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The Road Map and Role of Internet of Things (IoT) in COVID-19 Pandemic Scenario

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ABSTRACT: Internet of Things is the network of physical things (embedded with sensors and other devices) used for interacting with other devices and systems over internet. It is communication between machines, which helps in automation, and monitoring. This paper discusses some of the major aspect of IoT in Indian context and then focuses on challenges, risk factors and its role present pandemic crisis of Covid 19 in Indian conditions. COVID-19 has proved to be a big threat to the entire human race. It has caused many deaths and the toll is increasing day by day. Inclusion of technology can help us fight this pandemic very efficiently. By applying IoT, AI and similar technologies, we cannot only prevent the spread of the virus but can also find the cure of this catastrophe. Adoption of technology is necessary to fight such epidemic or pandemic.

Keywords: Internet of Things (IoT), security, standard, Covid-19, sensor. Artificial intelligence.

Abbreviations: IoT; Internet of Things, AI; Artificial Intelligence.

I. INTRODUCTION

This Internet of Things (IoT) was a less popular term lately, and now a day it is certainly becoming a need. Whether it is big industries or home everything is approaching towards 'Smart'. We want smart trade, smart homes, smart industries and almost all. So, IoT is making its place in economy and in near future it would be having a great share in world economy. According to a report, the global market size of IoT was $170.6 billion in 2017 and is expected to reach $561.0 billion by 2024. In Indian context, it is likely to grow to a great extent and according to Deloitte's TMT India Predictions 2017, Internet of Things (IoT) will be the huge thing for administrators as India will quickly develop into a center point for IoT arrangements. The market estimation of IoT is expected to reach $19 billion by 2024. IoT units in India are likewise expected to see a fast development in multiple times to reach $2.9 billion by year 2024.

It is not only confined in offering new techniques or applications, rather it also provide new services and business models, which will be unconventional and robust. Though it can become a threat to many industries and various workers may become unemployed, but there is a beautiful saying that: Jobs never gets destroyed, they just change their forms by time, so is true for IoT. According to Gartner trends, IoT was among top 5 technology trends, which shows that IoT is having a capability to grow a lot in future. It is being used in many big scale applications like industrial monitoring, automated industries, traffic control, and smart cities. Even in the pandemic threat of Covid-19, IoT technologies are used to fight diseases during pandemics, and in many small scale applications like telemedicine, tracking ambulance vehicle's, monitoring elderly people and kids etc. Hence, IoT is the new talk of future, but in Indian context it is having a lot of challenges as well as advantages. IoT has been a mounting technological leaning in recent years. It has gained noteworthy attention in academia and computing industry in the past decade.

II. TECHNOLOGY ROAD MAP OF IOT IN INDIA

Government activities, supporting condition, great expectations for everyday comforts and expanding endorsement of savvy applications assumes the essential jobs in the development of market. As per 'IoT India Congress 2018', India's Internet of Things market will be worth $9 billion by 2020. The reception of IoT innovation is set to increment in every single significant part including media communications, wellbeing, agribusiness, cars and home.

Nasscom is progressively bullish on the possibilities of IoT in India as it predicts the fragment will hit $15 billion by 2020. Universally, Gartner gauges there will be 14.2 billion connecting devices being used by end of this current year. By 2022, it's required to arrive at 25 billion. IDC sees the areas understanding the capability of the innovation as the worldwide spending on IoTs is relied upon to hit $1.8 trillion by 2023. Make in India initiative by the Government of India, which encourages the enterprises to grow their business in this sector, can be a motivation for growth of IoT in India. There has been a focus on various application of IoT like Smart Grids, Smart Waste/Sewage Management, Smart Hospitals, Smart Safety etc. But Indian environment and infrastructure can prove to be a bit challenging for IoT due to irregular power supply, poor telecommunication services, high level of pollution, temperature non-

uniformity and humidity variation etc. No clean and poor telecom coverage is big challenge in Indian environment Fig. 1 shows the road map of IoT, which depicts the growth in the number of devices connected globally and almost everything. In 1960s communication was established between two computers using computer network. In the early 1980s, TCP/IP protocol was developed. The existence of the internet get started in the late 1980s. Later In 1991, World Wide Web (www) came in to industry, which made internet a huge success with rapid growth. Later in the same decade, cell phones began interfacing with the internet and framed the portable internet chain. By 2000 with the assistance of social internet, clients get associated with one another over the internet web. The following huge thing is the IoT, where object around us can associate with one another over the system and establish communication speak with the assistance of Internet.

The Internet of things systems are consisting of sensors, processors, many smart devices and software. All these are integrated among themselves in helping to transfer information between machines to machine. IoT technology has proved to be a keystone for many industry and business, IoT market is increasing in the entire globe due to lude technological advancements in the field of electronics devices and computer technology. The emergence of low-power hardware devices, robotics, smart sensors, cloud integration, big data analytics and automation also contributing a big role in the rapid growth of IoT based market. Mobile internet along with the emerging fields in computer science such as artificial intelligence (AI), edge computing, cognitive computing, predictive analytics, and cyber security are the major reasons for the growth of IoT in smart cities. Fig. 2 shows the growth rate of IoT devices. It is evident from the figure that IoT contributes an exponential growth with time.

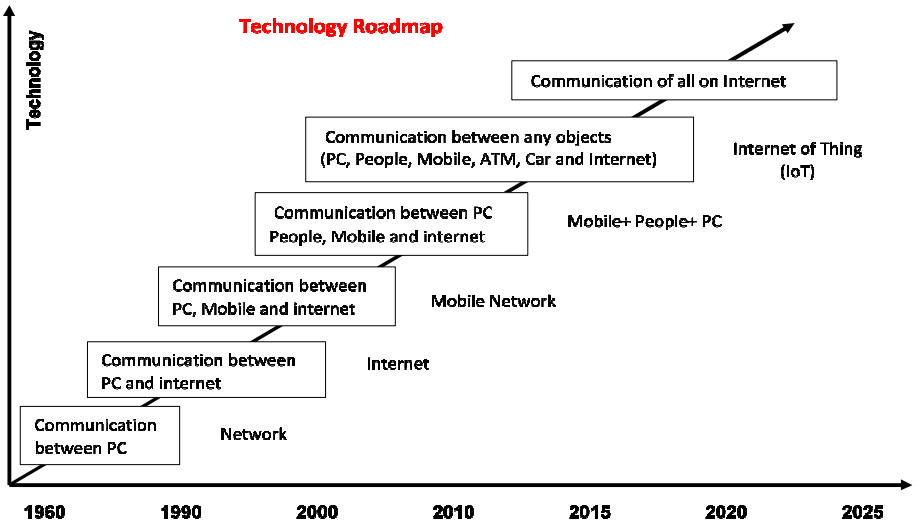

Fig. 1. Road Map of IoT.

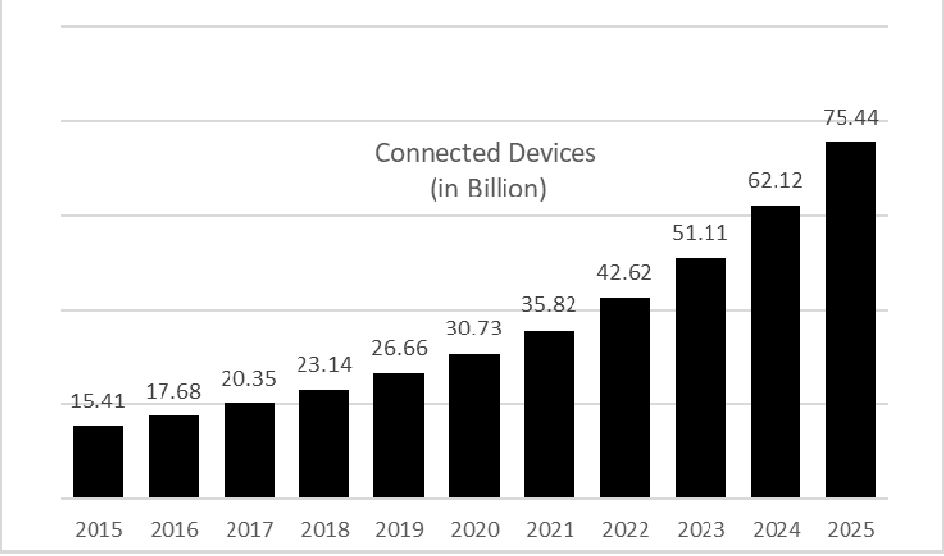

Fig. 2. Growth of IoT devices.

Role of IoT in India are useful in each domain, various companies are investing a lot in this sector, and their investment in this area are on increase day by day. The focus of Government initiatives are in the, healthcare, smart environment and agriculture, smart waste and water management, smart safety and supply chain, etc. Fig. 3 shows the Indian market share of IoT in key application areas.

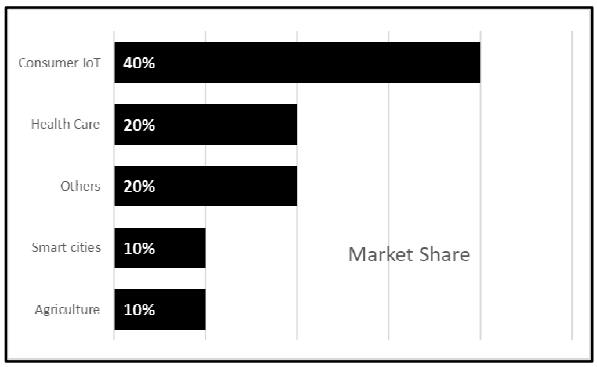

Fig. 3. Market share of IoT in India.

The most elevated evaluated need venture by Indian Government is Digital India, which is focusing on the consolation of digitalisation. Its primary mission is to combat India as a digital empowered country and knowledge based economy. This is relied upon to give the necessary inspiration to extension of the IoT productiveness environment in the nation. Globally IoT market is expected to raise from 15.4 billion devices in 2015 to 30.7 billion devices in 2020 and 75.4 billion in 2025. By the end of year 2020, IoT market in India is expected to grow to $ 15 billion worth with 2.7 billion units from current $ 5.6 billion and 200 million units. In the next 10 years, IoT would increase to about $10 to $15 trillion of global GDP.

III. CHALLENGES OF THE INTERNET OF THING

The various challenge in this technological prospects are listed below:

1. Security: The major issue in terms of IoT, because internet was never made keeping security in mind. So, it will become really difficult to maintain the security when in the future there will be millions of connected devices. So, good standards for designing and good data protection protocols are needed as there may be chances of data theft. Homogeneity in IoT is also a risk factor. This means that the devices which have similar designs or features can face a problem if there is a problem in even a single device.

2. Privacy: It is the essentiality in today's world in every aspect. When we work with so many sensors and data, then it is the most vital thing as no one wants someone else to know about his/her data. This thing can be a real threat in Indian perspective, as the data networks are neither flexible nor secure, and moreover cloud computing is not very much used in India. Cloud is the necessity of IoT. Every single bit of data is stored on cloud. So, we need secured and privacy protecting architectures for implementation of IoT in India for every sector.

3. Standards: Cheap quality networks, sensors and other devices may really prove to be harmful in IoT implementation. So, there is a strong need of standardization of devices, services etc. Because low quality products can behave anonymously, incorrect data could be fetched. This lead to a bigger loss when we take this on a larger scale like Industrial temperature control system.

4. Availability of Internet: It is a major challenge in India. We still don't have good connectivity, reliability and bandwidth of internet which is the backbone of IoT. India is not having that much of good bandwidth to all internet users. Internet Service Providers (ISP) are struggling to provide good bandwidth, and this hinder the normal streaming. All these limitations are posing a challenge in wide implementation of IoT.

5. Cost: The cost of IoT is a big challenge as Indian users are very selective for every technology and every product. So, it must be feasible and satisfactory for every consumer, else they won't be putting their money on it.

6. Resources: Lack of skilled workers/resources is a very large hurdle for IoT implementation in India. Simply 4.69 percent of India's workforce is officially gifted, as against 52 percent in the US, 68 percent in the UK, 75 percent in Germany, 80 percent in Japan, and 96 percent in South Korea. In individual rising economies like China, gifted laborers represent 24 percent of the workforce. So in a country where people think that technology snatches the jobs and new technology cannot survive, it remains a major problem of implementation at large scale in industries as well as in small scale like smart cities and smart homes.

IV. ROLE OF INTERNET OF THINGS (IOT) ON COVID 19

Data is one of the most integral assets we have for crushing and adjusting to pandemics. In the current pandemic circumstance, all the nations, including India, are battling with COVID-19 and yet searching for a useful and financially well informed answer. Scientists are endeavoring to take such difficulties, to develop new hypotheses, to depict new examination issues, to produce client focused clarifications, and and the general non-military personnel.

Social event data on a worldwide scale from individuals, human services gadgets and from the more extensive world is fundamental to restricting the possibly destroying effect of this and future pandemics. The more data we accumulate on pandemic, the better we can become at displaying the result and combat plan for the future. It's fundamental that those with associated gadgets working during the COVID-19 make their data accessible to specialists, while governments need to take a gander at manners by which existing data sources can be utilized more scientifically. For governments and organizations, this should fill in as a reminder that in this cutting edge world, information and understanding get through interfacing gadgets remotely and dissecting the data created in a sheltered and important manner. Organizations then will have the option to adjust, and secure workers by making new market chances to enable the economy to recuperate.

Technology can provide better ways to educate and make people aware about how does the virus spread, what can be the preventive measures so that we can

lessen the impact of Covid pandemic. Although there are many technologies out there such as AI, ML, cloud, robotics, but Internet of Things (IoT) can help in preventing the impact of this pandemic. In this section the role of IoT technology will be discussed on Covid -19 with some major features as following:

1. Monitoring and Screening by using IoT: This can prove to be a very nice way of preventing the Covid -19 from spreading. Drones are used to monitor the temperatures of people roaming in public areas, to detect whether or not any suspected person out there. This type of monitoring can also give an accurate information that the people are maintaining social distancing or not and to detect any dense gathering so that police can take proper action.

Not only drones but wireless sensors, face recognition and AI can be of a good help in this perspective. CCTV cameras in public can detect the people wearing masks and update the data of unmasked people in cloud. A better approach can be to make health cards of the citizens. It should include the health details of the person such as body temperature, heartrate etc. that can be further used to detect the suspect and allow the healthy person in grocery stores or public transport.

Screening measures can become effective by using IoT. We can make automatic testing kits, which can roam in cities and detect the patients right away. This will reduce the work force included and fasten the screening process.

2. Delivering Essentials: In these times, when restaurants and grocery stores does not open, IoT can help in delivering the essentials contactless. We can deploy many automatic drones to deliver the items from restaurants and grocery stores. This is a beneficial as no human will be involved and transaction will be paperless, so the spread can be prevented.

3. Sanitization: This is the most important aspect concerned with this pandemic. We need proper hygiene. Though government is doing sanitization of every place throughout the country, but IoT can make it efficient, regular and reliable. We can start automatic drones and cleaning systems which not only do sanitization regularly, but also keep a record of which areas need to be sanitized and how much sanitization is needed. This way the whole country can be kept clean.

4. Fake News: This is a very bad issue in present scenerio. At present social media and internet has become in every person's reach. Internet is useful but at the same time it proves to be very harmful. Fake news about the number of infected persons, death toll, government policies, cure, and medical facilities creates chaos among the fellow citizens. It can cause many unwanted things such as violence among communities, discrimination, conspiration, rise in the price of essentials etc. Nowadays anyone can spread fake news with just a click. So authenticity of any news remains suspicious. But IoT and AI can help the spread of misinformation. It can help in detecting the source of fake news and destroying the fake news as soon as it get posted by searching tools.

5. Finding cure of Covid-19: Both AI and IoT are already helping scientist in suggesting the vaccines and the components required to make it. Various sensor-based systems are doing analysis of the corona virus. The root cause is been analysed regularly. Biotechnology and IoT enabled platforms are helping scientists to help find the antibody of the virus. We must use IoT, AI and similar technologies to find the cure of this outbreak.

Therefore, it is imperative to take a gander at the distinctive torment focuses during a pandemic where human contact should be constrained, and that IoT and developing technology might have the option to address. A portion of these include the absence of ongoing data on the quantity of those contaminated, the rate the infection is spreading and how it's being transmitted in nature. This data is fundamental in arranging a reaction and picking where to center assets. Eventually it leads to the spread of the infection through physical contact and in broad daylight places. Secondly, the failure to remotely screen and administration key gear and hardware, particularly if it's a piece of basic framework and the financial effect of recreation, neighborliness and retail organizations shutting their ways to the general population and different enterprises guaranteeing their staff can work remotely

IoT is provide to be very useful in tackling these difficulties. Some of these are:

— IoT gadgets can assist with spotting possible manifestations of an infection. By social event data on both a small scale and full scale level, governments can distinguish unordinary slants before they become an issue and produce progressively exact demonstrating. This can extend from shrewd city cameras that recognize the quantity of patients with high temperatures, to gadgets, for example, a keen ring that can distinguish COVID-19 side effects from a wearer. On account of distributed computing, data from remote gadgets the whole way across the world can be overseen and deciphered rapidly and afterward made available to researchers all over the place, to distinguish designs and create learnings to battle the illness quicker.

— A great part of the world's basic foundation is detached or gives little in the method of remote diagnostics and notices, not to mention the capacity to remotely fix these issues. In a pandemic when physical contact should be restricted and workforces are exhausted, it's imperative that the necessity of having engineers nearby is decreased to a base. Completely IoT associated gadgets empower less visits and a superior capacity to unravel specialized issues remotely, boosting uptime and protecting representatives from making hazardous site visits.

— The COVID-19 emergency is constraining organizations to improve at a mind boggling rate. Retailers and other unimportant organizations that depend on clients truly entering their stores or outlets are presently reconsidering their plans of action so as to produce income. Some helpful ways are smart storage spaces and imaginative pick, pack and conveyance techniques. It can facilitate the weight on internet business tasks which are battling to adapt to the expanded request and make a 'zero-contact' approach that makes it simpler and more secure for business to oversee lockdown circumstances. For food and refreshment organizations, candy machines can be set in basic stores , markets and gas stations. Associating

these gadgets utilizing IoT, takes more prominent business knowledge gathering, live execution checking and showcasing advancements to gadgets.

— During a pandemic, medicinal services benefits plainly bear a great part of the weight as their restricted assets are extended past limit. IoT can help here in different manners. Remote patient checking, which implies that patients can be observed from their homes by specialists with incessant conditions to be checked from the solace of their own home. This opens up beds and decreases the danger of spreading the infection, and it in addition guarantees that if condition break down, they can rapidly be recognized and brought into emergency clinic.

V. CONCLUSION

Internet of Things (IoT) is the arrangement of interconnected devices consented to all the network components, hardware, software, availability of the network, and some other required devices implies that at last makes them responsive by supporting in data quarrel and assortment. On the off chance that we talk more about IoT, it is past to an idea that builds up the general compositional foundation which eventually this pandemic is the second most extensive issue after the worry of antibody improvement. We were surely not prepared for this pandemic but this outbreak gives us a lesson to be prepared for any upcoming emergency.

The utilization of the IoT idea makes the reachability to the patients very valuable, which at last assistance to give them noteworthy consideration with the permits the incorporation and the viable trade of the data between the individual and the specialist organizations. In the present circumstance, the majority of the issues are emerging in light of the fact goal that they can escape this sickness

VI. FUTURE SCOPE

The Internet of Things (IoT) is an all around characterized plan of interconnected figuring strategies, computerized, and mechanical gadgets having the ability of transmission of data over the characterized network. All these talked about gadgets are related with their specific novel recognizable proof numbers or codes. IoT is currently settled and demonstrated technology which goes about as an intersection to the umpteen strategies, quick investigation, reasoning of AI, tangible items, and so forth. Additionally, IoT in day by day working is perceived as the utility of the thing in serving the real life necessities of people in different methods, such as security arrangement of the home, controlling of electricity utilization and so on.

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Conflict of Interest. We declare that this manuscript has not been published and is not under consideration for publication elsewhere. We have no conflicts of interest to disclose.

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