

The Impact Of Covid-19 On The Information Technology Sector In Egypt And Uae (Challenges And Opportunities)

MAHMOUD M. AL-SAKHNINI

Skyline University College – School of Business United Arab Emirates, Email:

mahmoud.alsakhnini@skylineuniversit.ac.ae

m.alsakhnini@gmail.com , ORCID: 0000-0002-7075-6108

Al-Madinah International University – Faculty of Computer and Information Technology

57100 Kuala Lumpur Malaysia.

Abstract:

In light of the technological and digital development that dominates all areas of life in our time, there are many challenges and opportunities available to the information technology sector, the most prominent example of which is the pandemic, which affected the entire world more than two years ago, and as a result of this global epidemic, there was an imposition of many restrictions that dominated most areas of life such as work, education and the economy, and here we note the role of communication and information technology and artificial intelligence techniques that have contributed to alleviate these restrictions through the opportunities and possibilities they offer. Despite that, the technology and information sector in most countries in the world and the countries of the Middle East in particular have faced many threats and challenges that have affected it, and in this scientific paper we discuss the effects of the global Covid-19 epidemic on the technology and information sector in both Egypt and the United Arab Emirates in terms of discussing opportunities, challenges and the role played by technology, and at the end of the research is presented a set of recommendations that can be used in the framework of better future research and scientific experiments.

Key Words: Information Technology, Covid-19, Impact Of Covid-19 On Information Technology, Opportunities, Chances, Challenges, Threats.

I. Introduction

The coronavirus crises (COVID-19) is the worst crisis the world has witnessed since World War II (**Labour Organization, 2020**) and has been declared a pandemic by the World Health Organization due to its widespread spread, (**Nagar, 2020**), which has so far infected more than four million people, and lead to the death of more than 280,000 people around the world (**Egypt cares, 2020**), and it has unprecedented effects on the global economy in all its sectors (**Organizational Labor Organization, 2020**).

In the context of dealing with this pandemic and trying to contain it, the efforts of countries focused on achieving two main goals, namely slowing the spread and increasing the readiness of health systems to confront the aggravation of the crisis. These measures include social distancing policies in order to limit the spread of the virus (closures, travel restrictions and school closures), effective use of personal protective equipment, selection and tracing, and increasing health care capacity in order to handle the catastrophic results to national health systems and reduce losses. These measures have had serious impacts on global markets (**Organizational Labor Organization, 2020 and Craven, et al.**),

where there have been disruptions in global supply chains for many productive sectors, whose entire global economic growth depends primarily on their continuity and liquidity. (Special Studies Series, 2022).

1.1. Study Problem Statement & Questions

1.1.1. Statement Of The Problem

Since the past two years, it was almost impossible to predict the huge changes that have taken place as the spread of Covid-19 global pandemic lead to a serious crisis in all sectors of life which has generated many challenges in addition to the creation of opportunities, especially in the information technology sector as all the countries around the world have moved to online working for business, education, industry, and other fields, so it was necessary to explain the impact of Covid-19 pandemic on the information technology sector

1.1.2. Study Questions

The problem of the study lies on a major important question which is:

How Could The Covid-19 Pandemic Affect The Information Technology Sector In Some Of The Arab Countries?

Other Sub-Questions Are:

1. What are the major opportunities and chances of the IT sector in UAE, and Egypt during the Covid-19 pandemic?
2. What are the threats and challenges for the IT sector in UAE, and Egypt during the Covid-19 pandemic?

1.2. Importance Of The Study

This study focuses on showing the exact impact of Covid-19 pandemic in a specific sector of life which is information technology (IT), and this can be done through the explaining of the challenges and opportunities related to it, which

is very essential in learning how to deal with any crisis.

1.3. Study Objectives

The study aims mainly to investigate the impact of Covid-19 pandemic on the information technology sector in the Arab countries including UAE, and Egypt through presenting the opportunities and challenges, other objectives of the study are:

- To highlight the role of information technology during Covid-19 crisis in UAE, and Egypt.
- To investigate the opportunities and challenges that surrounded the IT sector in UAE, and Egypt during Covid-19 pandemic.

1.4. Study Approach

A descriptive study that depends on reviewing the results and information from special studies, in addition to published statistics from the different articles and academic papers.

2. THEORITICAL BACKGROUND

2.1. The Role Of The Information Technology Industry In Light Of The Covid-19 Crisis

The use of technology has rescued many sectors such as education and health, as technology companies provide digital tools to overcome social isolation, and many other applications of it.

The IT sector has a significant role in the immediate and short-term response to the pandemic and to long-term resilience .Also big data and artificial intelligence were available to create digital public products in the form of predictable real-time insights, helping to identify new outbreaks, identifying places where an increase in health care and other public services is needed, and measuring the cross-sectoral impacts of the crisis on vulnerable populations ,in addition to target risk

communications, financial assistance, and political interventions (**United Nations, 2020**). Blockchain technology along with big data, fifth generation technology, and artificial intelligence have also helped in accelerating business recovery and played a role in efforts to control the spread of the virus and develop a COVID-19 vaccine, and hackathons were organized in many countries, to harness the creativity of startups and entrepreneurs to contribute in finding solutions to the crisis. (**OECD, 2020**)

China has used technology to contain the epidemic through the use of artificial intelligence technologies, big data science and various other applications to detect the disease and also used drones and robots to reach isolation areas, in addition to use fifth-generation technology, where the two companies ZTE and China Communications through technology creates a network connecting doctors and patients in China to facilitate diagnostics. (**HOC, 2020**)

Also, the technology companies have a role in supporting the economy, as several major technology companies announced about funding initiatives in order to support the innovative potential of start-ups and small, big companies.

Information technology industry organizations play a strong role in harnessing the entrepreneurial capacity of small businesses, and industry associations are stepping up their efforts to support entrepreneurs during the crisis. For example, France Digital has created a toolkit on remote work and advises companies in dealing with the crisis.

Large companies are also costing their cooperation with small companies in biotechnology innovation to help find the COVID-19 vaccine. (**Dunn, 2020**) Hence, it is clear that digital technologies have become a positive enabler in this crisis, facilitating the continuity of work and communication between people more than ever, and helping them maintain good mental health. ICT impedes effective remote participation, access to distance learning, health information and

remote medical consultations by all, as 3.6 billion people do not go without an Internet connection, the majority of whom live in the least developed countries. (**United Nations, 2020**)

2.2. The Role Of The Information Technology Industry In Egypt In Light Of The Covid-19 Crisis

Covid-19 crisis has affected the sectors of the economy in Egypt, as in the case of other countries, and due to the state of social separation imposed by the crisis, the rates of use of communication services and technology applications increased.

In Egypt, in the second week of April compared to the second week of March, in 2020, we noticed that the international voice calls increased by 15% and local calls by 3%, and the number of peak hours for using Internet applications and services has doubled to 15 hours a day instead of 7 hours, the use of the home Internet increased by 87% and the mobile Internet by 18%, as well as the percentage of browsing the Internet by 131%, and the browsing of educational websites increased by 376 percent. The use of various applications for social media and entertainment has also increased, such as (Facebook, Tik Tok, WhatsApp, Netflix, Shahid, YouTube, and games) (**National Telecommunications Regulatory Authority, 2020**)

The rates of use of telecommunications services and technology applications in the Arab Republic of Egypt continued to increase, as we noticed from several statistics, which shows the increase in usage rates in the third week of May compared to the third week of April in 2020, as international voice calls increased by 4% during the month of Ramadan to become the total increase since the beginning of the lockdown was 19%, while local voice calls decreased by 10%, bringing the percentage of decline to 7% since the beginning of the lockdown. The number of peak hours for using Internet applications and services decreased to 14 hours a day, compared to 15 hours during the

month of April, and the number of peak hours remains double the number of hours in the second week of March, which was 7 hours, and the use of home Internet has increased by a percentage, bringing the total increase rate to 99% since the beginning of the ban and mobile internet increased by 17%, bringing the total increase to 35% since the beginning of the lockdown, and browsing educational websites increased by 19%, bringing the total increase to 395%. And the percentage of use of video-streaming applications for entertainment content increased by 295%, bringing the total increase to 315% since the beginning of the lockdown. **(National Telecommunications Regulatory Authority, 2020).**

The Global Shopping Index report for the first quarter of 2020 revealed a change in buying behavior around the world, due to the spread of the emerging Coronavirus, and customers buying products while they were committed to staying at home. The report shows that the demand for e-commerce in Egypt has increased by 20% in the first quarter of 2020, compared to 12% for the same period in 2019, as the number of visitors to e-commerce websites increased by 16% and the proportion of spending increased by 4%, and the growth of the digital economy is expected to continue with the increasing demand by consumers to meet their requirements through online purchases and with companies focusing more on e-commerce, and here it was an opportunity for Egyptian companies working in e-commerce and e-marketing for what may create demand for their business from the private sector, and in light of the Covid-19 crisis and with the increase in demand and the high number of Internet users and related programs for performing work and study tasks, receiving lectures, holding electronic meetings and electronic payments, as well as purchasing personal needs through electronic applications. Information Technology sector faces a serious crisis that time, which result in the decrease in the ability of the communications and information infrastructure to meet the sudden

and increasing demand due to the Covid-19 crisis, which is mainly related to the readiness of the network "Network Readiness" **(Egyptian Center for Economic Studies, 2020)**

2.3. The Role Of The Information Technology Industry In UAE In Light Of The Covid-19 Crisis

Information technology is considered as a strategic option, both to confront the consequences of the Corona pandemic, as well as to develop and increase the efficiency of strategic sectors. Its manifestations, economic, social, educational and others, have given the latter a strong and exceptional impetus to the digitization sector and to the use of digital technology and remote work distance education, online shopping, etc. **(Fong, 2020)**

At the same time, we find that other sectors benefited from the closure, perpetuating the isolation that is called closures, attributed to changing the perception of the telecommunications sector, information technology, from being just a means that it is desirable to provide to an imperative necessity and an integral part of life in its various manifestations, economic, social, educational and others. The latter is a strong and exceptional impetus for the digitization sector and for the use of digital technology (remote work, distance education, online shopping..etc), and even that some global institutions such as Microsoft and Google have not achieved in two decades what the Corona pandemic achieved in a few weeks to persuade society to unite towards working through electronic applications and remote management in most sectors, and this is confirmed by the huge increases in the number of subscribers to applications such as Google Meet, where the number of users in it rose from a few million before the crisis to more than 100 million users per day in April 2020, As for the ZOOM app, it has grown to 300 million daily users.

The UAE has made use of scientific and technological development, in a remarkable way, to combat the emerging corona virus

(Covid 19), which has entered scientists and countries in a race against time to contain the epidemic.

The UAE's use of technology in the battle against Corona ranged from adopting smart means to detect carriers of infection as quickly as possible, and developing treatment techniques that speed up the recovery of the injured.

In addition, many institutions have made their services available to customers, without them having to go to them, by resorting to websites and smart applications. (Bharti, 2020)

Health data indicate that the UAE has conducted more than 1.6 million examinations in order to detect infection with the virus that appeared in China, late last year.

In addition, the UAE was one of the first countries to adopt the vehicle test technology, as it was announced, earlier, for a treatment through stem cells.

The UAE has used many smart solutions to detect, track, and control the spread of COVID-19. One of the most prominent of these smart solutions is the Al-Hosn application. Al-Hosn application allows people to know people who have been in contact with cases infected with the Covid-19 virus, and also provides the feature to view the results of medical examinations for Covid-19 easily. Another smart solution is the "Virtual Doctor for Covid-19" platform, through which people can evaluate the symptoms that appear and whether these symptoms are related to the emerging coronavirus "Covid-19", or not. The platform asks the patient a set of questions and based on the person's answers, the virtual doctor concludes whether the patient has a possibility of contracting Covid-19 disease. (The National. n.d.)

The state has benefited from its large investments in digital infrastructure, and employed digital technology applications in the health field to control the Corona epidemic. For example, the Al-Hosn mobile application is used to keep records of tests and vaccinations, as well as to facilitate contact tracing. The color-coded system clearly shows the status of

immunization, as citizens are encouraged to make use of the app's "green traffic protocol" to enter public places such as shopping malls, restaurants, gyms and other recreational facilities. Also, a "telemedicine" program was launched to obtain digital health consultations, in response to precautionary and preventive measures, and to prevent infection by reducing the number of visitors in hospitals and health centers. (Bashir, 2020)

The Virtual Technological Doctor For COVID-19 In UAE

The Ministry of Health and Community Protection has launched an electronic platform called the "Virtual Doctor for Covid-19", through which people can assess the symptoms they appear and whether these symptoms are related to the emerging coronavirus "Covid-19", or not.

The virtual doctor platform asks a set of questions related to the travel history of the individual, and whether he has been in contact with a person who was traveling or sick, or whether he has been in contact with a person infected with the Coronavirus (Covid-19). The virtual doctor also asks if the person is experiencing certain symptoms or following certain health habits. Based on the person's answers, the hypothetical doctor predicts the level of danger he or she might face. The person is then linked to their own doctor through the same platform. (Sheerman, 2020)

Artificial Intelligence Techniques To Monitor Covid-19 Violations In Taxis

The Roads and Transport Authority in Dubai has announced the employment of artificial intelligence techniques - represented by machine learning algorithms and computer vision - to monitor violations of preventive measures to limit the spread of the new Coronavirus, Covid-19, such as physical distancing and wearing masks inside its taxis, whether for passengers or drivers.

The aim of employing artificial intelligence techniques is to monitor the extent of adherence

to the measures to prevent the spread of the new Coronavirus and to monitor violations, such as the increase in the number of passengers allowed for one trip, where the analysis of the videos revealed the monitoring of violations of commitment to physical distancing and violations of wearing a muzzle in an unhealthy way. (Ahmed, 2020)

A Smart Application To Track Contacts Of People Infected With The Covid-19 Virus

TraceCovid is an innovative smart application that identifies and identifies people who have downloaded the same application, so that if two phones are close to each other, a secure tracking identifier is exchanged that is stored in each.

The application relies on the Bluetooth feature and through which it identifies the people who downloaded it, so that if one of the users of the application is infected with the emerging coronavirus, the competent authorities will access the tracking data of the infected, which includes a list of the safe tracking identifiers that his phone was close to, and identify the exposed contacts. to risk infection, and contact them quickly to facilitate appropriate health care measures to prevent the spread of the virus. This application, launched by the Health Authority - Abu Dhabi, contributes to tracking Covid-19 infection by identifying people in contact with people infected with the virus, whether they have a relationship with the infected person or not, provided that they are users of the application, which speeds up the pace of providing the necessary health care, and ensures that preventive measures are taken. Precautionary measures to preserve the health and safety of the community. (Al Shouk, 2020)

Telehealth Platform - Doh

Remote health care is available, through a free smart application that enables all members of society to access health care services remotely, from their homes, without the need to visit health care facilities.

The application provides digital tools powered by artificial intelligence that enable patients to obtain support services and medical consultations, diagnose non-emergency cases remotely, through voice, text and videos, book and manage appointments, obtain prescriptions, and logistic services online by the doctor.

This application was launched by the Department of Health - Abu Dhabi as part of its efforts to ensure the safety of community members in light of the spread of the Covid-19 virus, especially for people who suffer from chronic diseases, or senior citizens, or who need to renew a specific prescription, and prefer not to Visiting health centers, as well as people in home isolation as a result of the Coronavirus. (U.A.E 2020).

3. The Challenges Facing The IT Industry In Light Of The Covid-19 Crisis:

Despite the importance of the information technology industry and the applications and software resulting from it in order to face of the Covid-19 virus crisis, and what was reviewed of how governments and individuals benefit from them globally, it did not most companies do not work on global applications such as meeting applications, electronic and other applications. The crisis revealed that there are many challenges facing information technology in several Arab countries, and among these challenges are the following: (Civil Society Organizations Information Technology and Training Sector Group, 2020, and a workshop to study the implications of the Corona virus on the software industry, training and information technology services, 2020)

- ❖ Lack of clarity in the implementation of the digital transformation strategy.
- ❖ Unfair geographical distribution in terms of connecting all governorates of the Republic to the Internet, in particular high speed internet.

- ❖ The absence of a regulator for information technology, as this sector lacks regulatory mechanisms and monitoring of its commitment to quality standards, and how to deal with confidentiality of information and others.
- ❖ Lack of a mechanism to collect medical data related to the current crisis and the degree of spread, including records of recoveries and deaths.
- ❖ The absence of an integrated and updated database for all sectors that allows data analysis in all fields, and consequently poor opportunities for sectors to benefit from modern technologies (including Big Data) in analyzing data to serve policy-making for each sector.
- ❖ The absence of a detailed database on individuals working abroad.
- ❖ The high cost of remittances in Arab countries, which requires taking advantage of financial technology and its various and new tools to reduce the cost of remittances in these countries, exceeds its counterparts in East Asian and Latin American countries with the need to develop technological infrastructure.
- ❖ The distance learning mechanism is not properly implemented, while its adoption as a learning mechanism becomes the new reality.
- ❖ A severe shortage of liquidity, due to lack of sales, suspension of some contracts, and lack of collection at the local and external level.
- ❖ There is a shortage of human resources, both quantitatively and qualitatively, due to the reduction of salaries and employment.
- ❖ Product development has stalled and some companies are closing down.
- ❖ Not allocating sufficient support to the sector in light of the crisis, despite its importance.

4. Opportunities For Information Technology Sector During Covid-19 Crisis:

There are a group of opportunities which arise during the Covid-19 crisis, and could benefit it as the following: (Alper, 2020)

- ✓ The abundance of talented developers and programmers in arab countries compared to other countries and compared to the volume of domestic demand.
- ✓ The tendency of business companies to adopt remote work in light of the crisis leads to an increase in the local demand for the industry, and thus creates an opportunity for its development.
- ✓ The ability of information technology to serve the health sector and innovation of technologies to deal with patients and detect cases and others increases the chances of developing the industry.
- ✓ Projects can be put forward in ministries, agencies and governorates that deal with the public for digital transformation with the PPP system, the partnership between the private and government sectors.
- ✓ This helps citizens to obtain services without going to government agencies, which contributes to coexistence with the Covid-19 virus.
- ✓ Reservations for government agencies can be used to reduce congestion in government and private sector service providers.
- ✓ The ability of workers in the sector to work remotely by a large percentage compared to other sectors.
- ✓ The Ministry of Communications and Information Technology in Egypt has proposed projects worth 900 million pounds, and allocated 10% of them to small and medium-sized companies in the form of competition, a small percentage, but it is a good start. As for the rest of the percentage, it is directed

to global integrated systems companies such as IBM, Microsoft and SAP.

5.1. Recommendations And Actions Necessary To Develop And Benefit From The Information Technology Industry In The Arab Countries:

1. Activate a clear and complete strategy for digital transformation, with an entity responsible for following up its full implementation with all concerned parties.
2. Improving the technological infrastructure and doubling the investment in networks to absorb the amount of data that will be in the next stage, especially in rural areas, so that the sector can meet the needs of different sectors, the most important and most widely used of which is the educational system.
3. Increasing the reliability of the various ministries, especially the Ministry of Communications and Information Technology, on arab companies, and reducing dependence on foreign companies and integrated system operators, for national security considerations and to increase the advice of arab companies that already provide their services to the Gulf region and Western Europe over the past years in the field of information technology, and outsourcing services.
4. The banking sector is still not sufficiently assisting the information technology sector, and it is required to provide an appropriate affiliation cover that helps in the development or growth of the IT industry companies.
5. Intervention is needed to correct this situation in order to align with the global situation to support the technology industry.
6. Analyzing information, to avoid the occurrence of new crises or at least mitigate their effects, as well as providing Bioinformatics labs with the aim of developing medical research.
7. Working on adopting modern technologies from Cloud Computing and Blockchains, which leads to reducing the cost of transactions and providing information for analysis, which benefits all economic sectors.
8. Establishing strict laws for the protection and security of information in the context of supporting companies to adopt information technology systems at work, and activating the electronic signature law to facilitate the completion of work remotely.
9. Activating the use of information technology and artificial intelligence in the medical field through data analysis and understanding the mechanisms of disease spread using big data, and identifying disease outbreak hotspots, places and areas of large gatherings or violations of ban decisions through heat maps.
10. Activating information technology in government institutions by applying the "ticketing" system in hospitals and government departments such as real estate and others to avoid overcrowding and reduce overcrowding in these interest in pumping investments into the technology industry, directing banks to invest in technology companies, taking advantage of the crisis in making the applications necessary to serve the various sectors by the government and the private sector.

5.2. Conclusion

From the previous presentation of the conditions of the information technology industry in light of the Covid-19 crisis globally and locally, and particularly in the arab countries including (UAE, and Egypt) it is clear that the local industry is able to help all economic sectors, especially the health sector,

in responding to the pandemic crisis, work continuity and remote communication.

In Arab countries, despite the increase in the use of websites for learning, remote work and e-commerce activities, this demand is mostly directed to foreign websites. Although the spread of the virus and the existence of the crisis led to an increase in the demand for the information technology industry globally, and created an opportunity for the software industry to grow and make gains, the Arab countries are relatively behind some countries in the world that support the industry and exploit it to face the repercussions of the crisis, as the industry in these countries faces some challenges that it stands in front of its progress and its ability to face the repercussions of the crisis, such as poor liquidity, lack of technological infrastructure, and the lack of full implementation of the digital transformation strategy, as well as the presence of deficiencies in databases for some economic sectors, with the need for government support for technology companies, and this can be achieved by increasing domestic demand for government projects.

6. References:

- Arab digital economy index. (2020). "Covid 19 and the need for transformation to the digital economy", pp.20-21.3- Arab Digital Economy Index 2020, p 61.
- Authors, J. What You May Have Missed During That Netflix Binge, Bloomberg, March 24, 2020, accessible at: <https://bloom.bg/39RFHwR>.
- Dunn, A. (2020). "The French pharma giant Sanofi is partnering with a tiny biotech to develop a coronavirus vaccine using a speedy but unproven technology platform", March 27, 2020, accessed from: <https://www.businessinsider.fr/us/sanofi-translate-bio-ink-mrna-coronavirus-vaccine-deal-2020-3>.
- Alper, T. (2020). "Blockchain Plays a Part as China Claims 72% of SMEs Are Back to Work", <https://cryptonews.com/news/blockchain-in-plays-a-part-as-china-claims-72-of-smes-are-back-6132.htm> at March 26, 2022.
- Ahmed, N., Michelin, R.A., Xue, W., Ruj, S., Malaney, R., Kanhere, S.S., Seneviratne, A., Hu, W., Janicke, H. and Jha, S.K. (2020). A Survey of COVID-19 Contact Tracing Apps. IEEE Access, [online] 8, pp.134577–134601. Available at: <https://ieeexplore.ieee.org/abstract/document/9144194/authors#authors>.
- Al Shouk, A. (2020). COVID-19 precaution: Dubai Police using A.I. to find out if your trip was essential. [online] gulfnews.com. Available at: <https://gulfnews.com/uae/covid-19-precaution-dubai-police-using-ai-to-find-out-if-your-trip-was-essential-1.70829268> [Accessed October 20, 2020]
- Authors, J. (2020). What You May Have Missed During That Netflix Binge, Bloomberg, March 24, 2020, accessible at: <https://bloom.bg/39RFHwR>. Channel Future, "Dice Report: Early Look at COVID-19 Impact on Tech Hiring", April 24, 2020, accessed from: https://www.channelfutures.com/digital-transformation/dice-report-early-look-at-covid-19-impact-on-tech-hiring?fbclid=IwAR02s9Deu3B0q1-gzvn8_0rgMSn9hLj-e-tZOcgpXTxI75Z6VmVKXy2BCTg.
- Bharti, U., Bajaj, D., Batra, H., Lalit, S., Lalit, S., and Gangwani, A. (2020). Medbot: Conversational Artificial Intelligence Powered Chatbot for Delivering Tele-Health after COVID-19. IEEE Xplore, [online] pp.870–875. Available at: <https://ieeexplore.ieee.org/abstract/doc>

- ument/9137944 [Accessed 31 Oct. 2020].
- Bashir, H. (2020). Saif Bin Zayed Adopts Smart Helmet Technology to Monitor Coronavirus. [online] Wam. Available at: <https://wam.ae/en/details/1395302837034> [Accessed 12 Nov. 2020].
 - Craven, M., Singhal, S., and Wilson, M., (2020). “COVID-19: Briefing note”, Mckinsey& Company.
 - Egypt cares, “COVID-19 Overview”, May 11,(2020), accessed from: <https://www.care.gov.eg/EgyptCare/Index.aspx>.
 - Founder's Guide, “COVID-19’s Impact on the Software Development Industry”, April 16, (2020), accessed from: http://foundersguide.com/covid-19s-impact-on-the-software-developmentindustry/?fbclid=IwAR3rGikCxhpFoMruz-i8spec459K6-iPR_qPOwRsdYKwc6FtFKXsProk-mg.
 - Gartner, (2020). Impact of Covid-19 on IT spending.
 - Global connectivity index, (2019), Powering Intelligent Connectivity with Global Collaboration Mapping your transformation into a digital economy with GCI 2019, <https://www.huawei.com/minisite/gci/en/index.htm>.
 - GlobalData,<https://www.globaldata.com/while-all-tech-sectors-will-be-negatively-impacted-by-coronavirus-it-services-will-be-hit-hardest-says>.
 - Hirt, M., Smit, S., Bradley, C., Uhlaner, R., Mysore, M., Atsmon, Y., and Northcote, N., (April, 2020), “Getting ahead of the next stage of the coronavirus crisis”, Mckinsey & Company.
 - Mangu-Ward, K., Regulatory barriers to online tools will fall, Politico Magazine, March 19, 2020, accessible at: <https://politi.co/2x5srqW>.
 - Momani, A. M., Alsakhnini, M., & Hanaysha, J. R. (2022). Emerging Technologies and Their Impact on the Future of the Tourism and Hospitality Industry. *International Journal of Information Systems in the Service Sector (IJISSS)*, 14(1), 1-18.
 - Kinsta, “Ecommerce Statistics for 2020 – Chatbots, Voice, Omni-Channel Marketing” January 29, 2020, accessed from: <https://kinsta.com/blog/ecommerce-statistics/>.
 - Market Watch, (2020). NASDAQ Market Watch, May 8, 2020, accessible at: https://www.marketwatch.com/investing/index/comp?mod=newsviewer_click.
 - The National. (n.d.). A.I. helped limit spread of Covid-19 in the Gulf, experts hear. [online] Available at: <https://www.thenationalnews.com/uae/health/ai-helped-limit-spread-of-covid-19-in-the-gulf-experts-hear-1.1063052> [Accessed November 14 2020].
 - Fong, S.J., Dey, N., and Chaki, J. (2020). AI-Enabled Technologies that Fight the Coronavirus Outbreak. *Artificial Intelligence for Coronavirus Outbreak*, pp.23–45.
 - OECD, SME Policy Responses, (March, 2020).
 - Organizational Labor Organization. (2020). “ILO Monitor 2nd edition: COVID-19 and the world of work”, 2020.
 - Sheerman, L., Marston, H.R., Musselwhite, C. and Morgan, D. (2020). COVID-19 and the secret virtual assistants: the social weapons for a state of emergency. *Emerald Open Research*, 2, p.19.
 - United Nations, (2020 b), “Shared responsibility, global solidarity: Responding to the socio-economic

impacts of COVID-19”, Nations Office for the Coordination of Humanitarian Affairs (OCHA).

- United Nations, (April, 2020 a), “Global humanitarian response plan: covid-19, United”, Nations Office for the Coordination of Humanitarian Affairs (OCHA).
- U.A.E (2020). Smart Solutions to Fight COVID-19 - the Official Portal of the U.A.E. Government. [online] Available at: <https://u.ae/en/information-and-services/justice-safety-and-the-law/handling-the-covid-19-outbreak/smart-solutions-to-fight-covid-19> [Accessed 20 Oct. 2020].