

# Influence of Coronavirus Disaster on Technology & Cloud Computing Applications

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**Abstract:** In mild of the COVID-19 outbreak brought about with the aid of the novel coronavirus, organizations and establishments have recommended their personnel to work from domestic as a precautionary measure to limit the danger of contagion. Employees, however, have been uncovered to extraordinary protection dangers due to the fact of working from home. Moreover, the fast international unfold of COVID-19 has multiplied the extent of information generated from a variety of sources. Working from domestic relies upon often on cloud computing functions that assist personnel to efficiently accomplish their tasks. The cloud computing environment is an unsung hero in the COVID-19 pandemic crisis. It consists of the fast-paced practices for offerings that reflect the vogue of hastily deployable functions for keeping data. Despite an enlarge in the use of cloud computing applications, there is an ongoing lookup undertaking in the domains of cloud computing environment (CCE) regarding data, guaranteeing security, and the availability of cloud computing applications. This paper, to the excellent of our knowledge, is the paper that fully explains the effect of the COVID-19 pandemic on Cloud computing environment and also highlights the safety dangers of working from domestic environment.

**Keywords:** Covid-19, Cloud computing environment.

## Introduction

Coronavirus disease 2019 (COVID-2019), formerly known as 2019-nCoV, has caused disruption around the globe. It was discovered in December 2019, with a report stating that people were suffering from fever and breathing problems after doing their shopping in a seafood marketplace in Wuhan, Hubei, China. In less than a month, the cases of 2019-nCoV infection spread to several countries (Thailand, Japan, Vietnam, and Singapore) regions (Hong Kong, China; Taiwan, China; Macau, China). The statistics have recorded that more than 120 countries' people have been affected. Moreover, governments announced strict lockdowns across their countries to minimize the possibility of spreading the disease[1].

Schools have been closed and the medium of learning has been converted to distance learning. Companies suspended employees from working in offices and implemented a work-from-home policy. The airline industry has enforced limitations in both international and domestic flights. According to the UN Educational, Scientific and Cultural Organization (UNESCO) monitoring, the total number of 39 countries affected with many cases of 42138846. Twenty-Eight countries have closed their schools, affecting 392 million children and youth. With the probability of this event becoming even more international, hundreds of millions of learners will stay at home [2]. University students or graduates are no longer able to participate in internships or attend classes on campus. Online education is the only viable option left to teach students. One of the ways to teach students is remotely using online learning. In light of the coronavirus crisis, the role of the cloud computing environment (CCE) has emerged as an unsung hero. Almost all sectors, such as small and large companies, healthcare, and education, have been forced to electronically convert their services. With the increasing sophistication of technologies, more can be achieved more easily online through these services, such as merchandise purchases, bill payments, education, medical consultations, purchases of airline tickets, sea and land transport, and hotel reservations. The use of cloud computing (CC) applications has increased the

volume, velocity, and/or variety in data being generated every minute around the world from various services and applications, also poses critical risks. These factors have required enterprises to change their ways of presenting services to customers, from the “old era” services to the “new era” services.

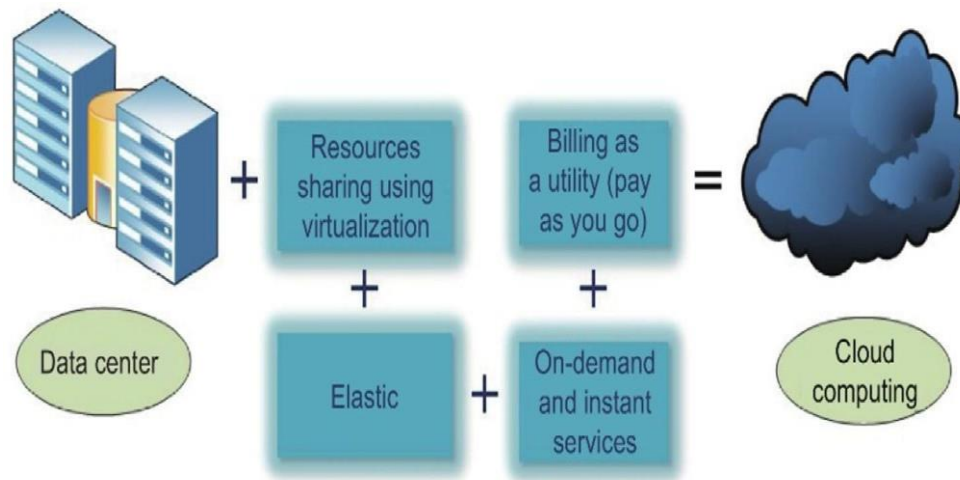


Figure 1: Schematic Diagram of CCE

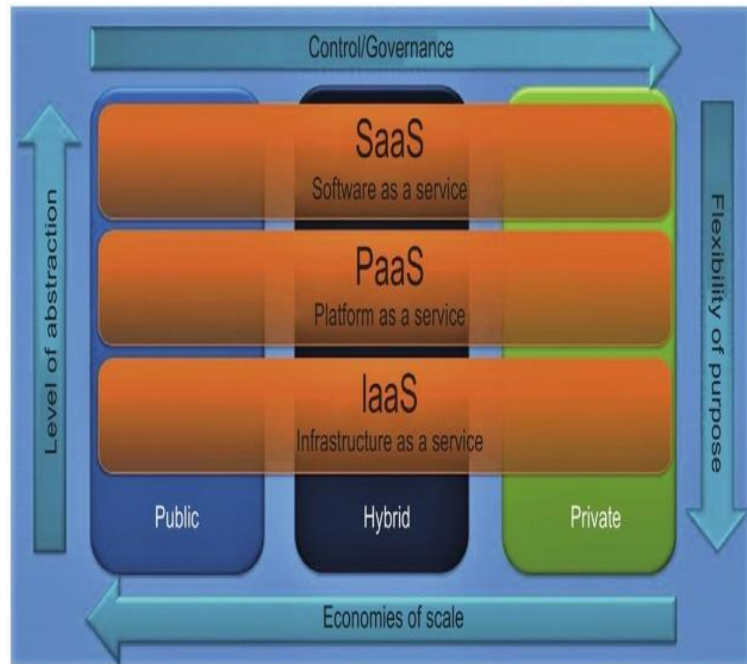
There are a lot of benefits for cloud users, such as not having to invest in hardware, network infrastructure, or software licenses. CCE has low up-front costs, quick deployment, [3]customizable features, and flexibility, while also being a solution with room for innovation. These CCE features are effective and attractive. The migration of applications services to CCE is anticipated to increase at a significant compound annual growth rate (CAGR) of 22.59% during the years of 2019 to 2022. The increasing adoption of CCE solutions that deliver both advanced and basic application services [4] supports the rapid growth of e-commerce applications and by ensuring access to almost unlimited resources when they are needed. These rapid changes have triggered enthusiastic researchers to move their focus towards the pandemic and how industries are coping with these changes. Hence, this paper seeks to address the following questions: a) How has the COVID-19 outbreak affected CCE? b) From a security perspective, what are the issues that might arise when working from home?

### Impact of the COVID-19 Outbreak on CCE

CCE is a machine configured from applications, IT infrastructure, and community services. It makes use of the assets of a facts core, which can be shared via the virtualization technology. CCE traits can be visualized in a graphical form, as illustrated in Fig. 1.

With this notion of “Computing as a Utility”, there is a lot of plausible in CCE, simply as that in electricity, gas, and water. With alternatives like plug and play, or even a “pay as you go” system, the possible is huge. Customers are free to select their software, platform, and infrastructure needs. As a utility, there is scalability and immediately access.

The CC mannequin consists of the platform, hardware, software, and infrastructure as a provider and is now an entire package. The three classes are: Infrastructure as a service(IaaS), software program as a service (SaaS), and platform as a service (PaaS) [4]. In cloud deployment, there are 4 models: a) Private cloud, b) public cloud, c) Community cloud, and d) hybrid cloud. Each mannequin describes how the cloud is deployed or what is handy to users. Clouds can be primarily based on the size, kind of services, location, kind of users, and security.



**Figure 2: CCE Service & Deployment Models**

Blackboard affords offerings thru CC and their groups have been taking quite a few pre-emptive infrastructure measures to assist control significantly extended traffic at some point of this pandemic considering the fact that there is a developing variety of Schools and universities shifting to wholly online courses.

UNESCO advocated collaboration functions that use live-video communications systems such as DingTalk, Google Meet, Microsoft Teams, and Zoom for the enterprise sector. Netflix, Hulu, and PrimeVideo are the examples of amusement applications, amongst many others.

The coronavirus became the world upside down, affecting nearly all sectors, forcing agencies to switch their offerings with the aid of the Internet to restriction the unfold of the disease. In the end, the end result used to be working from domestic due to the fact of governmental stay-at-home orders. The speedy solution, except buying tools like servers, software, and storage, is a vogue toward right away embracing CCE offerings due to the fact one of the traits of CCE is “pay as you go”. This led to a sudden overload on CCE elements thru the elastic traits of CCE by way of the prison or unlawful use (such as the financial denial of sustainability (EDoS) attack). Furthermore, the overload on the apparatus of CSP, like safety tools and Internet bandwidth, is additionally common [5].

### **Security Risks of Working from Home**

There are many kinds of commercial enterprise representations in markets, such as business-to-consumer (B2C), business-to-business (B2B), and business- to-government (B2G). Now, COVID-19 has suddenly given existence to home-to-X terminology, like home-to-business (H2B), home- to-government (H2G), or home-to-consumer [6] (H2C). This science entails digital meetings, digital healthcare, on-line education, cybersecurity, logistics to smart cities, and telecommunications [7]. Office and schooling facilities have been closed, and stay-at-home orders have resulted in a big and sustained surge in users’ collaboration, learning, and enjoyment options into virtual-only ones. This “stay-at-home” state of affairs to restrict the unfold of this sickness is now not for a quick period, and might also prolong over months, as introduced in many international locations throughout the world. In different words, the work surroundings are transferred to

home, each in my opinion and virtual-collectivity (virtual-together) remotely. On the different hand, it will end in surprising harm and protection issues. These can be classified into five new taxonomies primarily based on the troubles of protection of home-to-X: Data privacy, applications, private gadgets, the Internet, and CCE,[8] as proven in Fig. 3.

### Data confidentiality issues

Nowadays the COVID-19 disaster has generated big quantities of records thru the distinct sectors'. one vicinity that indicates promise is large facts. Data is amassed for healthcare, whether or not from patients, the virus genome, pharmaceutical to medical trials, social media, and even facial awareness data. Therefore, records need to be saved and processed correctly.

Because it has led humans to work from home, they are additionally compelled to transfer, use, and withdraw facts from the Internet, detachable disks, or flash cards. All these techniques may additionally now be impenetrable to switch records due to the fact they may exchange facts or reproduction it, [9] or it should be hacked. At home, there is no backup answer to tune adjustments in facts or new data. The facts consist of 4 aspects: Accuracy, redundancy, completeness, and consistency. There is additionally the query of facts throughout the globe with every us of a having special legal guideline and rules regarding legal and about facts safety and records integrity. There will be dangers related with the jurisdiction and loss of data.

### Internet Quality Issues

Covid -19 in 2020 is one of the largest drives for remarkable and exceptional digital transformation globally. It became regular working lifestyles into a digital one. It additionally has affected the use of the Internet and applications, even so plenty as inflicting fears of the Internet and social media cave. The coronavirus pandemic has a massive affect on the Internet, and this surprising urgency and demand have precipitated some issues for ISP companies. This, in turn, is reflected in customers when the use of functions from home. The functions generally want a properly Internet velocity to work suitable for audio, video quality, and switch of data. Vodafone stated that the Internet utilization has surged up to 50% in some European nations [10] and in the UK it is anticipated to trip a 30% upward jab [38].

TalkTalk printed an expanded demand of round 20% on Tuesday, March 17 following Boris

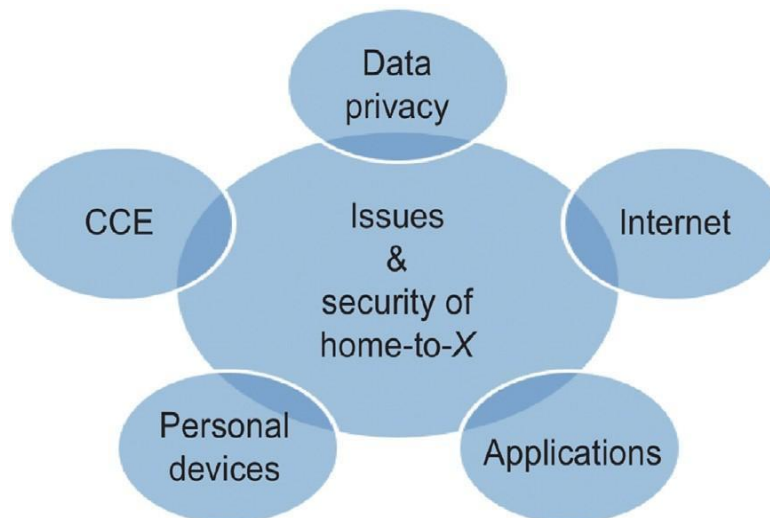


Figure 3: Issues and Security Issues of Working from Home

Johnson's practice for thousands and thousands to work from home. As proven in Fig. 4, facts furnished from the identical duration from Open Reach; however, it is nevertheless some distance beneath the regular nighttime peaks. Netflix, which used to be at the forefront in phrases of use, reduce down the best of its streaming at some point of the duration of the pandemic due to the fact of overloads Zeus Kerravala (ZK), the founder and major analyst with ZK Research, requested Cisco to enforce a 20% packet loss to minimize community congestion.

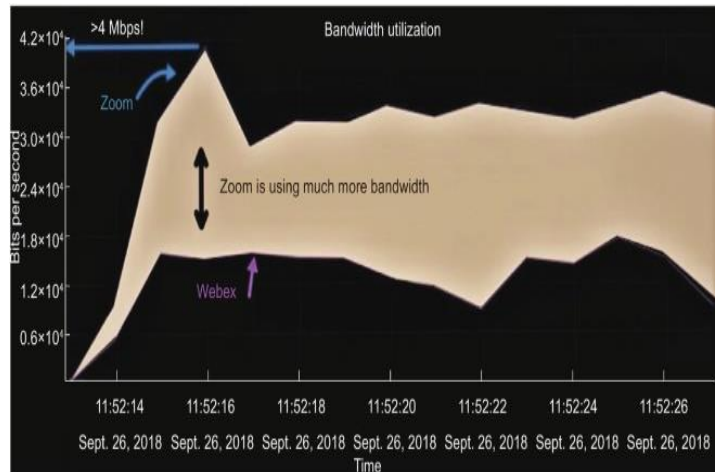


Figure 4: Increasing Demand on TalkTalk

The check statistics from the packet loss induced periodic outages on each platforms. For Zoom, they used the more bandwidth to get better faster, as its fee shifted down to 360 pixels. Following the test, Cisco downgraded its fee to 360 pixels. Once the packet loss was once performed at 20%, Webex's algorithms kicked in to repair video decision to 720 pixels, whilst Zoom took little longer to subsequently get better to 720 pixels, however it used to be outdoor the checking out window. Fig. 5 indicates the bandwidth utilization between Zoom and Webex.

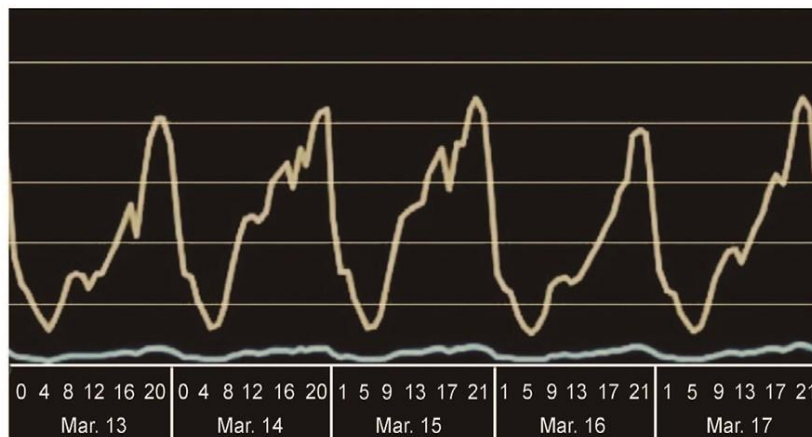


Figure 5: Bandwidth Utilization between Zoom and Webex

### Application Issues

Another trade which the COVID-19 pandemic disaster has initiated is social distancing. This makes studying from domestic necessary. As such, this now allows digital work, digital meetings, and distance learning. The fast unfold of Covid-19 contains excessive volumes information in specific codecs such as structured, semi-structured, or unstructured data, requiring these application massive processing competencies [14].

Performing stage of statistics except sufficient science infrastructure and purposes is difficult, so the use of variety of purposes stress corporations to comprehend the new technological know-how [15]. An evaluation from funding firm Yunqi Partners mentioned that, possibilities for faraway collaboration equipment for human beings to work at the same time even when they are no longer bodily together. Among the famous downloads of work apps are WeChat Work, DingTalk, and TikTok's sister, Lark. America's Zoom jumped exponentially from No. 180 at the stop of January to No. 28 at the give up of February 2020 in phrases of downloads and installs, as proven in Fig. 6. The draw back to this fast boom has been hacked and pirated due to the protection faults in application. In the UK, ISPs are providing clients limitless get entry to and expanded facts to the National Health Services (NHS) websites in the course of this time of self-quarantine . Vodafone, which presents each broadband, cellular Internet, has noted it will supply clients limitless get right of entry to NHS of UK on-line web sites. Mail Online is aware Everything Everywhere Limited (EE), Three UK cell (Three),Telefonica O2 UK Limited (O2) will additionally provide free get right of entry to NHS web sites. Apps from different components of the world assisting humans nationwide to work from domestic are Alibaba's DingTalk, ByteDance's Lark, and Tencent's WeChat Work. Sensor Tower compiled these app rankings, and all three apps have year-over-year boom in downloads from January to February 2020, i.e., Lark: 6085%; DingTalk: 1446%; and WeChat Work: 572%. DingTalk, an app developed through an Alibaba team, launched in 2014. It grew to be the most-downloaded free iOS app in China [52].

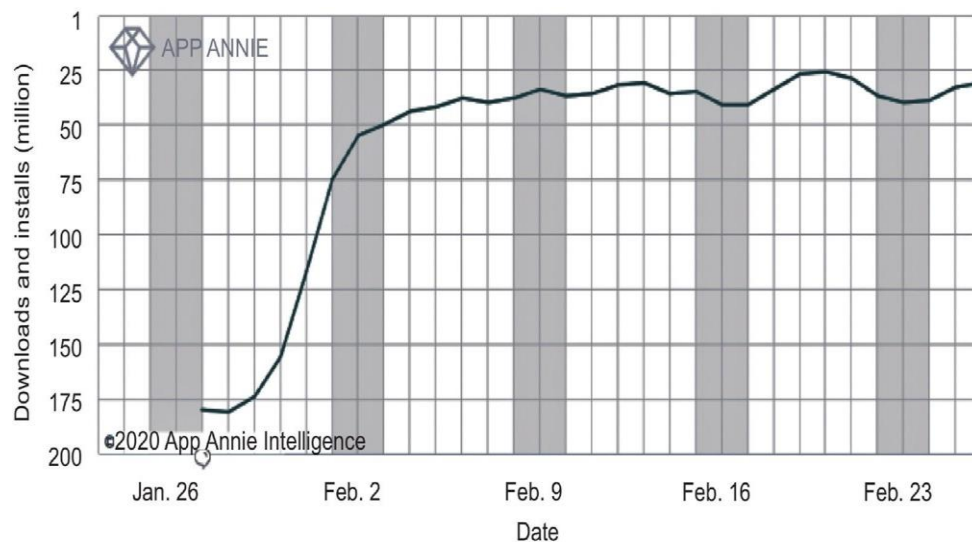


Figure 6: Usage of Zoom Application in Feb-March 2020

### Personal Devices Issues

Because the coronavirus pandemic disaster has compelled humans to work remotely from home, it has additionally led to the re-use of older devices. Makes safety things worse, after re-using non-public units such as non-public computers, laptops, and tablets. These units may additionally have now not been in use for a lengthy time, requiring updates for the running system, anti-virus software, until now hooked up programs, and so on. Cybercriminals considered a probability to make the most people, as they have already developed malicious software program to infect gadgets. All of these units may get contaminated with malware (Botnets) when connecting to the Internet to use net functions and get updates from the servers that are positioned on CCE, which will reason exceptional injury if gadgets are contaminated as soon as they are linked to the Internet.

### **Cloud Computing Environment**

Several CCE stocks, like Zoom, will expand in price over subsequent few quarters. RingCentral, Inc. provides a cloud-based suite of communications tools, and the income improved 34% to clock in at \$902 million. AWS has dedicated \$20 million in CCE credit for researchers working on monitoring and reading & searching to speed the improvement of assessments by permitting researchers to run workloads at no price on its CCE. The launch has 35 labs and companies collaborating. Alibaba has pledged assist to fight towards this disease, for the reason that its cloud income is greater than 10 billion yuan for the first time. It has grown 62% to hit 10.72 billion yuan for its 0.33 quarter (Q3). The on line equipment that are supplied by using software builders are fundamental in supporting all these sectors going for walks agencies at some stage in the difficult and complicated time like these.

CCE affords more than a few sorts of services, such as internet site hosting. It additionally presents on-line software program and a platform for growing functions . An internet site hosted in CC permitting everyday allows cellular units like private pcs and clever gadgets to connect. At this time, CCE has more than a few protection issues, as evidenced by way of cyberattacks. These attacks, in accordance to the Cloud Security Alliance (CSA), exhibit how assaults are hazardous to CCE protection [15]. The DDoS assault is a very massive chance.

### **Discussion**

China utilized statistics & digital Technology to assist fight disorder via the usage of robotics and drones. The former used to put foods at function diagnoses, behavior thermal imaging, and transport scientific samples. The latter is used to spray disinfectants to attempt to stop the unfold of the virus. Applications are additionally the usage of the huge statistics technological know-how with artificial Intelligence (AI) for face detection and infrared temperature detection. A.I. is in addition enjoying a heroic function in healthcare with COVID-19, such as assisting in predictive and information analytics. Consequently, there has been the collaboration between the Chinese authorities and Alibaba and Tencent to produce an application, such as the fitness system.

The fitness ranking machine speedy response codes had been used to tune tens of millions of human daily, whilst block chain was once utilized assist sectors throughout this disaster to deal with possible financial constraints. This is any other way in which the COVID-19 disaster has all of sudden multiplied the Internet use, now not solely by means of forcing human beings to do their work from home, however additionally to transfer, use, and withdraw data. People have been the use of purposes for digital work, digital meetings. The impact of the coronavirus on CCE got here from shifting a lot of utility offerings onto it, which may amplify positive sorts of attacks, such as an EDoS assault [15]. Extra assets add greater billing costs, which leads to greater financial burdens on the CCE client. Moreover, “stay-at-home” can also aid DDoS and EDoS assaults and make things worse.

### **Limitations of the Research**

There are now not but ample assets about assault instances on CCE that have took place at some stage in this period, due to the fact the COVID-19 pandemic disaster is ongoing.

### Conclusion

The dependency on CC uses and its technology has dramatically elevated due to the modern-day state of affairs of the COVID-19 pandemic. Undoubtedly, this pandemic disaster has impacted nearly all sectors, such as tourism, healthcare, education, CSPs, and others. Furthermore, the COVID-19 disaster may want to reason an everlasting shift in the direction of working from domestic as precautionary measures for containing the virus. The world speedy unfold of COVID-19 additionally expanded the quantity of information generated from a range of sources. The increase in Size in the records quantity wants extra information storage systems, storage mechanisms, new environments, and novel technologies, all of which create a fundamental challenge. In this paper, we have tried to truly exhibit the proper and possible effects of the COVID-19 disaster on CCE and additional technology enhancements due to the surprising extend in working from home. Additionally, this paper analyzes the protection dangers for working from home. From protection perspective, contemporary scenario may expose each CCE and its customers to special sorts of assaults due to the lack of preparedness to face such an unexpected situation. may be prone to exceptional sorts of assaults as they function untrustworthy Internet functions on their very own domestic devices, which may now not be up to date or patched with the present day protection policies. Therefore, at-home employees may grow to be the goal of attackers to without difficulty steal (copy) massive quantities of data. As a result, there is a necessity to tackle the protection dangers that CCE and customers face, as nicely as to upward jab the attention of customers about the threats of the use of unsecured gadgets to get entry to the Internet when they are working from home.

### References

- [1] Office of Postsecondary Education, Guidance for interruptions of study related to coronavirus (COVID-19) [Online]. Available,
- [2] UNESCO, School closures caused by coronavirus (COVID-19) [Online]. Available, <https://en.unesco.org/covid19/educationresponse>, April 2020.
- [3] Universiti Sains Malaysia (USM), COVID-19: social responsibility, preventive policy and current developments at Universiti Sains Malaysia [Online].
- [4] Edsource, How learning will change across California’s K-12 schools amid coronavirus closures [Online]. Available, <https://edsource.org/2020/how-learning-will-look-very-differentacross-californias-k-12-schools-amid-coronavirus-closures/625623>, April 2020.
- [5] British Broadcasting Corporation, Coronavirus: School closures and travel curbs in UK plans [Online]. Available, <https://www.simhospital73.com/2020/03/coronavirus-school-closures-and-travel.html>, April 2020.
- [6] Z.R. Al Ashhab, M. Anbar, M.M. Singh, K. Alieyan, W.I. Abu Ghazaleh, Detection of HTTP flooding DDoS attack using Hadoop with MapReduce: a survey, *Int. J. Adv. Trends Comput. Sci. Eng.* 8 (1) (Jan.-Feb. 2019) 71–77.
- [7] Z.A. Al-Sai, R. Abdullah, M.H. Husin, Big data impacts and challenges: a review, in: *Proc. of IEEE Jordan Intl. Joint Conf. on Electrical Engineering and Information Technology*, 2019, pp. 150–155. Amman.
- [8] Markets and Markets, Cloud migration services market size, share and global market forecast to 2022 [Online]. Available, <https://www.marketsandmarkets.com/Market-Reports/cloud-migration-service-market-266815130.html>, April 2020.
- [9] Cision Prweb, 451 research: 69% of enterprises will have multi-cloud/hybrid it environments by 2019, but greater choice brings excessive complexity [Online]. Available, <http://www.prweb.com/releases/2017/11/prweb14952386.htm>, April 2020.
- [10] S.P. Ahuja, Architecture of fog-enabled and cloud-enhanced Internet of things applications. IGI Global [Online]. Available, <https://www.igi-global.com/article/architecture-of-fog-enabled-and-cloud-enhanced-internet-of-things-applications/240691>, July 2020.
- [11] Market Watch, Global cloud migration services market size by 2022: top players, growth factors, trends,



business development [Online]. Available, [https://www. marketwatch.com/press-release/global-cloud-migrationservices-market-size-by-2022-top-players-growth-factors-trendsbusiness-development-2019-09-27](https://www.marketwatch.com/press-release/global-cloud-migrationservices-market-size-by-2022-top-players-growth-factors-trendsbusiness-development-2019-09-27), April 2020.

- [12] R. Krishna murthi, M. Goyal, Enabling technologies for IoT: issues, challenges and opportunities, in: B.B. Gupta (Ed.), Handbook of Research on Cloud Computing and Big Data Applications in IoT, IGI Global, Hershey, 2019, pp. 32–82.
- [13] C. Stergiou, K.E. Psannis, B.B. Gupta, Y. Ishibashi, Security, privacy & efficiency of sustainable cloud computing for big data & IoT, Sustain. Comput.: Inf. Syst. 19 (Sept. 2018) 174–184.
- [14] R.K. Sharadchandra, L.M.R.J. Lobo, Parallelization of genetic algorithm using Hadoop, Int. J. Eng. Res. Technol. 1 (9) (Nov. 2012) 1–5.
- [15] Statistic Brain, Twitter statistics [Online]. Available, <https://www.statisticbrain.com/twitter-statistics>, April 2020.