Case Study

Tracking in Distribution of Vaccines through IoT Sensors

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Origin

The World Health Organization (WHO) declares Coronavirus Disease 2019 (COVID-19) pandemic on March 11th, 2020, due to its outspread globally, subsequent transmission from the Wuhan City, China December 2019. After the 1918 flu pandemic, this COVID-19 pandemic is the fifth vulnerable pandemic globally, which killed millions of lives. As we know, that the entire world is fighting with this pandemic in the development of vaccines across the globe by the initiation from pharmaceuticals companies. Generally, administering a vaccination requires years together, but this pandemic is so severe and urges the companies to embark on a race in the production and distribution of COVID-19 vaccination.

Research shows that there are currently 64 vaccines in clinical trials testing on humans, and nearly 20 vaccines reached the final testing stage-few vaccines for full use. Eight have got approval for limited/ emergency use in the Immunization against Covid-19, which involves eight vaccinations for emergency use and few vaccines consent for use. Already we have come across the first wave of vaccination drive. The second stage of the drive process puts forth many challenges in logistics and supply chain facilities to ensure that the vaccines will be administered reliably. COVID-19 is the fastest ever developed vaccination, but India is still a highly populated country: how does it face the challenges in its distribution and administering the vaccination.

Fact sheet

India is the 'pharmacy' for the entire world facing challenges and issues in distributing vaccines for the COVID-19 outbreak. The world's largest generic medicine producer is India, which accounts for 20 percent of the total global production and satisfies 62 percent of the vaccine's worldwide demand. By July 2021, the government has a plan to vaccinate nearly 25 crore people. Thirty-nine percent of the loss to the vaccine is due to the less availability of cold chain storage.

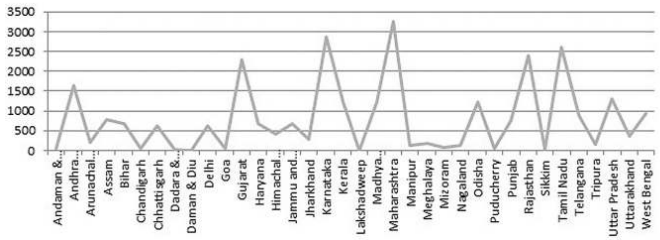

Figure 1: Cold Chain Equipment Availability (Source: MoHFW State wise cold chain equipment availability)

The availability of cold chain distribution will not be enough to meet our country's requirements, as displayed in the chart. Due to India's climatic conditions, it is of highly challenging task to keep the nature of medicine in cold storage. There is a need for the vaccine to be distributed through Cold chain distribution.

As programming languages shape the entire world, the business's nature and its services become more integrated. Digital initiatives benefit the service sector a lot, and the present world is more technology integrated and digitalized. Cost optimization in

production and logistics delivers substantiate benefits more than earnings.

Digital supply chain in supporting vaccine distribution cold chain and IoT

It is astounding that the speed of vaccine invention and production is a recovery measure for COVID 19. It is possible with the advent of technology, scientific research, and investment infrastructure. The faster the vaccine is manufactured, the faster it needs to be administered. Supporting this, the supply chain plays a vital role in the distribution of vaccine globally, but then the problem is the vaccine must be kept at -94 ! (-70!), -4 ! (-20!) (Values differ concerning different vaccine producer), gaining the most real advantage or else it will get spoiled. Hence here comes the question of the discussion about the possibility of making it successful. How do the digital supply chain of cold chain and IOT support the distribution of the vaccines?

Cold chain is the provision for the vaccination to be maintained at the required temperature. Digital cold chain focuses on monitoring the cold chain storage temperature with the support of temperature monitoring devices (TMD) and digital data logger (DDL) to ensure that the required temperature is maintained at the cold chain. When a good is loaded from a production unit to airways, waterways, rail, or trucks, the platform involves risk in supply chain management because of the poor temperature management. A report from the International Air Transport Association, 2019 highlights that, 25 percent of the vaccines through waterways incurs loss due to poor temperature management issues. The digital supply chain gears the vaccine distribution for the pandemic COVID-19, with its advanced innovations and tools and the hour's need.

IoT

Internet of Things in the digital supply chain reduces the risk in the supply chain by providing the details about location identification and the nature of the good through its GPS. IoT in the supply chain process involves updating the information wirelessly and automatically to solve temperature management and excursion issues. IoT facilitates the availability of information on a global scale, aggregation of data will be efficient, and position data will be the added advantage, highly automation so that manual monitoring can be reduced and proactive so that the cost optimization can be possible. IoT uses GPS-enabled thermal sensors to monitor the temperature excursion throughout the supply chain using a control tower.

The pandemic brings technology and the digital supply chain closer to minimize cost and efficient operations. Though there are challenges associated with the distribution of the vaccination, there are positive signs for bettering the situation with the use of a digital supply chain. COVID 19 paves the way for many innovations in digitalization. IoT is one such thing that helps a lot.

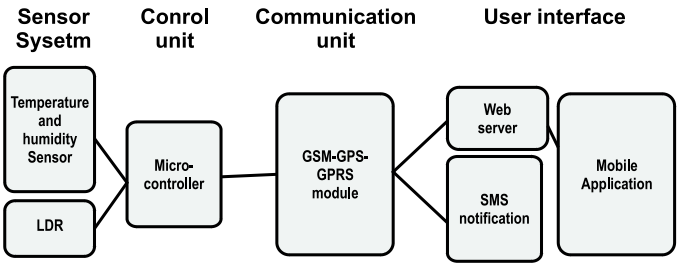

Figure 2: Block diagram of Monitoring System (Hasanat et al., 2020)

Conclusion

Mounting the vaccination, distribution, and administering it quickly is the tender goal. Administering the vaccine to billions of population in the country is not easy, considering the pandemic situation. Logistics and supply chain challenges in vaccine distribution stay top, wherein IoT can answer in streamlining the channel. Operations need to be scale up concerning the current pandemic and the economic turbulence. An IoT sensor helps the distribution channel to fix up the errors at the early stage. The availability of IoT in the digital supply chain progress opens up the transparency of the entire process gain advantage to the healthcare. Adopting IoT in the supply chain will obviously enhance the delivery and minimize the loss involved, thereby support the supply chain practices in a more significant way.