergencies, low SES individuals are most likely to become infected and spread the virus by continuing to work. Without access to the basic resources needed to defeat the virus such as, food, shelter, clean air and health-care, the likelihood of infections increases. When low SES individuals who need to work, continue to do so despite their infections, the spread of the virus continues in their communities. For example, migrant workers without personal protective equipment or clean working conditions putting in long hours in meat packing plants, are a primary cause of the spread of the virus in their communities. It is the frontline workers who keep essential services working, who become susceptible to infection and death.

When governments impose lock-downs and restrict the ability of individuals to earn a living, their survival depends upon government bailouts. These people end up residing in clusters where infections relate to cases in which people are in the same location, group, or event around the same time. Such cases are rising in locations where people are living in close proximity and are thus forced into quarantine. There is a sense that broadband internet access is becoming essential to enabling people to lead their lives while locked-down and/or in quarantine. As countries slowly open up their economies while others institute lockdowns, people become accustomed to accessing healthcare information, resources and providers through mobile and or other devices. As much of the COVID 19 information, tracking and tracing is being carried out using mobile applications, there is a sense that beyond broadband, device access, whether via computer, tablet, or smartphone, is critical for patient engagement (Rodriguez et al., 2020). Being able to overcome the challenges posed by the

pandemic will entail reaching large segments of a population through mobile applications. This involves communicating and providing information as well as collecting data on their wellbeing and whereabouts.

In their book on COVID-19 from the margins in which they offer a unique view of the *datafied society*, Milan et al. (2021) suggest that the multiplicity they call ‘the poor’ is more than ever at the receiving end of the worst effects of globalized, patriarchal/colonial racist capitalism. But they are not passive victims, for their everyday forms of activism and re-existence, including their daily tweaking of the digital for purposes of community, care, and survival, has incredible insights about design and digital justice that this pandemic of the datafied society. Adding to this view, Di Salvo (2021), refers to the *datafied pandemic* in which life revolves around the internet more than ever through access to tools, basic services, and social environments. Access to the internet is becoming increasingly unequal. Such inequalities have increased due to the uneven distribution of opportunities, resources, and the exclusive design of socially-impactful technologies. For example, refugee populations and migrant workers with no shelter have suffered the most serious effects of the virus. At the same time, their data collected through their phones, workplaces and location-based services are used to build tools for tracking and testing to benefit the larger population. At the same time, those with resources to shelter-in-place have remained largely unscathed economically, socially and possibly even maintained their psychological and biological wellbeing. Milan and Treré (2020) have raised alarms over data poverty which constitutes a dangerous form of invisibility that perpetuates various forms of inequality. Yet despite the pandemic, they find that the disempowered manage to create innovative forms of solidarity from below that partially mitigate the negative effects of their invisibility.

Despite the inequities in internet and healthcare access, governments are using mobile applications for tracking and tracing, collecting data and communicating with their citizens to combat the viral spread. The concept of *datafication* refers to the generation of large amounts of digital data that is machine-readable and computationally manipulable, particularly for ‘big data’ analytics are of unprecedented size and detail, are generated, collected and processed under the auspices of private-sector corporations and are shared, often on a pro-bono basis, at the level of international academic research institutions or development actors (Heeks & Shekhar, 2019; Masiero & Das, 2019; Taylor & Broeders, 2015). The COVID-19 pandemic increased the scale and scope of datafication while reducing the rights of those whose data is harvested. Taylor et al. (2020) report that government response to the pandemic has amplified many existing problems of technology and justice. They state that techno-solutionism, frequent technological interventions, excessive public attention on elaborate yet ineffective procedures and information asymmetries through new applications of technology have made worse existing inequities while revealing the tenuous relationship between authorities and citizens. They point to connection between an expansion of government surveillance powers and frequent protests across the globe. In response to COVID-19, 84 countries have now declared domestic emergencies where nearly all governments have exerted exceptional powers: ‘The difference between the countries that have managed to minimise deaths and those unable to contain them is not power, money or even might— it is the trust of the governed’ (Taylor et al., 2020, p. 22).

Milan and Treré (2021) suggest that lack of reliable numbers to accurately portray the COVID-19 pandemic as it spreads, offers fertile ground for malicious actors to promote distorted narratives for political reasons. They suggest that the dearth of data allows populist leaders like Brazil’s Jair Bolsonaro to announce the ‘return to normality’ in the country, dismissing the harsh reality as a collective ‘hysteria.’ In Italy, the fake news that migrant populations of African origin would be ‘immune’ to the disease swept social media, unleashing racist comments and anti-migrant calls for action. In Hungary, the pandemic gave the government additional powers while ‘Abolishing the rights of the data subject and freedom of information.’ These decisions removed protections to personal data, freedom of expression and information whilst increasing the government’s surveillance over its citizens. In Kenya, digital surveillance is not limited to contact tracing, it is also used in monitoring of social media for misinformation where staffers are suspended for posting footage on social media

not approved by the authorities (Taylor et al., 2020). In the United States and United Kingdom fear of losing control prompted anti-mask and anti-vaccination groups to propagate false narratives on social media – thereby increasing the spread of infection in their communities.

The role of false narratives propagating unhinged on social media have dire consequences. Fake news and the effects of social media disinformation campaigns by populist leaders fan the hazardous flames of domestic terrorism. On 6 January 2021, the greatest democracy in the world saw domestic terrorists take over the US capitol building where the votes of a fair democratic election were being certified. An over two-hundred-year old tradition carried out by elected officials was interrupted by an angry, armed and very volatile mob storming towards their chamber intent on taking hostages. In their imaginary war organized on social media against an election they thought was stolen from them, many of whom had not exercised their right to vote in the election they contest (Ellis & Hicken, 2021; Folley, 2021; Spocchia, 2021). The protesters became domestic terrorists as they continued to be fed falsehoods in real time through the mass and social media from their leaders – principally the outgoing president. People all over the world witnessed instantaneously through the mass and social media images and videos of an over eight-hundred strong army of rioters breaking the doors, windows and climbing the walls of the US capitol building leaving destruction, injury and death in their wake. Had the angry mob succeeded, a vice president and speaker of the house may have lost their lives and the democracy might have succumbed to a populist autocratic regime. The ripples of these events spread rapidly to the rest of the world illustrating the increasing threat to democratic freedoms among greater interconnectedness between people, governments and economies.

The unique challenges of our time have given rise to equally unique ways of referring to them: *digital biopolitics* refers to the ambitious efforts by governments and corporations to maximize knowledge and control of populations using digital means for political and economic power. This makes democratic rights such as privacy and the ‘right to know’ vulnerable (Waisbord & Soledad Segura, 2021). The pandemic has offered governments an excuse to exert control over their populations using digital means. Controlling a pandemic

spread involves many forms of surveillance and an acceleration in the adoption of various monitoring technologies and automated decision-making systems (Di Salvo, 2021). Political and economic interventions worldwide are made easier through digital connectivity and ample data collection efforts. These efforts offer opportunities for artificial intelligence engines and machine learning analytical techniques to be used to gain unique insights into the private lives of individuals, their families and communities. Such power in the hands of a few tech giants and governments can make for perilous uncharted territory in digital biopolitics. Di Salvo (2021) suggests that as smart working, remote teaching, and public services were forced to migrate online, this evolution also has profound implications in a society that relies heavily on digital tools to function. He asks what are the long-term implications of making private services [such as those offered by Google] the infrastructure of social life, citizenship, and agency?

Global competition for medical resources and the inequitable distribution of vaccines, access to care and other resources continue to be a threat to global recovery. Low income countries are unlikely to vaccinate their populations for the next few years as they rely on the COVID-19 Vaccine Global Access Facility for help. Some estimate that the world will not be fully vaccinated for another decade (Randall, 2021). Such inequities limit a full recovery from the virus as without vaccinations, the virus will continue to circulate, infect, mutate and spread anew. The major disruptions in low and middle-income countries’ health services, including childhood immunizations, will continue to cause excess deaths well beyond COVID-19 (Gostin, 2021). Global economic recovery depends on covid-19 vaccination programs, especially in poorer countries, are essential for the health of the global economy. The World Bank estimates that the world economy will grow by 4% in 2021. It is estimated that China’s Gross Domestic Product (GDP) will expand by 7.9%, The United States and Europe by around 3.5%. This is tempered by the fact that by 2022, global GDP is still expected to be 4.4% below pre-pandemic projections (Economist, 2021). Given this global reality, this editorial explores

what opportunities ICT for development offers as we attempt to tackle socio-economic inequities in a datafied world? The following sections highlight challenges that have changed the world and offer insights into opportunities that may bring about improvements in the lives of people.

2. Pandemics within the pandemic

It is becoming apparent that the world is experiencing a pandemic within the COVID-19 pandemic: large segments of its population suffering from the effects of the virus while struggling with various mental health and chronic diseases, domestic violence, food insecurity and homelessness. In order to understand this pandemic, we need to consider the socio-economic inequities that led to its spread within countries and communities. There are some distinct differences between and within countries in terms of cases, containment measures and health outcomes. When compared in terms of their mortality rates, twenty countries stand out as being most affected by COVID-19. In terms of deaths per 100,000 population, Czechia, the United Kingdom, Hungary, Italy and the United States have the highest mortality rates from COVID-19 - in that order (see [Figure 1](#)). The world's richest economy, the United States, has been among the world's poorest performers in addressing the pandemic, with more than 500,000 deaths argues Gostin (2021). Geopolitical conflict between the United States and China, a weak public health infrastructure, public resistance to risk mitigation measures like wearing a mask, uncoordinated national responses, and a need for a better system for outbreak detection and verification all contributed to delayed responses (Gostin, 2021). [Figure 1](#) below illustrates the twenty countries with the highest COVID-19 mortality rates.

As the world struggled to contain the pandemic, Latin America became the new epicenter as cases of infections and deaths increased. Latin American governments (including those in [Figure 1](#): Mexico, Brazil, Argentina and Peru) have deployed digital technologies to control the transmission of the virus to support testing and tracing. These governments have collaborated with private companies and universities to set up mobile applications for geo-locating and contact-tracing. Their actions have raised concerns about the negative impact of surveillance and inaccurate data gathering where in some countries 65%, while in others 85% of households own mobile phones (Waisbord & Soledad Segura, 2021). This leaves significant proportions of the population not digitally connected. Peru has the second largest overall number of registered infections in the region, behind Brazil, which has almost seven times the population of Peru. Cerna Aragon (2021) describes Peru as a state which barely knows its population. It uses technologies devised for poverty-alleviating

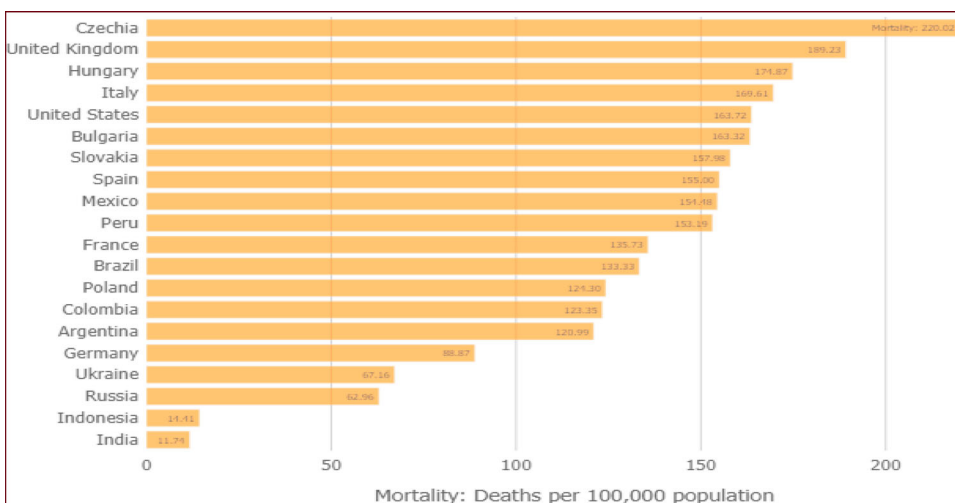


Figure 1. Countries with highest COVID-19 mortality rates. Source: Johns Hopkins University & Medicine (2021).

programs, that have left large segments of the population invisible. This has left them unable to receive subsidies and basic resources for survival during quarantine.

The pandemic has revealed that it is not just differences in access to care and resources that are worsening the gaps between those who can survive the virus and those who cannot. Feinstein (1993) contends that the literature documenting the relationship between socioeconomic status and health has been more successful in documenting health inequalities than in explaining why they exist. He highlights two important dimensions. One dimension refers to the underlying characteristics of persons (or households) that may cause differences in health status in terms of materialist or resource-dependent characteristics like wealth, home ownership, and automobile ownership; and non-resource-dependent behavioral characteristics, including psychological, genetic, and cultural factors. The second dimension refers to the stage of life experience in which inequalities are generated, and can also be conveniently divided into two groups: inequalities arising from different experiences over the 'life span,' such as differences in diet, smoking, exercise, and occupation; and inequalities that arise from differences in access to and utilization of formal 'health care services' (Feinstein, 1993, p. 28.).

Mortality rates are higher in communities where wealth is low and access to care difficult. Such communities also experience low education and limiting behaviors that would potentially enable them to access needed information and resources to stay healthy. According to LaQuandra and Nesbitt (2021) stay-at-home orders implemented in response to the rapid acceleration phase of the pandemic, in communities across the United States, racial and ethnic minorities were overrepresented in the critical infrastructure workforce such as food retail/grocery, public transportation, and allied health professions and unlicensed/uncredentialed health care workers. The disproportionate representation of racial and ethnic minorities in these employment categories, largely a function of access to educational opportunities, increased their risk of exposure to SARS-CoV-2, thus leading to higher COVID-19 incidence and disparities in outcome.

A pandemic within this pandemic is mental health crisis emanating from isolation and loss of SES. Waite and Nardi (2021), suggest that health crisis will intensify the behavioral health, mental health (Post-Traumatic Stress Disorder, anxiety and depression) and emotional health (loss, loneliness, and grief) needs of everyone, but especially for marginalized populations. Psychiatric mental health providers are challenged by and with these disparities as they strive to keep their patients stable, steady, and on a path to wellness during this pandemic. Issues related to mental health and substance abuse have become widespread. According to the World Health Organization (2020), the pandemic is increasing demand for mental health services. Bereavement, isolation, loss of income and fear are triggering mental health conditions, or exacerbating existing ones, are causing people to take their own lives. Many people are facing increased levels of alcohol and drug use, insomnia, and anxiety. Meanwhile, COVID-19 itself can lead to neurological and mental complications, such as delirium, agitation, and stroke. People with pre-existing mental, neurological or substance use disorders are also more vulnerable to SARS-CoV-2 infection— they may stand a higher risk of severe outcomes and even death (WHO, 2020). The pandemic control measures have also increased loneliness among the elderly. Zhang et al. (2021) suggest that elderly adults are prone to feeling isolated and helpless due to their retirement, changed social roles and degraded physical ability. This isolation is amplified by lock-downs, stay-at home orders, and quarantines making it impossible for friends or relatives to visit. This according to Zhang et al. (2021) may make the elderly less satisfied with their lives and significantly compromises their well-being.

Another pandemic is increased violence. In particular, increased domestic violence has also been documented as a pandemic within the pandemic. Evans et al. (2020) state that inequities related to social determinants of health are magnified during a crisis, and sheltering in place does not inflict equivalent hardship on all people. They report that one in four women and one in ten men experience Intimate Partner Violence (IPV) which can take various forms: physical, emotional, sexual, or psychological. People of all races, cultures, genders, sexual orientations, socioeconomic classes, and religions experience IPV. However, such violence has a disproportionate effect on communities

of color and other marginalized groups. Economic instability, unsafe housing, neighborhood violence, and lack of safe and stable child care and social support can worsen already tenuous situations. IPV cannot be addressed without also addressing social factors, especially in the context of a pandemic that is causing substantial isolation. Economic independence is a critical factor in violence prevention. The pandemic has exacerbated financial entanglement by causing increased job loss and unemployment, particularly among women of color, immigrants, and workers without a college education. The public health restrictions put in place to combat the spread of the virus have also reduced access to alternative sources of housing: shelters and hotels have reduced their capacity or shut down, and travel restrictions have limited people's access to safe havens (Evans et al., 2020; Howell et al., 2020).

An additional pandemic within the pandemic of major concern has been in education. Families with good Internet access and educational encouragement can provide an environment that induces educational advancement for children. Such is not the case in poorer households with primitive (or non-existent) Internet access sharing basic technology (if any) without any encouragement to further education. This lack of access to basic technology is exacerbating inequities helping the rich get richer and the poor get poorer. Many of these students may be permanently stunted in their education and the divide widens further into future generations. Closures of schools and child care facilities have added to the stress at home. Virtual learning often requires the involvement and supervision of parents and guardians. Some parents are considered essential workers and cannot work from home, and others are required to work virtually. The added stress of balancing work, child care, and children's education has led to a rise in child abuse. Mandated reporters, such as teachers, child care providers, and clinicians, also have fewer interactions with children and families and fewer opportunities to assess, recognize, and report signs of abuse than they did before the pandemic (Evans et al., 2020; Howell et al., 2020; LaQuandra & Nesbitt, 2021).

These and other chronic conditions such as higher rates of diabetes, asthma, stroke, hypertension, depression, and severe psychosis increase risk for poorer outcomes from, and vulnerability to, COVID-19 in black and brown racialized populations. These health risks are compounded by the food deserts, wage earning disparities, increased and pervasive social stressors, still-segregated housing, cultural mistrust born of centuries of enslavement, oppression and racism, and lack of comprehensive insurance coverage. Protracted periods of isolation, multigenerational living and overcrowded residential spaces, unrelenting levels of increased stress and anxiety, in addition to financial difficulties, anguish, loss and strained relationships are pervasive and heightened for racial minority populations with disproportionately fewer resources compared to racially white populations (LaQuandra & Nesbitt, 2021; Waite & Nardi, 2021).

3. Digital health literacy

It is an accepted notion that ICTs can help address the socio-economic inequities that are fueling emerging pandemics within the pandemic. The first line of defense is offering equal access to broadband Internet service in people's homes. Access could be expanded by means of a subsidy program or the installation of wireless access points in public spaces, making healthcare more accessible through phone calls and video streaming and enabling wider access to telehealth. This would enable wider access to educational resources, and permit people who have experienced IPV to search for resources and maintain their critical social connections (Buntin et al., 2011; Evans et al., 2020; Howell et al., 2020; LaQuandra & Nesbitt, 2021; Qureshi, 2016; Rodriguez et al., 2020; Zhang et al., 2020, 2021). There is a role for the use of mobile phone applications to address the different inequities caused by the pandemic. There is a relationship between what Qureshi and Xiong (2021) identify as the mobility effect and human development outcomes such as health and wellness. They define the mobility effect as the effect of the use of mobile phones, internet usage and the health and wellbeing of a population. They discovered a significant relationship between the use of mobile phones, Internet usage and health, and human development. Inequalities

in education and income moderate the positive relationship between the mobility effect for health and human development.

Equitable healthcare provision entails socio-economic development. This means that in order to overcome inequities technology access needs to be provided together with support for patients' use of these digital tools. Digital health literacy refers to the 'degree a patient can obtain, process, and understand digital services and information' (Dunn & Hazzard, 2019). ICTs support health and wellbeing by standardizing and disseminating the information essential to the maintenance of a community's people and their health, creating efficiencies and improving the interoperability of collected data. By increasing accessibility to healthcare and its degree of quality through ICTs, the time spent between inhibiting health issues and becoming a more productive member of the community is minimized. Higher health standards are attributed to better education, of which, higher education becomes higher economic outcomes within a local community and strengthens the community from within. This leads to social development outcomes which bring about improvements in the lives of people through social programs such as those in healthcare, and economic development considers improvements in the lives of people through income (Qureshi, 2016).

Accessibility to healthcare and ICT-based solutions that are involved with, and help facilitate the accessibility to healthcare are absolutely needed in these communities. ICTs are an efficient and cost effective solution to the management of health needs and for assisting the duties of healthcare professionals. Mainly women and children are the recipients of non-profit healthcare outlets and at a minimum, should see their basic needs fulfilled with systems like these. ICTs have been used by the poor to produce income in many different ways. The most basic use has been messaging family and other social contacts to ask for funds. Impoverished communities are among the highest benefactors of ICT systems, especially where healthcare and opportunity are in question, providing sustainable development to this generation and for future generations to come (Heeks, 2017).

The opportunity for users to remotely monitor their own health is particularly useful for low income and rural populations who may be unable to visit healthcare professionals due to monetary or travel limitations as well as those who may have hesitations in seeking medical services (Bolin et al., 2015; Deitenbeck et al., 2018). However, to be sustainable, developers of mHealth tools must observe how their tool is being used, monitor user behavior, and collect feedback from its users to ensure quality and relevancy (Negash et al., 2018). It is apparent that in addition to broadband, device access, whether via computer, tablet, or smartphone, is critical for patient engagement in a system that relies on mobile apps. Even though 81% of the US population owns a smartphone, there are gaps across literacy and socioeconomic status that prevent such systems from reaching the most vulnerable (Rodriguez et al., 2020).

Zhang et al. (2020) state that mobile health (mHealth) is a service defined as health care practice supported by mobile devices. In their research the use of mHealth to cope with disruptions related to the COVID-19 pandemic included applications that health care professionals use to treat clinical disease, reinforce treatment adherence, provide consultation to the users, and educate users on self-monitoring of the disease COVID-19. mHealth service is an essential component of health information technology, which has the potential to enhance health care quality and promote good health (Buntin et al., 2011). Zhang et al. (2020) found that event disruption of the COVID-19 pandemic induced mHealth emergency use intention through increased psychological strain. In another paper in which ICT use by the elderly to address isolation, Zhang et al. (2021) found that both intrinsic and extrinsic motivations can influence the ICT use of elderly individuals that then improve their life satisfaction. ICT use plays an important role in life satisfaction for elderly people, and their individual health consciousness is a crucial factor. There is an important role for ICTs, particularly the use of mobile and broadband connectivity in addressing the pandemics within the pandemic. The following section addresses the digital divides and how they may be overcome in addressing COVID-19 and related challenges.

4. Tackling the pandemic within the digital divides

A central issue in tackling the pandemic are the digital divides that keep those at the margins isolated from their communities and economic opportunities offered in the global economy. In a world where most people rely on digital connections for their physical, psychological and economic survival, ICTs can bring education to people, healthcare to disadvantaged communities, promote civic engagement and better management of natural resources. These measures are difficult to implement unless the digital divides have been overcome or at least addressed in some manner. Pippa Norris (2001) provides us with a distinct view of the Digital Divide. She suggests that the digital divide is a multidimensional phenomenon that encompasses three distinct aspects.

The global divide refers to the divergence of internet access between societies. The social divide refers to the gap between the information rich and information poor in each nation. Within the online community, the democratic divide signifies the difference between those who do and those who do not use digital resources to engage, mobilize and participate in public life (Norris, 2001). Servon (2002) adds that while information technology has wrought fundamental changes throughout society, it benefits and hinders the progress to social and economic development. In addition to altering commerce, education, government, and communications, ICTs affect the construction of and response to social problems such as poverty and inequality. The very existence of the digital divide – or lack of access to IT to certain segments of the population exacerbates inequalities (Servon, 2002).

Queau (2002) offers compelling insight into the global divide. He states that internet access disparities are considerable. Although telecom privatization and deregulation have made traditional operations more efficient, they are not a guarantee for local access to the internet. The nature of the telecom industry enables it to impose revenue terms because of their advanced technology, high speed internet backbones and net-concentration. This advantage has meant that a few dominating telecommunications operators can force service providers and customers to shoulder their access costs making it even more difficult to provide the most basic services (Queau, 2002). This limited access increases the social divide making it difficult to provide educational and health services to the rural poor. This may potentially exclude those living in the margins, rural areas with limited mobile and broadband connectivity, inner cities and refugee camps from the benefits of information and access to healthcare. In addition, Queau (2002) argues that a new culture is emerging of 'information literacy' through online interactions comprised of visual representations and mental images that can potentially increase the disparities between people who are part of this culture in industrialized countries and those who are not, as well as within societies themselves. This has implications for the level of civic engagement and level of participation in public life (Giddens, 2003; Norris, 2001).

It is worth noting that Nigeria, having successfully battled Ebola and SARS, has a public health infrastructure that was able to tackle the COVID-19 pandemic despite the digital divides it faces. There are around 170 million mobile subscriptions in Nigeria of which only around 10 to 20 percent of the population uses smartphones. Mobile phone penetration is estimated at 41.4% for 2020 (Statista, 2021). Nigeria has a population of 206 million (2020) and the number of mobile internet users in Nigeria amounted to over 85.26 million (Statista, 2021). The country reports 161,539 confirmed cases and 2,027 deaths from COVID-19 (WHO, 2021). As the most populous country in Africa, Nigeria's epidemic response is carried out in the context of a fragile and under-resourced existing health delivery system, and complicated by economic, political, social, and security issues throughout the country. Nigeria has, to date, the second-highest number of confirmed COVID-19 cases in Africa, and accounts for 7% of all confirmed cases on the continent. This may be an underestimation of the actual case load given the relatively low testing rate in Nigeria (Dan-Nwafor et al., 2020).

The 2014 Ebola epidemic tested the limits of the Nigerian health system and gave rise to the Nigeria Center for Disease Control (NCDC) with mechanisms for tracking, tracing and mitigating the infection. As a result, Nigeria is one of a few countries that have coped well with containing

the spread of COVID-19 from its points of entry to its vulnerable rural communities. The NCDC has enhanced diagnostic and surveillance capacity based on a mobile geographic information system. According to Ekong et al. (2020), Mobile Positioning Systems have been central to Nigeria's strategy for contact tracking and tracing. Mobile telecommunications subscriber communication and movement data was used for contact tracing during the Ebola outbreak. There has been a 90% increase in the number of countries implementing digital tracking measures and a 100% increase in reports of censorship (Cozzens, 2020). These approaches range from the use of anonymized aggregate data to monitor the general mobility of people and track the mobile phones of confirmed cases to tracking suspected patients and their contacts. In some cases, these approaches were individualized and mandatory while, in others, they were aggregated and anonymized. In all cases, there were collaborations between the government, mobile network operators (MNOs), and other data controllers such as technology companies and financial services providers (Ekong et al., 2020).

By 31 May 2020, Nigeria had conducted 63, 882 COVID-19 tests, equivalent to 293 tests per million population; in comparison, Ghana had conducted 184, 343 (5948 per million population) and South Africa had conducted 488, 609 tests (8251 per million population). In order to address the rising infection rates, the Nigerian Emergency Operations Centre (EOC) was activated at the highest level of response in the country intended for public health emergencies requiring national coordination and use of all available resources for the response. The EOC comprises multiple pillars, including: coordination, surveillance and epidemiology, case management, laboratory, points of entry (PoE), risk communication, logistics, and research. Points of entry and case management pillars are led by the Departments of Port Health Services and Hospital Services of the Federal Ministry of Health respectively (Dan-Nwafor et al., 2020). Nigeria's infection mitigation strategies have been taken up by other countries facing similar challenges.

5. Globalization: the perils and possibilities

The pandemic has illuminated greater inequalities in the global economy. Not only in the way in which the pandemic was handled, but also illustrating the increased interdependencies between the nations of the world. There has been a sense that globalization contributed to the progress of the world, through trade, migration, spread of cultural influences and the dissemination of knowledge and understanding including science and technology (Sen, 2002). At the same time, large segments of the population have been left out. Amartya Sen (2002), argues that the economic predicament of the poor across the world cannot be reversed by withholding from them the great advantages of contemporary technology, the well-established efficiency of international trade and exchange, and the social as well as economic merits of living in open rather than closed societies. Ajayi (2003) adds to this argument by stating that globalization offers new opportunities, including expanded markets and the acquisition of new technologies and ideas. The closed economies risk marginalization and must take steps to co-ordinate their trade strategies if they are to alleviate poverty (Ajayi, 2003).

A number of theories have been developed on the nature and impact of the process of globalization (Castells, 2000; Giddens, 2003; Held et al., 1999; Hirst & Thompson, 1996; Robertson, 1992; Scholte, 2000; Wallerstein, 1974). Castells (2000), is notable in his description of globalization to be fueled by information technology in what characterizes this current technological revolution is not the centrality of knowledge and information but the application of this knowledge and information to knowledge generating and information processing devices. These form a cumulative feedback loop between innovation and the uses of innovation. Information technology is so fundamental to globalization, that differential timing in access to technology for people, countries, and regions is a critical source of inequality in our society (Castells, 2000). According to Monge and Matei (2004), telecommunication systems are the skeleton of this new world order which is composed of a denser and better interconnected network of connections between countries. They suggest that international telephonic traffic quadrupled due to a number of

social and economic factors: technological advances increased transmission capacity at reduced cost, deregulation increased competition and the democratic transformation of Russia and Europe eased international tensions and facilitated cross national communication (Monge & Matei, 2004).

A fundamental change that is unfolding before us is that social action is taking place within the context of a society that is global and interconnected in so many ways. Giddens's (2003) insight into this global society is that the age of the nation state is coming to an end and governments can no longer control economic life just as the welfare state cannot remain intact. He suggests that globalization is a political, social, cultural as well as an economic phenomenon that is revolutionizing the way in which we live. Recent events that have unfolded in the pandemic have shown that anger, violence and anxiety with governments' actions or lack thereof is a global phenomenon. While some governments especially those in South East Asia, namely, New Zealand and Taiwan have received praise in their handling of their economies during the pandemic, social unrest has been commonplace in most countries. Could this be the beginning of the long awaited fall of the nation state and the rise of the global datafied society?

Taylor and Broeders (2015), offer a compelling view of how power, profit and datafication are powering the global economy, specifically, the global south. They explore two trends in datafication and development:

corporations expand into emerging markets through services which generate digital data, they now find themselves simultaneously expanding into the development field. Although the private sector has long played a role in development through Corporate Social Responsibility (CSR) activities, corporations are becoming involved in the field in new ways as digital data emerges as a resource for analysing development and informing policy. This is taking place in two different configurations: first, with corporations as partners or deputies of states or donors where the latter are still developing digital capacity, a configuration which reflects the distributed modes of governance facilitated by the new data flows. Second, there are projects which carry the label of development but which are managed and rolled out entirely by corporate interests. (Taylor & Broeders, 2015, p. 5)

Corporations such as Facebook, Google and Starlink work towards getting internet access to those at the margins while working with donor agencies to get access to those who may need it the most. They are promoting development and inclusion while still reinforcing existing power and knowledge asymmetries. To this Taylor and Broeders (2015) add that these corporations can continue to gather data unfettered offering analytical advantages to themselves. This means that they no longer have to conceal their profit motives under development discourse and are now free to connect the expansion of their markets and digital records under the guise of promoting human development.

Given the risks and complexity associated with globalization, various notions of development have abounded as human, social, and economic processes converge (Castells, 2000; Giddens, 2003; Norris, 2001). The human face to development is captured in poverty and suffering of the most deprived populations of the world and they struggle to survive. Authors such as Sen (1993) focus our attention on the struggle for human freedoms and in providing them with the opportunities for self-development. The social concept of development suggests that people participate in improving their circumstances through the development of healthcare, education, environment and community services (Apthorpe, 1999; Arce, 2003; Hamelink, 2002; Midgley, 2003). This has political ramifications in that foreign policies dominated by political interests drive decisions related to aid, governance and trade (Sewell, 1999). The concept of development is most often referred to as an economic phenomenon in that poverty is seen to be overcome through the use of economic indicators to inform monetary and fiscal policies. In more recent years, perceptions of development have transitioned from being a global phenomenon to a global responsibility.

However, according to Sen (2002), the key issue that globalization brings about, is how to make good use of the benefits of economic inter-dependency and technological progress in a way that pays adequate attention to the interests of the deprived. He adds that the removal of poverty and deprivation cannot be seen as an automatic result of economic growth, but suggests that there is a 'complementarity' between generating resources through economic growth and using

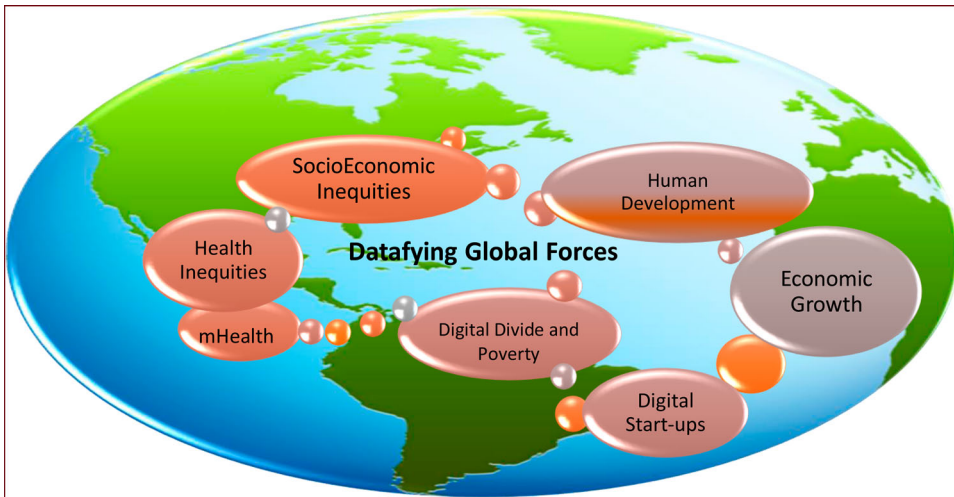


Figure 2. Global forces.

those resources to expand and enhance public services (Drèze & Sen, 1991). There are some unintended consequences of datafication in the context of development that may in fact enable pressing problems to be addressed. Heeks and Shekhar (2019) offer two generic models that can be used to analyse all forms of datafication. The first suggests that pro-equity data initiatives involve community mapping. Mapping aims to counter the relative invisibility of (i.e. lack of data about) marginalized communities by gathering, visualising and utilizing new data on locations, assets and issues within those communities. The second is a framework for the analysis of data systems and initiatives around datafication by placing data at the heart of the model. The following Figure 2: offers a view of the global forces affecting the ability of people to cope with changes brought about by the pandemic:

Sen (1993) suggests that human well-being should be at the heart of any development effort. In particular, he emphasizes the need for human freedoms especially in the face of market mechanisms and proposes three distinct facets of freedom: opportunity to achieve, autonomy of decisions and immunity from encroachment. Sen argues that without freedom and the capability to carry out an activity, a person cannot be responsible for doing what they do. His contribution to development is that it is a 'momentous engagement with freedom's possibilities' (Sen, 1999, p. 284). Sen's work has influenced development efforts in many ways. Empowerment of those who stand to benefit has become the focus in donor agencies' policies from doing development to or for those who are perceived to need it towards doing development with or empowering those who need development. There is a recognition that for development efforts to succeed, human freedoms must be stimulated and responsibilities enhanced at the grass roots level.

6. Papers in this issue

At the heart of the global forces affecting the ability of people, their communities and countries to cope with the changes brought in the pandemic, are the socioeconomic inequities. These relate to rising poverty levels and the inability of people to cope given their falling socio economic status. As shown above low socioeconomic status is related to lower health outcomes, especially in areas where education and access to healthcare are low. Such health inequities can be overcome through mobile health applications where the mobility effect may offer opportunities for human development. The papers in this issue address some of the ways in which the digital mobile health applications may assist people in a development context, they show ways of addressing

the digital divide and poverty mapping and how digital start-ups and the use of mobile phones empower entrepreneurs. Another set of papers offers key contributions into the role of ICTs in supporting economic growth and development efforts. The final set of papers contributes to ways in which research in ICT4D can be strengthened.

6.1. Digital start-ups

Richard Heeks, Gerardo Quinones and Brian Nicholson co-author the first paper in this issue. It is titled 'Embeddedness of Digital Start-Ups in Development Contexts: Field Experience from Latin America.' The authors contend that context is a key mediator of the relation between digital and development – they focus particularly on digital enterprise and development. Yet this mediation is little-understood in terms of contextual embeddedness. To address this gap, they analyze field evidence on digital start-ups in Latin America's four largest economies using the Triple Embeddedness Framework (TEF). They found that digital start-ups have multiple, hybrid embeddedness in terms of product and digital sector regimes, in local and global industry regimes, and in their economic and socio-political environment. Successful digital start-ups have optimal embeddedness: strong enough to provide flows of knowledge and resources, but not so strong as to constrain innovation. Digital start-ups in the global south are seen to be positioned on the relative periphery of the global economy. This brings benefits in that it allows ideas to flow in while offering some protection from external competition. This paper makes a theoretical contribution to the literature on digital and development by conceptualizing the relation between embeddedness, digital enterprise and development. Alongside this new conceptualization of digital enterprise and development, conclusions are drawn for future research, government policy and business strategy.

The second paper in this issue is co-authored by Monzur Hossain and Hussain Samad; it is titled 'Mobile Phones, Household Welfare and Women's Empowerment: Evidence from Rural Off the grid Regions of Bangladesh'. The authors contend that the existing literature lacks comprehensiveness in assessing the impact of mobile phones on household welfare, in particular, on the welfare of rural poor. They use household survey data from off-grid regions of rural Bangladesh, to assess the impacts of mobile phone use on household welfare and women's empowerment. Using two propensity score-based weighted regressions (IPW and AIPW), this study finds that mobile phone use increases household income (3–10 percent) from different sources, such as small businesses and remittances; improves women's empowerment; and facilitates consumption smoothing during periods of shocks. Thus, favorable policies on investment in mobile telephone technologies, tariffs on talk time and internet usage, and mobile innovations, such as mobile financial services could reduce communication bottlenecks and digital divide in rural lagging regions that will help achieve a balanced regional development. Simultaneously, policies to avoid adverse impact of mobile phone usage should also be in place.

6.2. Mobile health

Since the use of mobile phones offers low income households and low SES individuals to seek better livelihoods, the third paper in this issue addresses privacy issues. It is titled 'Factors influencing individuals' personal health information privacy concerns. A study in Ghana' and co-authored by Ernest Adu, Annette Mills and Nelly Todorova. With advances in digitization, there have been heightened concerns about online privacy in many countries. In particular, the privacy of personal health information (PHI) as these are shared among various stakeholders. To understand these concerns, this study explores the impacts of individuals' characteristics, experiences, and perceptions on PHI privacy concerns (PHIPC) in the healthcare setting of a developing country, Ghana. Using data from 276 individuals, the results show individuals are less concerned about PHI collection, but more concerned about the management of their PHI once it is collected (e.g. errors, secondary use, and unauthorized use). The results further indicate that the factors influencing PHIPC are

differentiated for the collection and management of PHI. While gender, age, health status, and privacy risk perceptions impact PHI collection concerns, PHI management concerns are impacted by privacy orientation, computer experience, and trust in healthcare providers. The contribution of this paper is in a model which brings together and explores the influence of individuals' characteristics, experiences, and other factors on PHIPC which is modeled as a multidimensional construct comprised of four dimensions of privacy concerns namely: collection, errors, secondary use, and unauthorized access.

6.3. Digital divide and poverty mapping

In a datafied world, numerous forms of data can be collected and analyzed to solve pressing problems. The fourth paper in this issue by James Pick, Avijit Sarkar and Elizabeth Parrish, is titled 'the Latin American and Caribbean Digital Divide: A Geospatial and Multivariate Analysis.' Their paper examines spatial patterns of information and communication technology (ICT) adoption and utilization and seeks to understand underlying reasons for the digital divide in Latin America and the Caribbean (LAC). Five distinctive clusters of technology adoption and use factors are identified, characterized, and geographically mapped. Disparities in adoption and utilization in ICTs in 36 LAC countries are examined Using a Spatially Aware Technology Utilization Model, fifteen socio-economic, innovation, business efficiency, infrastructural, affordability, and societal openness indicators are posited to be associated with six ICT indicators. Human development, civil liberties, political rights, urban population, and electricity access are found to influence ICT adoption and use in LAC indicating socio-economic, urban, societal openness, and infrastructural dimensions of the digital divide in this world region. For a sub-sample of Latin American nations, regression findings point to human development and infrastructural factors. Spatial bias in confirmatory analysis is diagnosed, and policies are recommended. This paper contributes to knowledge with a theoretical model that is tested empirically by multivariate technique and spatial analysis, in order to shed light on the factors leading to the differences in ICT levels and to spatial patterns of ICTs across the LAC nations.

Jonathan Hersh, Ryan Engstrom, and Michael Mann, co-author the fifth paper titled 'Open Data for Algorithms: Mapping Poverty in Belize Using Open Satellite Derived Features and Machine Learning'. The authors explain that the Open Data for Development (OD4D) movement promotes the publication of government data and statistics, under the belief that increased government transparency is crucial for promoting economic growth. Mapping the spatial distribution of poverty and incomes within a country remains a challenge. This paper investigates the extent to which open-source, Big Data can be meshed with existing survey data to alleviate the lack of frequent sub-national poverty estimates. Using Belize as a test case, the authors utilize freely available, open-source satellite imagery to build sub-national estimates of income poverty, and determine the extent to which features from satellite imagery act as substitutes and complements to survey-based estimates of poverty.

The authors state that several proposed methods incorporate features from satellite imagery to improve model performance. These include poverty mapping using convolutional neural networks trained on high and medium resolution satellite images, with an application in Mexico, or supplant small area estimation methods combining satellite imagery and machine learning to predict poverty. Techniques are being used to measure poverty from space using high-resolution satellite imagery for estimating economic well-being. However, these methods require high-spatial resolution imagery which, given their cost and infrequent acquisition, may render these advances impractical for most applications. The authors investigate how small area estimates of average income may improve when incorporating features derived from Sentinel-2 and MODIS imagery. They evaluate the use of proprietary satellite imagery for the purposes of poverty measurement, and test an alternative source of open-source satellite imagery that is freely and readily available. Both satellites provide free imagery, have global coverage, and a frequent revisit rate. The authors estimate a

poverty map for Belize which incorporates spatial and time series features derived from these sensors, with and without survey derived variables. They document an 8% percent improvement in model performance when including these satellite features and conclude by arguing that Open Data for Development should include open data pipelines where possible. They found that household-level income models used to generate Enumeration District (ED) poverty rates improve when incorporating satellite variables; The models improve most significantly for the poorest households.

6.4. Economic growth

The sixth paper in this issue is co-authored by Bosede Ngozi Adeleye, Festus Adedoyin and Solomon Nathaniel and is titled 'The Criticality of ICT-Trade Nexus on Economic and Inclusive Growth'. This paper contributes to the ICT-growth and trade-growth literature by investigating the ICT-trade nexus on economic and inclusive growth. That is, does ICT adoption enhance or distort the impact of trade on growth? With data on 53 African countries from 2005 to 2015 using mobile phones and fixed telephone subscriptions as indicators of ICT, findings provide evidence that (1) trade is a significant and positive predictor of growth, (2) the impact of trade on growth differs significantly across Africa's sub-regions, (3) the effect of ICT adoption differs significantly across sub-regions, (4) ICT innovation enhances the impact of trade on growth, and (5) the ICT-trade nexus differ significantly across sub-regions. The study submits that these variables are critical drivers of economic and inclusive growth in Africa. However, the lack of consistency of the results across the sub-regions suggests that the level of ICT is still undeveloped. The contribution of this paper is in showing that ICT enhances the impact of trade on both economic and inclusive growth in Africa. Their also results suggest that across the five sub-regions, the ICT-trade nexus on growth significantly differs. Policy implications are discussed in this regard.

Shashi Kant Srivastava is the author of the seventh paper titled 'IT Capital in Improving National Innovation Productivity: Understanding IT Productivity Paradox Through Cognitive Path-Dependence Model'. This paper deals with the issue of IT productivity paradox and examines the influence of IT capital and IT institution on the national innovation productivity. Applying North's neo-institutional economics, Hayek's model of the mind, and Bandura's explanation of learning the author investigates this relationship through the cognitive path dependence model. The analysis is performed using a data set of 137 countries and apply Partial Least Square (PLS) technique of Structural Equation Modeling (SEM). The findings suggest that the existence of strong IT institutions as an essential step to capitalize IT investments to national innovation productivity. The IT institutions of the nation fully mediate the relationship between IT capital and national innovation productivity. This paper contributes to IT and development literature in two important ways. Firstly, a neo-institutional economics perspective is used to address the IT productivity paradox. Secondly, the concept of IT institution is brought out, measurement scale is proposed for it, and it addresses the connection of human development and cognitive path development. The study demonstrates a cognitive perspective to the subject of IT and development and brings about policy recommendation for diverse national scenarios.

Tsuyoshi Kano, Abdul Matin Sheikh and Kentaro Toyama co-author the eighth paper in this issue titled 'Career Aspirations in Bangladesh: A Trigger for Development?' They suggest that the Saxe-nian's concept of 'brain circulation' explains how a developing country can benefit when its diaspora community returns home to accelerate economic growth. However, this says little about who leaves a country in the first place, and why they leave. The authors consider this issue in the context of Bangladesh's IT sector and focus on university students' aspirations for careers abroad. Based on a survey of 591 undergraduate IT students, they found that students' aspirations bifurcate into those hoping to work in English-speaking developed countries and those expecting to remain in Bangladesh. The difference correlates with parental income, attendance at elite universities, gender, and the presence of role models. They also found that parental income is predictive of what factors students value in a job. Their findings are discussed in relation to socio-cognitive career theory, with implications for interventions that could improve IT brain circulation in Bangladesh and beyond.

The contributions of their work lie in first, making clear distinctions in career aspirations occur not just with respect to what type of occupation a person desires, but also the larger context of the job. Second, they go beyond the findings from developed-world career-aspiration literature and highlight a study of an international, border-crossing context, specifically within the IT industry. Thirdly they build on existing theory by opening up an avenue of inquiry about the initial emigration required for brain circulation. They state that there appears much to be understood with respect to migration dynamics pre-diaspora. Fourth, they make contributions to social cognitive career theory, demonstrating that career aspirations can be studied at a finer grain within a single career category. This is more granular than the broad occupational categories that most career aspiration research focuses on. Finally, they suggest that these differences should be taken into account when designing policies or programs to encourage IT-relevant brain circulation.

6.5. Information and communications technology for development (ICTD/ICT4D) research

Maintaining ethical standards is an important foundation for this field. As it continues to offer contribution to how the global forces unravel into the daily lives of people and their communities, it is important to build ethical standards and governance mechanisms. Andy Dearden and Dorothea Kleine co-author the ninth paper in this issue titled 'Interdisciplinarity, self-governance and dialogue: the participatory process underpinning the minimum ethical standards for ICTD/ICT4D research'. They argue that concerns about ethical issues in Information and Communications Technology for Development (ICTD/ICT4D) research have been growing in recent years, alongside calls to agree on minimum ethical standards. This paper reflects on the three-year participatory process, co-facilitated by the authors, that has led to collective agreement on such a set of minimum ethical standards for ICTD/ICT4D research. The standards have been published (at <http://www.ictdethics.org>) under a Creative Commons license, and are open for further comment. The current version has been endorsed by the ICTD conference series, and there is ongoing dialogue about their implementation by other conferences, journals, and funding bodies. While the standards themselves are a collective effort, in this paper the facilitators lay out their own specific thinking and approach to the co-production process that they designed and facilitated. It considers the successes, potential for further improvement, as well as critical features underpinning the standards' legitimacy. These reflections may help guide other research communities interested in such participatory self-regulation processes.

Moonjung Yim and Ricardo Gomez co-author the tenth and final paper titled 'Strengthening ICT4D evaluation: Lessons from the fields of program evaluation, IS/IT evaluation, and aid/development evaluation.' Their study suggests ways to strengthen and clarify conceptual underpinnings of information and communication technology for development (ICT4D) evaluation by exploring its associations with other related evaluation fields – program evaluation, information system/information technology (IS/IT) evaluation, and aid/development evaluation. These fields have developed long and rich theoretical discourses, models, and approaches over the years, which are of interest to strengthen evaluation practices in ICT4D. Through detailed content analyses and expert interviews, we find that ICT4D evaluation shows significant parallels with the three fields in theory and practice. Also, we see that ICT4D evaluation has developed its own discourse – in particular, ICT4D researchers have valued capturing the situated development context of ICT. They argue that ICT4D evaluation can learn more from other evaluation traditions and disciplines, in order to help move the field to a more 'mature' stage.

The authors found that ICT4D evaluation can be examined through the three evaluation fields' aspects, i.e. paradigmatic stance in evaluation (program evaluation); approaches in IS/IT evaluation, IS/IT adoption, acceptance, use models or theories applied (IS/IT evaluation); and development agenda mentioned (aid/development evaluation). They state that this implies that conceptual aspects of ICT4D evaluation are associated with the three evaluation fields. Also, with regards to evaluation models, theories or frameworks mentioned in the reviewed works, they found that IS/

IT evaluation has a relatively more prominent presence among the three fields (particularly noticeable in discipline- and sector-specific evaluation models, theories or frameworks). They offer unique insight into ICT4D evaluation's own discourse which has been developed over time along with ICT4D researchers' normative perspectives toward what evaluation ought to essentially capture, i.e. the situated development context of ICT – which distinguishes ICT4D evaluation from other evaluation fields.

7. Conclusions and ways forward

The unique challenges of our time require equally unique and innovative methods to overcome. The socio-economic inequities unraveled by the COVID-19 pandemic have given rise to yet another set of pandemics. Cases and deaths continue to rise in the western world which despite its technological advances, struggles to contain. With a death toll and mortality rates unseen in modern times, the datafied world amidst some populist regimes continues additional pandemics within the pandemic of raging infections. As people become accustomed to accessing healthcare information, resources and providers through mobile and or other devices, their movements are being tracked, traced and monitored through the mobile applications. Those at the margins become vulnerable to digital biopolitics by their governments and corporations in this the datafied society where increased data surveillance is cause for activism and fight for human rights and freedoms. This datafied pandemic, rising mortality rates and additional pandemics within the COVID-19 pandemic, offers pause. Within the digital divides, the forces of globalization forge ahead with perils and promises in which a world economic revolves around our data.

There is hope in tackling the datafied socio-economic forces surrounding the pandemics. The papers in this issue offer ways in which inequities can be overcome through mobile health applications where the mobility effect may offer opportunities for human development, they show ways of addressing the digital divide and poverty mapping and how digital start-ups and the use of mobile phones empower entrepreneurs. They offer key contributions into the role of ICTs in supporting economic growth and development efforts and to ways in which research in ICT4D can be strengthened to support the challenges of our time.

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