

The Challenge of COVID-19 on the Information and Communication Technology Sector – Maximizing Misfortune

Barileé B. Baridam¹, Ezekiel Uzor Okike²

¹Department of Information Technology, Faculty of Computing, University of Port Harcourt, Nigeria

²Department of Computer Science, University of Botswana, Gaborone, Botswana

Abstract

The outbreak of the COVID-19 pandemic came to a world unprepared and brought untold hardship upon individuals and nations. The pandemic changed the world-view and general operations in technology and secular activities. Several sectors of economies were challenged and still being challenged. The outbreak of the pandemic brought to the fore the use of virtual devices (software and hardware) to communicate and undertake service delivery. As a result, there has been supposedly an upsurge in the use of information and communication technology based virtual devices to do business in all the sectors of human activity. Businesses which hitherto depended mainly on physical contacts had to device means of reaching clients virtually with the aid of electronic devices powered by appropriate software. The demand on the use of virtual platforms during the pandemic has reached its crescendo with the likelihood of a sustained tempo. With both negative and positive strands, COVID-19 pandemic has thrown the world into a lasting pain with the irreparable loss of family members or colleagues. Interestingly, this period has boosted information and communication technology. The significant role of Information and Communication Technology in education, public service delivery, health, Banking insurance and every other sector of human activity is remarkable. This paper presents the positive impact of COVID-19 pandemic on the information and technology sector. The study shows, as it is globally evident, the reliance of individuals, corporate organisations, education institutions and other sectors on information technology during the pandemic.

1. Introduction

The COVID-19 pandemic came to an unprepared world, throwing all the nations of the world into disarray in national health, social life, and national economies. The pandemic brought about fears and trauma! It was more like an unseen war against human existence. The wailings from family to family put government and her agencies in a dilemma. Many businesses went into extinction owing to lack

of survival strategy, while many employees lost their jobs. Salary-cut became an alternative to several business owners while seeking for means to keep the business afloat. It is intriguing to note that during this period of economic uncertainties, there was the so-called 'Zoom Boom' [1], [2] which supposedly brought in economic gains and recovery in Asia. Online Virtual platforms became the vogue in teaching and learning as opposed to the traditional face to face teaching method. In the workplace, workplace design, workplace flexibility and empowering employees for remote working became vital issues as a means to contain the impact of the pandemic. Furthermore, the pandemic led to restrictions in social gatherings and transportation channels, enforcing social and physical distancing with approved limited users. Most importantly, all the sectors of the economy employed Information and Communication Technology (ICT) as ready tools in containing the negative impacts of the pandemic. It appears that most of the benefits of COVID-19 pandemic (in terms of fiscal gains) applies to the use of technology and social media platforms as well as the big global pharmaceutical industries such as Pfizer, Biontech, Moderna, AstraZenec, Johnson and Johnson, all of whom raked in billions of dollars occasioned by the global use of their products to contain the spread of the pandemic. As virtual meetings continue to be the most preferred option in combating the scourge, it appears that this trend has come to stay year after the pandemic!

The great potentials of ICT have been discovered during the pandemic. All sectors enjoyed the benefits in the use of ICT to cope with or combat the pandemic. Monitoring, screening and information gathering among others, have all been employed through the use of ICT [3]. While other sectors were adversely affected, ICT enjoy a considerable patronage.

2. Literature Review

The COVID-19 pandemic is novel, there has been several pandemics before 2019. Literature is replete with accounts of a number of significant

pandemics that have occurred in human history where pandemic related crises have caused enormous negative impacts on health, economies, and even national security globally. Technology then was not at an advanced stage as it is today. The case of COVID-19 pandemic and the upsurge in the use of ICT took a significant dimension now than previous pandemics. For example, in the 14th century, the 'Black Death' plague which killed the half population of Europe [4], the 20th century Spanish flu (1919-1920) which caused 20 – 40 million deaths [5], the Asian flu of 1957-1958 which caused about 2 million deaths, the Hong Kong flu in 1968-1969 which caused 1 million deaths [6], and in recent years hantavirus pulmonary syndrome, severe acute respiratory syndrome (SARS), H1N1 influenza – the first in the 21st century (2009) which caused more than 18,000 deaths worldwide [7], H5N1 influenza, Middle East respiratory syndrome (MERS), and Ebola virus disease epidemic [8], none involved the use of ICT in the form we have seen during the current coronavirus pandemic.

It is interesting to note that, while the pandemic lasted, the global south nations (especially countries in Africa, Latin America, the Caribbean, Pacific Islands and many developing parts of Asia) seem to be on the begging side in responding to the pandemic, whereas this is not the case with the global north nations (especially North America, Western Europe, Israel, Russia) and of course China. It is also noteworthy that global north nations are ahead of global south nations in many respects, especially with respect to education, economy, health, security and manufacturing during the period of the pandemic owing to their technological advantage including effective deployment of ICT. Online Antenatal Care [9] proposed and predicted an increase in online antenatal care for newly delivered mothers in China. The adoption of ICT in healthcare delivery during the period of the ongoing pandemic is significant among developed nations [10-12]. Telehealth transformation [13] also predicted that an upsurge of the era of virtual healthcare, adopting tele-health, in the United States of America had arrived. Similarly, Covid-19 pandemic opportunities and challenges [14] explored the opportunities and challenges of covid-19 vi-a-vis the use of ICT, and noted that by adopting friendly and favorable policies with enabling environment, Africa's ICT, and allied technology sectors, could also bring a boost in economies and advancement in other sectors of the economy at this time of the pandemic.

To keep patients away from exposure to the pandemic, telehealth became an option to attend to patients with noncritical chronic diseases [15], [16]. Telehealth received greater attention during the pandemic with patients being monitored with the aid of video consultation. Outside the medical sector, the use of e-commerce became an alternative to keep the

COVID-19 protocol of social distancing [17], [18]. It also became useful to adopt virtual alternatives in organizing events to maintain social distancing [19]

3. Methodology

The task of investigating the impact of COVID-19 on ICT as presented in this paper was done with the quantitative research model. Data collection was done with the aid of questionnaire divided into four sections: demography, personal views and development during the pandemic, impact on learning and the application of information technology, and impact on the economy. The major part of the questionnaire bothered on the use of IT in e-learning to assist in keeping to the social distancing of the COVID-19 protocol, and to assist to sustain the school curriculum during the lockdowns.

Owing to restrictions in movement and for better coverage, the questionnaires were administered electronically. 175 responses were recorded covering some countries in Africa (Botswana, DRC, Nigeria, Sudan, Zambia), Asia (China, India), Europe (UK), and Canada (see Table 2). Data collection strategy was achieved through online questionnaire circulated across the countries. There was no challenge with sampling bias in this study as all the samples were obtained from the sector plagued with similar challenges. The sampling frames are exactly the same. The questionnaire as a data collection strategy was chosen because it is a practical approach to information gathering. It involves a large amount of data and a large population size. Results from a quantitative analysis can be easily quantified (scientifically and objectively), unlike interviews that take lots of effort to analyze. Data analysis was done with the aid of the IBM Statistical Package for the Social Sciences (SPSS) version 25. Scientific data are mostly analyzed with quantitative techniques which may use statistical, mathematical or programming approaches [20].

3.1. Problem Statement

Besides the hardship and pains, COVID-19 came with innovations which individuals, organizations and governments with foresight have to latch on for growth and sustainable development. Presently, many firms have developed the 'work-from-home' pattern, and no one is sure of the time the pandemic will ease-off completely. In these circumstances, the need to effectively deploy information and Communication Technology to surmount the negative impact of the pandemic and contribute to the national GDP becomes very imperative, but this is not happening yet in many countries. Therefore, the Information and Communication Technology (ICT) sector of global south countries must rise to

the challenge to compete favorably with the global north nations of the world.

3.2. Objective of the Study

The aim of this study was to investigate to what extent the ICT sector is impacted by the pandemic and how ICT can be effectively deployed to overcome the negative impacts of COVID-19 in other sectors of national economies such as education, health, commerce, manufacturing, etc. The aim would be achieved through the following objectives:

- To evaluate the adoption of e-learning in institutions of higher learning and the usage of tailored learning management system for virtual classrooms in selected countries.
- To investigate the usage of local contents and e-concepts by end-users within the manufacturing, education and health sectors during the pandemic in selected countries.
- To study the digital penetration within the urban and rural communities of selected countries during the pandemic.

4. Results and Discussion

The result of the study is presented in Table 1 which shows participants' responses to relevant questions in terms of mean, standard deviation, and variance. Using a 5-point Likert scale (1=Strongly Disagree; 2 = Disagree; 3 = Neutral. 4 = Agree; 5 = strongly Agree), the result as presented in Table 1 suggests that:

i. The combat of COVID-19 was not a failure on IT infrastructure; that 5G Network was not responsible for the COVID-19 pandemic; that COVID-19 pandemic did not so much assist them in developing programming skills; and that distance/e-learning is not better than conventional study mode ($\mu \leq 2$).

ii. Respondents were not too convinced that COVID-19 pandemic assisted them in learning something new; that existing e-learning platforms were used during the pandemic; that they fully participated in, and benefited from e-learning or webinar classes during the pandemic; and that audio and video clips of lessons were available for downloads after the e-learning classes and were of good quality. With $\mu \geq 3.5$, there is a strong indication that the majority of the respondents did not use conventional IT tools during the study.

iii. Respondents were neutral as to their being conversant with e-learning prior to COVID-19 pandemic, that a new e-learning platform was adopted by their school/college /university during the pandemic ($\mu \leq 3.49$). Majority of the respondents were students who were not exposed to e-learning facilities before the pandemic. It was observed that although this was introduced at some point during the pandemic, there was no proper platform to train and enforce the concept for learners' buy in.

iv. Respondents agreed that COVID-19 provided a new way of studying, introduced new teaching methods, and that the pandemic had negative impact on overall businesses ($\mu \geq 4$).

Table 1. Descriptive statistics of participants' responses

Questions	Mean (μ)	Std. Deviation	Variance
The combat of COVID-19 is a failure on IT infrastructure	2.70	.911	.831
5G Network is responsible for the COVID-19 pandemic	2.11	.976	.952
COVID-19 Pandemic assisted in my learning something new.	3.79	.978	.957
COVID-19 pandemic assisted me to develop my programming skills.	2.84	1.149	1.319
E-learning was introduced in my school/college as an alternative study mode during the lock-down	3.83	1.029	1.059
COVID-19 provided a new way of studying	4.09	.836	.700
COVID-19 introduced new teaching methods	4.10	.763	.582
Distance/e-learning is better than conventional study methods.	2.63	1.181	1.396
A new platform was developed for e-learning in my school/college/university	3.32	1.034	1.069
An existing e-learning platform was used during the pandemic.	3.53	1.016	1.032
I am not conversant with e- learning	3.45	1.43	1.307
I fully participated in e- learning or webinar classes during the pandemic.	3.67	1.057	1.117
Audio and video clips were available for downloads after the e-learning classes, and were of good quality.	3.64	1.001	1.002
Valid N (listwise)	175		

Furthermore, the impact of COVID-19 pandemic in selected sectors of the economy vis-à-vis the role of ICT infrastructures is discussed with experience from Botswana and Nigeria. The use of Botswana and Nigeria in this discussion is due to the fact that out of the 175 participants in this study, 137 respondents to the online questionnaires were from both countries (see Table 2).

Table 2. Country response to online questions

Country	No of Participants
Botswana	104
Nigeria	33
UK	13
Zambia	11
South Africa	6
Canada	4
China	1
India	1
DRC	1
Sudan	1
Total	175

4.1. Impact of COVID-19 and the use of Information Systems in schools

An Information System (IS) is an integrated set of components for collecting, storing, and processing data and for providing information and digital products. It intends to solve user challenges that they come across on daily basis. These problems include services that people receive either onsite or over communication systems which may refer to telephone systems, fax mail, electronic mail, post mail and the Internet.

According to the United Nations, COVID-19 pandemic created the largest disruption to educational systems in history, affecting nearly 1.6 billion learners in more than 190 countries (including Botswana and Nigeria). Closing of schools and other learning space impacted 94 percent of the world population, up to 99 percent from low to very low-income countries [28]. Since the COVID-19 pandemic, people were driven to change to what they call “the new normal” where nations were forced to go on total lockdown and national state of emergencies. During lockdown periods, students had little or no access to educational content and only a few who could afford had access to internet and other alternative educational systems’ platforms. Therefore, months out of school, from the source of social emotional support, regular food, health support and adult supervision left many students in despair all due to the COVID-19 pandemic experience. The results obtained from the study are clear indices to support this fact.

4.1.1 Implications. There is a concern with the widening of educational opportunities and support gaps between children of different backgrounds. This is undoubtedly one of the greatest risks of the pandemic. It stands from the fact that some parents have more resources than others. This gap means that parents who can afford to supplement or even replace what students have lost in public schools, perhaps with the help of a tutor, online activities, and being highly educated themselves, may fill the gaps. In a pandemic situation, disadvantaged students are less likely to be engaged in remote schooling and are less likely to be able to have day-to-day contact with their teachers than the advantaged students.

In many ways COVID-19 has pushed one of the greatest interventions in education for all students as well as staff to be explicit about the learning goals and support being offered and what it means to be a community of learners either physically together or remotely apart.

4.2. Public service delivery using Information Technology and Information systems

The pandemic affected the society, private businesses, and the public sector such that organizations were forced to consider digitalizing business processes [21]. Digitalization of public services goes back to the 1990s and has been growing at a slow pace over the years. However, the emergence of COVID-19 resulted in an accelerated adoption of the digitalization of public service delivery [23].

The study by Agostino et al. [22] revealed that the COVID-19 pandemic has undoubtedly resulted in organizational changes, thereby forcing the reconstruction of business strategies. It has also acted as a catalyst for digital transformation in many sectors of the economy, healthcare, and education. The impact of COVID-19 on digitization and digital transformation focuses on the context of e-government or digital government, what the public expects from the government as a service, and in the context of public service workers working using information communication technologies (ICTs). The first months of the pandemic forced modifications in information technology (IT) infrastructure to enable continued service delivery in the public sector. There has been more investment on ICTs and allied services including maximized utilization of cloud systems and videoconferencing tools [23]. Furthermore, due to the COVID-19 related restrictions issued by governments, public servants were forced to do their duties according to new policies using innovative technologies. This new way of doing business is considered the positive effect of the pandemic as the digitalization of public service that would have taken years to achieve was accelerated [21], [23]. In addition, different work

policies were implemented by national governments, like the work from home policy, and the transformation of face-to-face service delivery to electronic service delivery in a bid to fight the spread of COVID-19 [24]. The restrictions on mobility also affected the bureaucratic public service process of African communities. Thus, the use of information communication technologies is optimized to provide the services while fighting the COVID-19 pandemic.

4.3. Workplace model

Examples of workplace model and the instances are discussed in sub-sections below:

4.3.1. Banking industry. Banking and financial institutions were under immense pressure to ensure business-as-usual amidst the lockdowns and health crisis created by the COVID-19 pandemic [25]. Banking sector considered essential service to be operational at optimum levels whilst keeping their employees and customers safe from the pandemic. However, most of the banks in Africa did not have ready-made information system strategies to accommodate the new normal, including remote working. Lockdowns meant customers are no longer free to move to and from banks, yet they need to continue banking, hence there was the need to optimize digital banking. Social distancing meant employees cannot be crowded on workplaces, yet they still needed to continue with service delivery. This meant new ways had to be devised to handle the new challenge; although banking policies in the African context does not support all banking tasks to operate remotely due to security concerns. Therefore, a working model for banks occasioned by the COVID-19 pandemic could be expected soon.

4.3.2. Health. The global health care system had a serious challenge because of the threat of COVID-19 pandemic. As a result of COVID-19, the public health system is exposed as lacking in many developing countries. The impact of COVID-19 was not only on people's health but also on how they lived, and thus the pandemic influenced the health sector to adapt to the usage of technology in order to keep afloat, and to ensure better service delivery. Technology was used to fight the pandemic; therefore, the pandemic had a huge impact on the use of information technology and information systems. The use of health information technology during the coronavirus pandemic rapidly increased. The impact on the health sector is both positive and negative as hospitals took the advantages such as the use of social media, emails, video conferencing, electronic records keeping, to make the workplace more productive and efficient to clients during the pandemic. However, because so many health facilities were not ready at the time, there were many

casualties owing to unpreparedness on the part of health service providers. Notably, during the pandemic, health information technology was used to provide telehealth services, for education on the severe acute respiratory syndrome coronavirus diseases, updates on epidemiology and treatments, and most recently, access to scheduling systems for the COVID-19 vaccines [26].

4.3.3. Insurance. Inflowing new markets and developing ones is an area of major concentration within the insurance industry across the globe. However, the insurance market could be going through a state of depression due to low numbers of new business and high number of claims, hence, low revenue. The impact of COVID-19 pandemic is quite significant on the insurance industry as in other sectors such as health, education, and business. Therefore, strategies to mitigate the damage done by the pandemic is the priority of every business and government organizations, and for the insurance industry, insurers need to speed IT/IS agendas. According to Baana et al. [27], insurance companies are now racing to digitally accelerate so that they remain relevant.

4. Conclusion

The COVID-19 pandemic presents the two sides to life. It is both positive and negative. The negative side is the resultant death from the outbreak. That notwithstanding, COVID-19 has brought about increase in the usage of IT to solve problem in an attempt to reduce face-to-face contacts. The pandemic is a wakeup call for appropriate actions in every sector of the economy towards digitization of processes and procedures. Information and Communication Technology (ICT) offers several options from hardware resources to innovative software resources that would enable efficient operations without service disruptions. The IT industry must wake up to the challenge and turn the pandemic into a catalyst to boost their revenue base.

5. References

- [1] E.-Y. Jeong. (2020). "'The Zoom Boom': Asia Leads the World in Covid-19 Economic Recovery", Wall Street Journal - Online Edition, vol., pp. N.PAG-N.PAG.
- [2] B. Hoffmann. (2020). "Keeping Connected: Thoughts on the COVID-19 Pandemic from WLA Executive Director", Alki, vol. 36, pp. 3-3.
- [3] A.R. Dennis, A. Kim, M. Rahimi and S. Ayabakan. (2020). "User reactions to COVID-19 screening chatbots from reputable providers", Journal of the American Medical Informatics Association, vol. 27, pp. 1727-1731.

- [4] A.G. Ross, R.M. Olveda and L. Yuesheng. (2014). "Are we ready for a global pandemic of Ebola virus?", *International Journal of Infectious Diseases*, vol. 28, pp. 217-218.
- [5] J. Taubenberger and D. Morens. (2009). "Pandemic influenza—including a risk assessment of H5N1", *Revue scientifique et technique (International Office of Epizootics)*, vol. 28, pp. 187.
- [6] L. MacKellar. (2007). "Pandemic influenza: A review", *Population And Development Review*, vol. 33, pp. 429-451.
- [7] S. Rewar, D. Mirdha and P. Rewar. (2015). "Treatment and prevention of pandemic H1N1 influenza", *Annals of global health*, vol. 81, pp. 645-653.
- [8] L.O. Gostin, O. Tomori, S. Wibulpolprasert, A.K. Jha, J. Frenk, S. Moon, J. Phumaphi, P. Piot, B. Stocking and V.J. Dzau. (2016). "Toward a common secure future: four global commissions in the wake of Ebola", *PLoS medicine*, vol. 13, pp. e1002042.
- [9] H. Wu, W. Sun, X. Huang, S. Yu, H. Wang, X. Bi, J. Sheng, S. Chen, B. Akinwunmi, C.J.P. Zhang and W.-K. Ming. (2020). "Online Antenatal Care During the COVID-19 Pandemic: Opportunities and Challenges", *Journal of Medical Internet Research*, vol. 22, pp. N.PAG-N.PAG.
- [10] D.M. Mann, J. Chen, R. Chunara, P.A. Testa and O. Nov. (2020). "COVID-19 transforms health care through telemedicine: Evidence from the field", *Journal of the American Medical Informatics Association*, vol. 27, pp. 1132-1135.
- [11] A. Peine, P. Paffenholz, L. Martin, S. Dohmen, G. Marx, S.H. Loosen and S. Loosen. (2020). "Telemedicine in Germany During the COVID-19 Pandemic: Multi-Professional National Survey", *Journal of Medical Internet Research*, vol. 22, pp. N.PAG-N.PAG.
- [12] J.J. Reeves, H.M. Hollandsworth, F.J. Torriani, R. Taplitz, S. Abeles, M. Tai-Seale, M. Millen, B.J. Clay and C.A. Longhurst. (2020). "Rapid response to COVID-19: health informatics support for outbreak management in an academic health system", *J Am Med Inform Assoc*, vol. 27, pp. 853-859.
- [13] J. Wosik, M. Fudim, B. Cameron, Z.F. Gellad, A. Cho, D. Phinney, S. Curtis, M. Roman, E.G. Poon, J. Ferranti, J.N. Katz and J. Tchong. (2020). "Telehealth transformation: COVID-19 and the rise of virtual care", *Journal of the American Medical Informatics Association*, vol. 27, pp. 957-962.
- [14] B. B. Baridam and E. U. Okike. (2021). "Covid-19 Pandemic: Opportunities and Challenges for Information and Communication Technology Sector", in *Proceedings of the 16th International Conference for Internet Technology and Secured Transactions (ICITST-2021)*, Informoics Society:London, 2021, pp. (in Print).
- [15] N. Liu, R. Huang, T. Baldacchino, A. Sud, K. Sud, M. Khadra, J. Kim and A. Sud. (2020). "Telehealth for Noncritical Patients With Chronic Diseases During the COVID-19 Pandemic", *Journal of Medical Internet Research*, vol. 22, pp. N.PAG-N.PAG.
- [16] S. Doraiswamy, A. Abraham, R. Mamtani and S. Cheema. (2020). "Use of Telehealth During the COVID-19 Pandemic: Scoping Review", *Journal of Medical Internet Research*, vol. 22, pp. N.PAG-N.PAG.
- [17] H.V. Nguyen, H.X. Tran, L. Van Huy, X.N. Nguyen, M.T. Do and N. Nguyen. (2020). "Online Book Shopping in Vietnam: The Impact of the COVID-19 Pandemic Situation", *Publishing Research Quarterly*, vol. 36, pp. 437-445.
- [18] L. Uscher-Pines, J. Thompson, P. Taylor, K. Dean, T. Yuan, I. Tong and A. Mehrotra. (2020). "Where Virtual Care Was Already a Reality: Experiences of a Nationwide Telehealth Service Provider During the COVID-19 Pandemic", *Journal of Medical Internet Research*, vol. 22, pp. N.PAG-N.PAG.
- [19] A. Al-Hasan, J. Khuntia and D. Yim. (2020). "Threat, Coping, and Social Distance Adherence During COVID-19: Cross-Continental Comparison Using an Online Cross-Sectional Survey", *Journal of Medical Internet Research*, vol. 22, pp. N.PAG-N.PAG.
- [20] T. Lucey and T. Lucey. (2002). *Quantitative Techniques*, Cengage Learning EMEA.
- [21] R. Gabryelczyk. (2020). "Has COVID-19 Accelerated Digital Transformation? Initial Lessons Learned for Public Administrations", *Information Systems Management*, vol. 37, pp. 303-309.
- [22] D. Agostino, M. Arnaboldi and M.D. Lema. (2021). "New development: COVID-19 as an accelerator of digital transformation in public service delivery", *Public Money & Management*, vol. 41, pp. 69-72.
- [23] OECD. (2000). "OECD Information Technology Outlook 2000: ITCs & the Information Economy (Book)", *Information World Review*, vol., pp. 36-36.
- [24] S. Arfan, M. Mayarni and M.S. Nasution. (2021). "Responsivity of Public Services in Indonesia during the Covid-19 Pandemic", *Budapest International Research and Critics Institute-Journal (BIRCI-Journal)*, vol. 4, pp. 552-562.
- [25] A. Perwej. (2020). "The impact of pandemic COVID-19 on the Indian Banking System", *International Journal of Recent Scientific Research*, vol. 11, pp. 39873-39883.
- [26] G.M. Prescott and W.A. Prescott Jr (2021) "Health information technology utilization and impact on COVID-19 vaccination", *Journal of the American Pharmacists Association*, vol. 61, pp. e230-e232.
- [27] P. Baana, X. Yang, A. Gyllbag, D. A. Awudi, D. Ngmenbelle, D. Brian. (2020). "The Impact of Covid 19 on the Insurance Industry", *Int. J. Environ. Res Public Health*, 17(16) pp. 5766.

[28] United Nations (2020) "Policy Brief: Education during Covid19 and beyond", <http://unsdg.un.org> (3 December 2021).