International Journal of Science and Research (IJSR)
ISSN: 2319-7064
SJIF (2022): 7.942

Exploratory Review of New Technologies on Information Systems and their Potential Impact on the Fight against the COVID-19 Pandemic

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Abstract: ***Due to the COVID-19 epidemic, the entire globe has been in crisis since the end of 2019. It has affected the economy, schools, and other vital spheres. Since we are still in the midst of a pandemic, it is imperative that we refrain from congregating in large groups and that we keep our distance from one another. To track the spread of the COVID-19 pandemic or mitigate its effects, new technologies like the internet of things (IoT) and artificial intelligence (AI) are being put to use in a wide range of sectors. The Internet of Things (IoT) has been considered in several studies in relation to the COVID-19 pandemic. While IoT-based monitoring systems are being implemented, little research has been done on the difficulties and design concerns that arise from doing so. Furthermore, the post-covid situation and the application of IoT and other technologies are not dealt with adequately. Our review article offers a comprehensive look at how the Internet of Things (IoT) is being used to govern the economy, healthcare, and other sectors in the fight against the pandemic. Since then, it has been clear that the Internet of Things (IoT) and related technologies have a significant effect on virus identification, tracking, and prevention. The accompanying designing difficulties of the IoT-based framework in the face of a rapidly spreading pandemic have been investigated as part of this research. This overview also sheds light on the key obstacles, such as privacy, security scalability, etc., that might be encountered while employing such technologies. Finally, we investigate "The New Normal" and the role of technology in the aftermath of a pandemic.***

Keywords: COVID-19, IoT, Pandemic, IoMT, AI, Drone

1. Introduction

Wuhan city in China's Hubei province saw the first cases of a new coronavirus strain in December 2019; this strain, SARS-CoV-2, is responsible for an outbreak of respiratory sickness, also known as COVID-19 (Zhu et al.2020; Backer et al.2020). A cough, fever, shortness of breath, exhaustion, etc. are all symptoms of SARS-CoV-2 infection, which targets the respiratory system like other influenza viruses. Even though the origin of SARS-CoV-2 is uncertain, the virus has been genetically characterised and shown to belong to the coronavirus genus (Cascella et al.2020; Afelt et al.2018). On 11 March 2020, the World Health Organization (WHO) labelled the virus a pandemic due to its rapid global spread to over 213 nations and territories (Gallagher et al.2020). The global community is currently working tirelessly to stop the extraordinary spread of this virus. To mitigate the effects of COVID-19, authorities have taken extraordinary public health measures such social isolation, travel bans, and quarantine (Hao 2020; Haleem et al.2020). The 'lock-down' process, which involves a global movement away from engaging in socially normative behaviour, is under way in many places. As a result of this lockdown, millions of people will be confined to their homes, companies will close, and nearly all economic activity would come to a halt. Worker shortages are a problem in every industry since they limit output. Since the closing of schools and universities, there has been a corresponding drop in demand for both raw materials and finished goods (Whiteside 2020). Further, many hospitals' futures are uncertain because of the epidemic since they have reached capacity. So it causes a worldwide financial, health, and education disaster. The prevention of disease transmission is of paramount importance in this critical scenario (Richardson 2020). Strong action is required to combat the epidemic; therefore we must resume all systems while keeping our emotional distance. Scientists from many disciplines are inspired to work together to restore the world's infrastructure in the face of these threats. In addition, technological advancements are increasingly essential to the success of every sector of global society, from commerce and finance to education and healthcare. In response, several nations are implementing IoT, ML/AI, Fog/Edge Computing (Azimi et al.2017; Jorge et al.2020), and other digital technologies to battle the pandemic and reduce the likelihood of community-wide transmission. The availability of wireless communications is crucial for meeting needs such as the constant monitoring of a viral infection, prompt diagnosis, treatment, observation of a mass gathering and the containment zone, contact tracing, aiding medical professionals, enabling telemedicine (Marr 2020a), and providing e-learning (Saeed et al., 2020).

One such technology is the Internet of Things (IoT), which allows everyday things to detect their surroundings, analyse, interpret, and predict real-time data, interact and exchange information with one another across a wireless network, and display this data to the user. The Internet of Medical Things (IoMT), transportation, and household appliances are just few of the fields that have started using this technology (Ting et al.2020; Javaid et al.2020a). As the ongoing COVID-19 epidemic puts a strain on health care providers, institutions, and entrepreneurs are looking to IoMT to help ease the situation. The medical field is only one of several that might benefit from IoT; other areas include the continuation of virtual learning, the introduction of fully automated industries, and the facilitation of E-commerce. The Internet of Things has also made significant contributions to areas such as crowd management, social isolation, disease monitoring, screening and surveillance,

and contact tracing (Javaid et al., 2020b; Singh et al., 2020b). Various nations have created drones specifically for crowd control and security checks. Swayamsiddhaa and Mohanty 2020; Rahman et al.2020) and contactless services (Nasajpour et al.2020b) are presented to manage the current problem, reduce the propagation of the virus, and apply these technologies. A high-speed, high-coverage, low-latency enabled, dependable 5G internet connection is crucial for making full use of all these IoT-based application capabilities (Qualcomm 2020). The purpose of this study is to demonstrate how recent technological developments like the internet of things (IoT), artificial intelligence (AI), drone and smartphone apps are contributing to the fight against the COVID-19 epidemic depicted in Fig.1. In addition, this article discusses how these new tools may be used for crowd monitoring, contact tracking, social distance maintenance, healthcare assistance, e-learning, and e-commerce. Next, we look at the ways in which the Internet of Things (IoT) might run into trouble, including privacy concerns, data loss, and incorrect information. In conclusion, we talk about how the Internet of Things may be improved to ease everyday living in the aftermath of a pandemic.

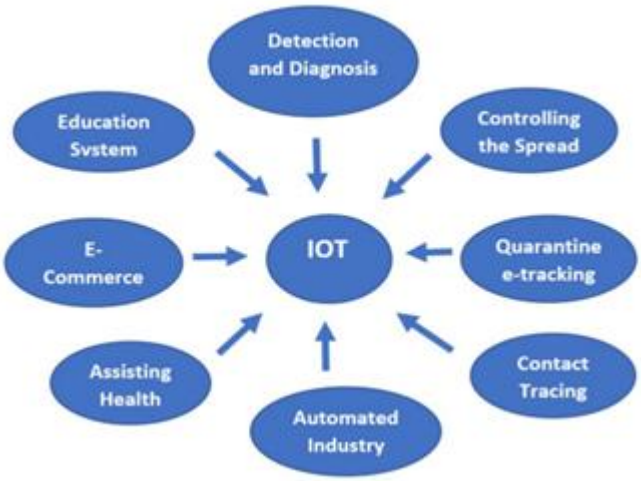


Figure 1: Significant role of IoT towards COVID-19 Pandemic

2. Literature Review

The effects of the current COVID19 epidemic have been examined in various published works. Chakraborty and Maity (2020) examine the effects of COVID-19 on our society and the global ecosystem, and they attempt to outline a preventative strategy for lowering risk factors.

They included forestation to minimise pollution, population management, restrictions on public gatherings, the development of a safe and stable COVID-19 vaccine, and so on as their primary preventative measures. Although IoT might be a beneficial tool in the fight against and suppression of coronavirus, that aspect of its use was not emphasised in this article. To counteract the spread of the COVID-19 pandemic, Oyeniyi et al. (2020) focused on using the Internet of Things. However, in this case we focused solely on the medical sector as a primary use of IoT. They developed an Internet of Things–based method for treating sick people remotely. An affected person's data may be collected remotely via a smartphone-based application, evaluated, and then therapy can be initiated depending on the results of the analysis. Nasajpour et al. (2020a) conduct a comprehensive review of the impact of IoT in the context of the COVID19 pandemic. In particular, it illustrates the use of IoT during the various stages of COVID-19 illness, including detection, isolation, and recovery. For early identification of COVID-19 infected or suspected patients, Mondal et al. (2021) suggest an IoT-based infection detection system based on an assessment of the role of the internet of things in the fight against coronavirus. Technology like the "smart" thermostat, "intelligent" cap, and "smart spec" can be utilised to keep an eye on a patient and prevent the transmission of infection at a reasonable cost. To prevent the spread of disease and alleviate the overwhelming workload placed on our medical professionals, Kumar et al. (2021) developed a smart healthcare infrastructure that makes use of IoT. Examples of IoT applications in healthcare include real-time patient location tracking, remote health monitoring and data storage, ambulance availability checking for a patient with COVID-19, and many more. Malliga et al. (2021) investigate how we might use our developing technology in our daily lives while keeping social distance in a world where we are all under pressure to rigorously adhere to all covid regulations. The authors of Bassam et al. (2021) suggest a three-tier Internet of Things (IoT) architecture for a remote health monitoring system, the first tier of which is a wearable IoT layer that senses several parameters of a COVID-19 patient, such as body temperature, oxygen saturation, heart rate, etc. The second layer, housed in the cloud, is responsible for receiving and storing the sensed data as a patient record, while the third layer, housed in the web interface, is primarily responsible for analysing the patient record received from the cloud layer and periodically alerting the authorities. When an orthopaedic patient is living in a distant area where medical services cannot reach promptly, Singh et al. (2020a) investigates how IoT can aid in his treatment and make his life more easy. Other than the field of medicine, Large-scale difficulties are also being experienced by businesses as a result of the epidemic. The global supply chain paradigm must be rethought and transformed as a result of this predicament. Multiple researchers have begun focusing on the supply chain sector since 2020 in an effort to counter the disruption. The impact of supply chain disciplines during the COVID-19 pandemic, as well as their potential future use, were analysed by Chowdhury et al. (2021). In Shahed et al. (2021), they create a three-layer optimization model to aid in rethinking inventory strategy in order to maximise profit and minimise supply chain disruption in the event of a pandemic. In order to create a more intelligent and robust supply chain management (SCM) system, de Sousa Jabbour et al. (2020) discussed the part a supply chain manager plays in an incident like COVID-19. The business's location, manufacturing capability, and flow of materials management must all be reevaluated by the supply chain managers. With this information in hand, they must design a new supply chain architecture that can be effectively managed throughout the epidemic. Based on Pareto analysis, Fuzzy theory, Total interpretative structural modelling (TISM), and Matriced Impacts Cruoses Multiplication Applique an un Classement (MICMAC), Karmaker et al. (2021) present an approach to increase the supply chain's sustainability in the context of

COVID-19. The food and beverage sectors are also feeling the effects of the coronavirus outbreak. The effects of COVID-19 in the food and beverage industry were studied by Chowdhury et al. (2020). The writers primarily looked at the short-, medium-, and long-term effects of COVID-19 on the food and beverage business, and they suggested a variety of measures to help the sector recover rapidly from these challenges. Losses in the food industry might be reduced by practises such as "First Expired, First Out," product rotation, cost cutting in operations, and reorganisation of the supply chain.

There are, to the best of our knowledge, a few publications that address the influence of the COVID-19 pandemic crisis on all of the many sectors, including healthcare, education, industry, e-commerce, and so on. In the meanwhile, the difficulties and design problems associated with the deployment of such an Internet of Things-based architecture are being overlooked. This review article provides a comprehensive illustration of the effects of the worldwide pandemic in a variety of spheres, including but not limited to healthcare, the educational system, electronic commerce, business organisations, and others. In this article, the effectiveness of a variety of IoT-based tools and technologies that can help minimise this issue is discussed. The issues that the Internet of Things (IoT) faces in terms of connection, security, privacy, and scalability were highlighted in this study as well. In addition, a brief discussion was held on the ways in which the aforementioned tools and technology might assist us in adjusting to our new normal existence.

Clarification of the issue

Existing public health system inadequacies have been highlighted by the COVID-19 epidemic. The employment of technology to stop the epidemic presents various difficulties. Due to the unique characteristics of the COVID-19 pandemic, it is essential that data, people, and systems be well-coordinated in order to promote international cooperation in the battle against it (Bardhan et al., 2020). As public health organisations and healthcare stakeholders have historically used different systems, data formats, and standards, so tracking epidemic patterns and creating countermeasures have been difficult. In order to better comprehend the developing epidemic and make collaborative decisions on how to manage this issue, public health experts, epidemiologists, and government officials need to be linked via integrated systems with connected data. Because of the importance of people in the battle against COVID-19, it is vital to link, coordinate, and assist different parties using cutting-edge and unified technological means.

Objective of the Study

- To check new technology emerging in information systems during and after the situation of Covid-19.
- To identify how new technology is utilised by the sectors for maintaining financial stability during pandemic times
- To focus on the situation of the new technology in the case of all companies using information systems that can be considered as the main focal of the country.

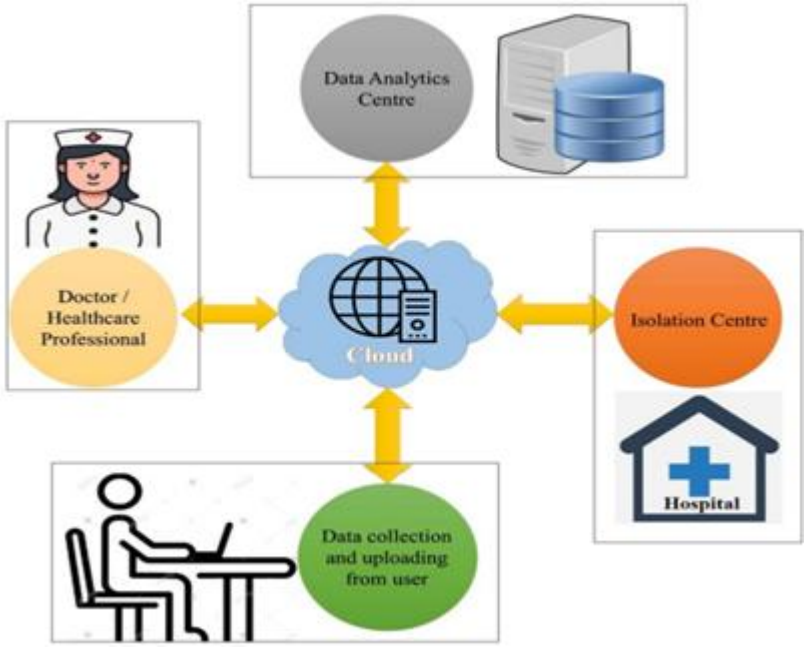
Research Questions

- To what extent has new technology been able to prove as emerging in information system before and after pandemic situation?
- How well has it been possible for each and every sector to make utilisation of new emerging technology in order to maintain financial stability during COVID-19?
- What has been the condition with respect to use of new technology by all the companies with usage of information systems considered to be as main focus?

3. Research Methodology

When it comes to the fight against global pandemics like COVID-19, a network comprised of a huge number of different kinds of devices that can communicate with one another and are all connected to one another is the most effective strategy. It is feasible to combine and gather the pertinent health and personal data of the suspected folks from a variety of sites using an automated tracking and alarm system. One example of this type of data would be location information. In this part of the article, we will talk about a full framework that is based on the Internet of Things and that it is feasible to develop with the assistance of already existing IoT ontologies. This system, which is based on the Internet of Things, has the potential to be used for real-time surveillance and detection of COVID-19 infections, which may also help reduce the spread of the diseases. The framework consists of the five components listed below: data gathering and transmitting, data analytics centre, healthcare/quarantine centre, healthcare system/ professional, and cloud infrastructure. One of the most important aspects of this paradigm is the fact that all of its components are connected to one another through the use of a cloud-based infrastructure. Platform as a Service is shortened to PaaS, and this is the shorthand for it.

The architecture of the Internet of Things-based monitoring system is depicted in the figure:



Obtaining User Information and Transmitting It

There is a wide selection of wearable technology on the market today that can collect data about a user's condition in real time. This literature discusses a number of different wearable technologies and the purposes for which they can be put to use. For the purpose of identifying COVID-19-related complaints, a large number of biomedical sensors may be deployed. It is possible to gather information on the whereabouts of individuals who are afflicted with the coronavirus in order to determine the social distances between people. This will help prevent the virus from spreading. The temperature of a person's body may be measured in real time with the use of a smart thermometer. Despite the fact that the user is moving, their core temperature may be checked (using a smart helmet). Several mobile applications allow for the collection of additional essential user data, such as records of trips taken and records of interactions had.

Exploration of Research

To ensure that only useful information is transferred to cloud servers, data analytics components examine the information and run a variety of machine learning (ML) and Deep learning (DL) algorithms on it. Data collected and uploaded by users is utilised by the analytics centre to develop a variety of statistical data analytics models. In real time, the developed model may be utilised to recognise user data. The ML model may also identify the patient's conditions using a variety of supervised machine learning approaches (such as critical, non-critical, and so on). Using the results of social distance calculations, users of various mobile applications or other warning systems can be prompted to keep their distance from one another. Through the duration of the contract, the analytics centre updates the system in response to real-time data and shares important insights with users and healthcare experts.

Combining the functions of a hospital with a quarantine facility

This part collects user information and patient status reports from the data analytics hub, which is connected to all the other modules through the cloud. If the patient's condition necessitates a trip to the isolation or quarantine centre, the centre will notify the client and provide a quarantine centre based on the patient's medical history as recorded in the user's devices' databases. The data analytics centre is in constant contact with the quarantine centre so that patients are kept up-to-date during their confinement. In addition, it shares patients' conditions with physicians and other medical staff so that they may receive and act on any necessary advice and treatment.

Expertise in Health Care Systems

The medical facility and the attending physicians are keeping an eye on each and every patient, regardless of whether they have been quarantined or transported to the hospital. In the event that any unexpected indications are found in patients, they will alert the data analytics centre. This will cause an update to both the data collection and the machine learning models, which will allow the ML equipment to re-learn. Additionally, clinicians make direct contact with patients whenever it is possible in order to reinvestigate medical testing, in addition to providing additional medical services and direction. With the use of Internet of Things (IoT) technology, it may be possible to establish an intelligent healthcare system in which patients do not have to go anywhere for the initial identification of COVID-19 indicators. Using their mobile devices, they are able to publish content from any location.

Infrastructure in the Cloud (PaaS)

PaaS provides a central hub for system-wide Internet communication. Customers may now report issues from anywhere in the world, at any time, and have their feedback sent to a central server in real time. Isolation wards have this system, which also maintains track of the patient's medical history and communicates with doctors. This system may also take advantage of its storage space.

Implications of the Internet of Things across Disciplines in the Fight Against the COVID19 Pandemic

The term "internet of things" (IoT) is used to describe a system in which everyday items are linked together and outfitted with electronics, software, and sensors to monitor their environments in real time (Yusuf et al.2019). We use data processing to pull out the specifics that will help us provide you this report.

Detection and monitoring of COVID-19 infections using an Internet of Things architecture 162 Environmental shifts are discussed in volume 7 page 157 to page 174 of the Transactions of the Indian National Academy of Engineering in the year 2022. The Internet of Things (IoT) is a scalable and automated solution that has shown explosive growth across a variety of applications, such as healthcare, agriculture, business industry, education, e-commerce, transport, and the economy, to make the system much smarter (Qi et al.2017; Reddy and Krishnamohan 2017; Pratama et al.2017). To combat the COVID-19 pandemic, the entire world is experiencing a significant difficulty (Chamola et al.2020; Dudhe et al.2017). There is an urgent need for a well-equipped and coordinated infrastructure to halt the spread of this devastating disease, since the number of infected people is rising dramatically each day (WHO 2020b). Detecting and stopping the spread of Coronavirus, so doctors can treat their patients effectively, is an urgent need. When seen in this light, IoT's role becomes clear. In this article, we take a look at the current research activities that have been carried out using IoT and other developing technologies and share our findings. Quarantine patients, tracking viruses, disinfecting containment areas, facilitating online education (Bahuguna et al., 2018), and offering treatment without patient contact are just some of the uses already being put to IoT in the healthcare sector (Hu et al., 2013; Goswami et al., 2019; Sachin et al., 2019). With the help of a high-speed network, this technology can gather real-time data and other relevant information effectively, and then deliver it to the right authorities so that they may take the necessary actions (Kumari et al., 2020). One can outline the different weighty roles performed by IoT in the fight against the COVID-19 epidemic as follows:

- Timely and efficient diagnosis and data gathering from infected patients.
- Coronavirus detection and containment are of utmost importance.
- Individuals with the disease must be located and isolated.
- Tracking down potential contacts of people with coronavirus infections.
- Please aid doctors and nurses.
- Distribution of consumables including food, medication, and medical tools.
- Remotely monitoring confined patients.

The Impact of IoT on Healthcare Systems

The temperature of the isolated individual may also be tracked thanks to the Internet of Things wearable gadget. During this epidemic, several new mobile apps have been created to help provide people with the healthcare they need (Kaur 2020). To aid in the diagnosis of COVID-19, these applications notify users of the estimated number of positive cases within 500 metres, 1 kilometre, 2 kilometres, 5 kilometres, and 10 kilometres of their location. Multiple obstacles have been encountered by healthcare IoT applications.

- Privacy and security of information is a major obstacle. Most IoT-enabled mobile devices don't follow data protocols and standards, despite the fact that they record data in real time. Data ownership and regulation is fraught with significant uncertainty. Thus, cybercriminals have an easier time breaking into the system and compromising individuals' health records if they are kept in IoT-enabled devices, which increases the likelihood of data theft.
- Having thousands of devices in a single healthcare facility and thousands more streaming information from faraway places would create a vast quantity of real-time data, making a big storage structure essential for smart healthcare. Its massive storage needs are a direct result. Using AI-driven algorithms and the cloud to store and manage this information would be ideal, but developing such a fully functional system would take a lot of effort.
- The healthcare industry has challenges in implementing IoT due to the complexity of integrating different types of equipment. This roadblock exists because makers of various devices have not agreed upon a common communication protocol and set of standards. Unfortunately, there is no synchronised mechanism for data collection that can be used in this scenario. This inconsistency slows things down and limits the scalability of IoT in healthcare. • The expense of investing in Internet of Things app development is a significant barrier to entry when evaluating potential mobility solutions in the healthcare sector. If the IoT solution is used to address a real need, however, the expenditures will be well justified.

The Impact of IoT on the Learning Environment

As with other sectors, the education sector has been hit hard by the COVID-19 epidemic. As of March 31st, 185 nations throughout the world have either closed schools or colleges as a preventative step against the spread of the virus, or declared that they would do so. Education is in dire need of digital learning in these times of turmoil. Students all around the world now have access to a plethora of online learning platforms, which educators to design engaging (digital) activities (Ethirajulu, 2020). Globally, schools are taking advantage of tools already available, like Google Classroom, Microsoft Education, and video conferencing programmes like Zoom. The trend toward online conference and meeting spaces is not limited to the academic realm (Suroor and Khan 2017). Using Virtual Reality (VR) to enhance online conferences or meetings might be a win-win (Keyes 2019). In an effort to convince people to "forget video conferencing and host next meeting to VR," the IEEE Conference on Virtual Reality and 3D User Interface was hosted this year using Mozilla's VR platform, Hubs (Ackerman 2017). Recently an alternative idea called "vFabLab" has emerged; it is an online-based virtual environment meant to aid teaching on semiconductor device manufacturing procedures and associated equipment. They are also considering integrating an IoT smart watch with the current "Learning Management System" (Heikkila 2017). This interface is

useful because it allows users to access their learning management system (LMS) from their wristwatch devices, allowing them to publish and exchange relevant materials, data, and information with their students at any time and from any location.

In many ways, online courses are more advantageous than classroom instruction. Digital gadgets and an always-on, reliable internet connection are necessary for online education. The fifth-generation mobile network (5G) might be useful here. To make distance learning more commonplace, 5G paves the path for new forms of telecommuting and online meetings (Chamola et al.2020). A large percentage of the world, however, has either very limited or no access to the internet. There's a chance they'll get even more behind. Systems of education have a responsibility to ensure that these initiatives do not exacerbate pre-existing disparities in access to learning and that they instead prioritise educational quality and resource equity. In spite of the fact that digital technology has the potential to greatly improve students' access to high-quality education, it may also fundamentally alter the way that schools operate as a whole.

The Impact of the Internet of Things on Online Business

Even more so, online shopping is emerging as a lifeline during this pandemic. integral support system to forestall the collapse of the international economic system. For instance, (Goodman & Atkeson, 2020). The ability to put into action effectively measures of social isolation taken in an effort to slow the disease's spread in response to COVID-19, some national governments preferred internet shopping to brick-and-mortar stores additionally, customers have shifted their purchasing habits, and methods for lowering one's vulnerability to infection (World Bank, 2020). Since transmission from person to person is rarely 100% effective, many eateries and food delivery services throughout the world are introducing a Service Where Goods Can Be Delivered without Any Physical Contact Robotic Pickup and Delivery Service deliveries. Furthermore, physical currency might be infected, making contactless digital payments through cards or e-wallets the safer option. are recommended as a safe and secure way to do business to stop the escalation of COVID-19. A digital payment system allows consumers to conduct financial transactions over the. Spending money on things you need or want, including services and utilities, payments and to get stimulus money more quickly (Amazon 2020). Unfortunately, most stores don't have the networking hardware and software to handle the massive amounts of IoT data. Inin order for shop owners to g digital, retail businesses would need dependable connections, cloud services, and user terminals barcode scanners, iPads, and other solutions. All those goods need a lot of money if you want them. Here also incorporating IoT, AI, and blockchain into 5G networks Furthermore, AR/VR will improve the online shopping experience (Kshetri 2018).

Automated manufacturing and the Internet of Things

The government and several organisations responded to the COVID-19 problem by the problem that industries everywhere must solve is how to harmony between people's safety and their ability to make a living. Digital and remote services are becoming increasingly common in this space. Helping immensely to maintain economic stability, public safety, and the continuity of essential supply networks (Sisinni et al.2018). In addition, Industrial The IoT has been adopted more quickly by applications, such (Khan et al.) refers to as "the Industrial Internet of Things. "2019). Features such as autonomous organisation, remote monitoring, and capability. With the use of machine-to-machine communication and predictive maintenance, it is possible to reduce human input to a minimum while yet achieving near-perfect accuracy. The Internet of Things block chain requires a decentralised and safe transmission of information gathered by these sensors or devices. Connectivity between block chain systems and IoT have been around since 2015 (Panarello et al., 2018), to address major concerns about data security and privacy in the Internet of Things privacy (Hassan et al.2019). Stable, interoperable infrastructure is required to put the IIoT concept into action. Continual monitoring and automation need a connection that is always on, never drops, and has a low latency. All 5G has these characteristics since it is based on a newer network standard. as a result of effectively adopt the idea of IIoT and 5G technologies can rise to the top and become crucial. In addition to the ambiguity, problems with corporate goals, misaligned departments, and a general absence of among the many difficulties that might arise while putting into action IIoT are those related to security, according to specialists in the field of the Internet of Things. Malware can be used to compromise an autonomous machine. Achieve victory over given the current state of affairs, it is essential that we have an operational cyber security. Periodic evaluations of risk over the product's life span gadget used in IoT.

New Mitigation Technologies Pandemic of COVID-19

Many new technologies are being used to detect and aid sick persons (Khaddar and Boulmalf 2017). These include geographic information systems (GIS), global positioning systems (GPS), Bluetooth, and others. Wearable Internet of Things (IoT) technologies like smart thermometers, intelligent caps, smart glasses, and trace proximity offer significant potential for preventing the spread of the COVID-19 pandemic, as will be shown in the subsequent sections.

System for Geographic Informational Analysis

When dealing with a pandemic like the one caused by the COVID-19 virus, it is extremely important to pinpoint the exact location of the affected region so that appropriate measures may be taken to contain the spread of the illness. By combining spatial analytics, mapping, and location intelligence, GIS aids epidemiologists in pinpointing the source of an outbreak relative to factors like population, geography, and historical precedent (Lokhman et al., 2012). In addition, it helps governments locate areas of extreme danger and set up appropriate medical facilities (Xiaosheng and Yuxuan 2009). Environment Systems Research Institute (Esri), a global leader in geographic information system (GIS) software, is collaborating with non-profits and government agencies to assist them use GIS technology to make choices, plan and communicate steps to halt the spread of pandemics (Decker 2020).

Figure: GPS as well as Bluetooth helping out in maintenance of physical distances.

Automatic Temperature Monitor

U. S. medical technology firm Aetna Inc. Kinsa introduced a high-tech thermometer to detect and diagnose common fever (Chamola et al.2020; Young and McMahon 2020). To put it another way, in light of the current epidemic, one of the most striking features of the epidemic was how quickly it spread while keeping a distinct social aims to limit the virus's transmission, a cunning Thermometer's use in diagnosing fever is crucial. Safeguarding frontline employees from a contaminated patient. The spread of this contagious illness Temp gauge here is linked to portable software that lets users to send the temperature measurement to the company Kinsa compiles the information into a daily graph to find out where in the United States of America there is the greatest chance of a COVID-19 polluted environment (Charters 2020).

Figure: Automatic temperature monitor

Activating Internet of Things Devices

As per Nasajpour et al., (2020), this tiny programmable device is wirelessly activated and may be used to initiate predetermined operations with the push of a single button. The use of this button in hospital administration has already been demonstrated, for example, by enabling real-time notifications regarding the tidiness of restrooms, the need for replenishment of essential supplies, and so on. As a result, the Internet of Things (IoT) button is now providing aid to all healthcare workers in the pandemic situation by facilitating the management of better and faster diagnoses, the identification of a high-risk patient, and the notification of both management and the patient party of any emergency and infected area (Chai et al.2018).

Figure: Button related to AWS internet of things

Drone

During this continuing conflict against the mysterious foe COVID-19, Drones play an important part by assisting both the people and the government. Through a variety of different strategies to stop the future spread of the Coronavirus epidemic (Abdulrazaq et al.2020). Around the world in totality Drones are being utilised for various purposes by all agencies and local communities. a variety of uses, beginning with tracking the movements of individuals interrupt any social gatherings in order to conduct thermal image scanning. The deployment of drones is particularly pertinent at this critical juncture. Since it permits surveillance of a large number of places with no need for direct physical interaction, there is a decreased likelihood that frontline social workers, such as police officials and other staff, would become infected.

Drones are also being used in China and a large number of European countries. For the purpose of transmitting messages and information on the shutdown take preventative actions such as social isolation, mask wearing, and medication. Required measures to preserve cleanliness and protect against the transmission of the virus, particularly in more remote areas that are devoid of open lines of contact for the sake of health (Sharma 2020). In potentially infected locations, disinfectant may also be sprayed using drones, which is another usage for this technology (Shaw and Vimalkumar 2020). In the field of medicine, drones are increasingly being employed for the transport of medical supplies and samples for testing from one hospital to another. or from the hospital to the laboratory in the most expedient and risk-free manner possible (Zema et al.2016).

Figure: Several kinds of drones for managing the effect of COVID-19

Results of Studies and Predicted Developments

Machine learning, deep learning (DL), artificial intelligence (AI), the internet of things (IoT), and drone technology are just a few of the many recent developments in this field. The spread of the coronavirus was slowed considerably thanks to the efforts of and others. However, in light of all these technological advancements, we suggest more research into the use of in the fight against the COVID-19 pandemic. More effort from the research community is required to of instantaneous and automated warning systems Our investigation reveals a significant expansion of IoT infrastructure combined with alternatives to the COVID-19 that are currently under development pandemic. An additional factor is the smart phone's impact. by furnishing an array of fantastic tools with which to the world-wide spread of a pandemic virus like SARS-COPD OR COVID-19. Individuals suspected of having COVID-19 are the subject of a data gathering effort. very important consideration. Implementing this using the Internet of Things Infrastructure calls for the linking of many dissimilar gadgets. Scalability is becoming more difficult as the number of heterogeneous devices proliferates. For the sake of network management and to facilitate a wide range of features, An Internet of Things (IoT) network must be planned or built via Internet of Things is defined by its software. SDN refers to a network in which the underlying hardware is defined entirely by software. As a result of the interconnectedness of its devices, an IoT network may centrally manage monitoring and gather data from a broad variety of sources. While permitting adaptability and expansion. Big data analytics helps by evaluating large amounts of data gathered through the Internet of Things. gives a tremendous impetus toward limiting the spread of the worldwide coronavirus epidemic (Marjani et al.2017; Zhang et al.2016). Big data merged with a number of newer technologies. AI and other forms of machine learning are being considered for use in the fight against the epidemic. But we've come to see that they don't perform up to par since people are reluctant to provide important health data. In addition to private information like where you've been. It's possible that future study may focus on improved data privacy, security, processing speed, and so that more people would feel comfortable providing important information those groups living together. Information quality must be raised. The concept of model sharing. As a means of addressing concerns over privacy and security, several well-known methods of encrypting data, such as AES, DES and 3DES don't appear to be appropriate for IoT devices. Need to create such computationally-light and energy-efficient. Security and privacy can be provided by lightweight algorithms that IoT gadgets. The exponential growth of the number of connected devices is changing the nature of the Internet of Things. In order to send all that needs to be sent, a network with a lot of available bandwidth is necessary. Sending data in a timely fashion from the sensor node to the cloud manner. Current Internet of Things gadgets rely on the 4G/LTE data system for the transfer of information. In contrast, a 5G network may make this issue would disappear.

4. Conclusion

When the entire planet is afflicted by a pandemic, COVID-19, outstanding contributions to the transformation of internet of things, artificial intelligence, and 5G are making concerted efforts to incorporate their relief of its effects. The suggested study and approach primarily detection and prevention of the spread of coronavirus infections. Several promising new technologies were discussed in this article. They have been modified for use in the war against the COVID-19 epidemic. How the Internet of Things may help with pandemic preparedness was laid down graphically and shown as a diagram including data capture, upload, and analysis health care provider and hospital or isolation ward. Its studies revealed that fighting against pandemics worldwide critically rely on timely data collection. To aid in remotely accommodating numerous users is a feature of many mobile applications. for the sake of working in a

cohesive setting. Administration from afar use of various contact tracking methods can decrease the need for direct physical contact between patients, healthcare providers, and patients. Latest gadgets and mobile software. Infected and maybe infected with Covid smartly and efficiently via remote management and monitoring Web-based support for IoT devices. Besides that, this Internet of Things – based. The success of e-learning and-commerce relies heavily on the underlying infrastructure. Business automation, too. People have gotten used to relying on cloud infrastructure for things like online shopping and contactless delivery in an effort to avoid personal interaction while keeping up with friends and family distances. This supports E-learning, allowing students to keep studying even when they are not physically in class. via use of online meetings and various educational software. The essay also draws attention to the numerous design challenges faced by IoT-based frameworks. Moreover, a number of difficulties concerns, such as secrecy, reliability, scalability, and accessibility. Pandemic preparedness is discussed and shown. Finally, Case examples from the post-pandemic period and the Internet of Things (IoT) and other technological revolutions are given and debated. Changes in the direction of "The New Normal"

References

[1] Abdulrazaq M, Nurul I, Salah A-Z, Sairah K, Safnaz M, Eddy Y (2020) Toward a novel design for coronavirus detection and diagnosis system using IoT based drone technology. Int J Psychosoc Rehabil 24: 2287–2295. https://doi.org/10.37200/IJPR/V24I7/PR270220

[2] Ackerman E (2017) Facedisplay and other bizarre virtual reality projects from chi 2017 [Online]. https://spectrum.ieee.org/tech-talk/consumer-electronics/audiovideo/facedisplay-andother-bizarre-virtual-reality-projects-from-chi-2017. Accessed 10 May 2017

[3] Afelt A, Frutos R, Devaux C (2018) Bats, coronaviruses, and deforestation: toward the emergence of novel infectious diseases? Front Microbiol 9: 702

[4] Allam Z, Jones DS (2020) On the coronavirus (COVID-19) outbreak and the smart city network: universal data sharing standards coupled with artifcial intelligence (AI) to beneft urban health monitoring and management. Healthcare (Basel) 8 (1)

[5] Aman MN, Chua KC, Sikdar B (2017) Secure data provenance for the internet of things. In: Proceedings of the 3rd ACM international workshop on IoT privacy, trust, and security, pp 11–14

[6] Amazon (2020) Amazon has hired 175, 000 additional people [online]. https://blog.aboutamazon.com/company-news/amazon-hiringfor-additional-75-000-jobs. Accessed May 2020

[7] Atkeson A (2020) What will be the economic impact of COVID-19 in the US? Rough estimates of disease scenarios, Tech. rep., National Bureau of Economic Research

[8] Azimi I, Anzanpour A, Rahmani AM, Paikkala T, Levorato M, Liljeberg P (2017) HICH: hierarchical fog-assisted computing architecture for healthcare IoT. ACM Trans Embed Comput Syst (TECS) 16 (5s): 174

[9] Backer AJ, Klinkenberg D, Wallinga J (2020) Incubation period of 2019 novel coronavirus (2019-nCoV) infections among travelers from Wuhan. Euro Surveill. https://doi.org/10.2807/1560-7917.ES.2020.25.5.2000062

[10] Bahuguna Y, Verma A, Raj K (2018) Smart learning based on augmented reality with android platform and its applicability. In: 2018 3rd International conference on internet of things: smart innovation and usages (IoT-SIU), pp 1–5

[11] Bai L, Yang D, Wang X, Tong L, Zhu X, Zhong N, Bai C, Powell CA, Chen R, Zhou J, Song Y, Zhou X (March 2020) Chinese experts' consensus on the internet of things-aided diagnosis and treatment of coronavirus disease 2019. Clin eHealth 6 (111). https://doi.org/10.1016/j.ceh.2020.03.001

[12] Bassam N, Asif H, Qaraghuli A, Khan J, Sumesh E, Lavanya V (2021) IoT based wearable device to monitor the signs of quarantined remote patients of COVID-19. Inform Med Unlocked 24: 100588. https://doi.org/10.1016/j. imu.2021.100588

[13] Blog G (2020) Privacy-safe contact tracing using bluetooth low energy [online]. https://blog.google/documents/57/Overviewof-COVID-19-Contact-Tracing-Using-BLE. pdf

[14] Bluetooth (2020) Fighting against COVID-19 via privacy-frst bluetooth tracing [online]. https://github.com/covid19cz/erouskaandroid. Accessed 06 June 2020