# Assess and Analysis Covid-19 Immunization Process: A Data Science Approach to make India self-reliant and safe

Muskaan Chopra[1], Sunil K. Singh[2], Gopal Mengi[3] and Devashish Gupta[4]

[1, 2, 3, 4]*Chandigarh College of Engineering and Technology, Chandigarh, India*

### Abstract

Covid-19 Vaccinations are playing a key role in keeping people safe from Coronavirus. India commenced its largest Covid-19 vaccination drive in January 2021. In response to the pandemic, the government implemented lockdowns across the country, causing the economy to stall. There was an urgent need to analyze the situation and come to a conclusion so that appropriate measures could be taken. This study analyzed the major role of the Covid-19 vaccination drive and also the economy using big data analytics and how these methodologies can be better utilized to examine the statistical properties of data, and also try to forecast a future prediction of the GDP of India using exponential smoothing and visualization tools. The authors portray the role of CoWIN, and Aarogya Setu, which use an approach of smart devices and the Internet of Things (IoT) in implementing a smooth vaccination process in a country with a population of 1.3 billion.

### Keywords

Data Science, Covid-19, Economy, Vaccination, CoWIN, IoT

## 1. Introduction

New instances of Covid-19 (Coronavirus) are expanding quickly at amazing rates worldwide; more than 1.2 billion individuals have fostered contamination and out of these, around 65,000 have kicked the bucket of this illness, until the present time. This has resulted in a huge effect on the economy worldwide and some officials of the international monetary fund (IMF) have also said that the world has gone into recession and this is worse than all previous ones. This explosion of data and information has resulted in an urgent need for a technology that can store this data and analyze it for the betterment of the future. Authors have analyzed the pre-pandemic and post-pandemic effects on the economy and have done a comparative analysis by graphical representations to visualize the data [1][23]. The use of smart devices has been of great help in this state of isolation and chaos. When the nation is in a state of emergency our government has taken the initiative of launching applications for smart devices like smartphones. This paper demonstrates the use of smart device applications like Aarogya Setu and CoWIN which have been of great use to the citizens and made the procedure of vaccination easy where the people can easily book their appointment and get their dose easily.

## 2. Literary Work

Big Data alludes to information that is huge, quick, or complex that it's troublesome or difficult to handle utilizing conventional techniques[25, 26]. Rewinding a year and a half, worldwide economies, organizations, and ventures were hopeful with regards to the yield of development going into 2020. The

CEUR Workshop Proceedings (CEUR-WS.org)

World Bank and The Economist cautioned on the compression in worldwide GDP to as low as 5.2%. Since the outbreak of the Covid-19 infection pandemic, investigators and specialists overall compete to extend greater and greater financial difficulties for the worldwide economy. With every day passing, the new figures are showing a gloomier picture than the past one. A decay of the worldwide economy by 1%, when contrasted with the past projection of a 2.5% development, has been gauged by the UN on 2 April 2020. The net effect that is projected is around 3.5%. This lockdown has impacted each Indian area, like the Economy, Retail Sector, Tourism Industry, and so forth [2]. This sparks a discussion about the analysis of the economic effects due to the pandemic and this can be done in a better way by the use of Big Data. India has a huge potential and resource in the manufacturing of vaccines [17]. The Serum Institute of India (SII) is responsible for exporting huge amounts of vaccines to developing nations and many countries rely on India for their vaccine supplies. This accounts for very good software that can handle this amount of data and can make the vaccination drive easy to manage, here come the applications (CoWIN and Arogya Setu) launched by the Indian government for smart devices like smartphones and the two applications which are the mainstream applications for the management of data of millions of people. **Figure 1** shows some technologies and devices which can be used in the field of IoT.

| Technology | Description | Pros | Cons |
|---|---|---|---|
| **Wearables** | An app-enabled technology that is worn on or adheres to the body for receiving and processing data. | • Consistent surveillance<br>• Improving the quality of Medicare coverage for patients<br>• Hospitals that are safer and more efficient<br>• Reducing hospitalizations | • Security and privacy of data<br>• Short battery life |
| **Drones** | Sensors and cameras, GPS, and communication systems installed on an aeroplane that is flown with little or no human input. | • Carry out a variety of activities, such as finding, monitoring, and delivering<br>• Reach hard-to-access locations<br>• Reduces worker contacts, such as maintenance. | • Security concern (large unstructured data)<br>• Service excellence<br>• Low connections |
| **Robots** | A programmable machine that, like a live thing, can manage complex behaviours. | • Remote diagnosis and therapy reduce interaction.<br>• Maintenance such as cleaning and disinfecting<br>• Reduce mental health problems | • Bias and privacy concerns |

**Figure 1**:IoT enabled smart devices during Covid-19

## 3. Role of Big Data and Smart Devices in Covid-19

Generally, when we talk about "Big Data" we refer to large quantities of unstructured data that fill the data layer of scientific computing applications and the Web [3]. Big data technologies can hold a large amount of information on Covid-19 virus afflicted people. It aids in a thorough grasp of the virus's nature [1]. Clinical decision support, population health management, and illness monitoring are just a few of the roles that big data technology may help with [14]. Scientists are using machine learning to forecast how a virus's proteins will interact with existing or novel treatments in the search for successful pharmaceuticals and vaccines, which now includes the frantic search for a viable Covid-19 vaccine [4][5]. Presently accessible smart gadgets incorporate cell phones, tablets and phablets, shrewd groups, and smartwatches [15]. Most utilized among the smart devices are cell phones [6]. Smart devices and IoT [18] are of great help in this time of pandemic as social isolation was a big problem in the running of the country and finances smoothly and connectivity was a huge issue, smart devices came here as a savior as they solved the problem of connectivity for good [7][16]. The government launched smartphone applications for the better management of the vaccination drive data [8]. The CoWIN framework is a start to finish arrangement that has utilities for the whole general wellbeing framework from the public up to the vaccinator level [19]. The framework (Figure 2) takes into consideration the making of clients (administrators, chiefs, immunizations), enrollment of recipients (mass transfer and

individual enlistment), offices/arranging unit, and meeting destinations followed by arranging and booking meetings and execution of the inoculation cycle [20][22].
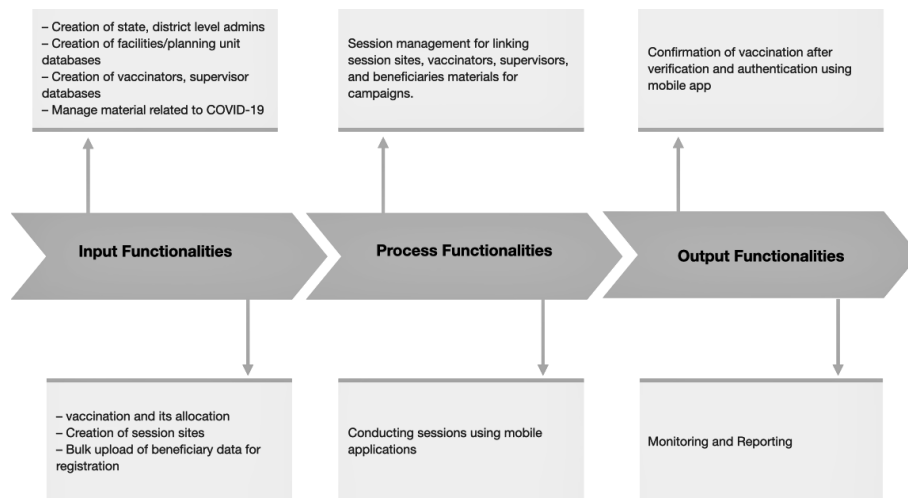


**Figure 2**: Flowchart of CoWIN System

## 4. Comparative Analysis

The world economy has been severely impacted by the Covid-19 pandemic. In the early weeks of 2020, the epidemic struck a frail global economy for the first time. The economy has come to a standstill [9]. To make the most of Big Data in economics, new analytic approaches are required [10]. In this paper, we have utilized Big Data to dissect the impact of the Covid pandemic to investigate the economy and GDP development of India, how the import-product of vaccines was of help in supporting the Indian economy [11][21].

### 4.1. Based on the economy and GDP growth

Since the time of the break of Covid-19, the countrywide closure has carried a quick finish to practically all financial exercises [12]. India's development tumbled to 3.1 percent in the final quarter of the monetary year 2020, as indicated by the Ministry of Statistics. The pandemic has unfavorably impacted the assessed GDP of the monetary year 2021 [13][24]. Figure 3 is a graphical representation of the GDP growth percentage and the annual change.
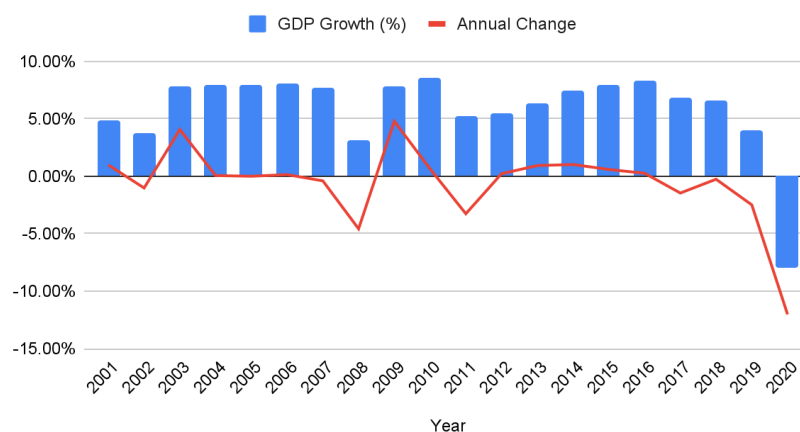


**Figure 3**: Analysis of the growth percentage of GDP and Annual Change

Before very long, a significant variable affecting the GDP is the number of cases, recuperation rates, and the speed at which immunization will be finished. Given the current circumstances, India's GDP is predicted to rebound quickly, and as per the forecasts as displayed in Figure 4.
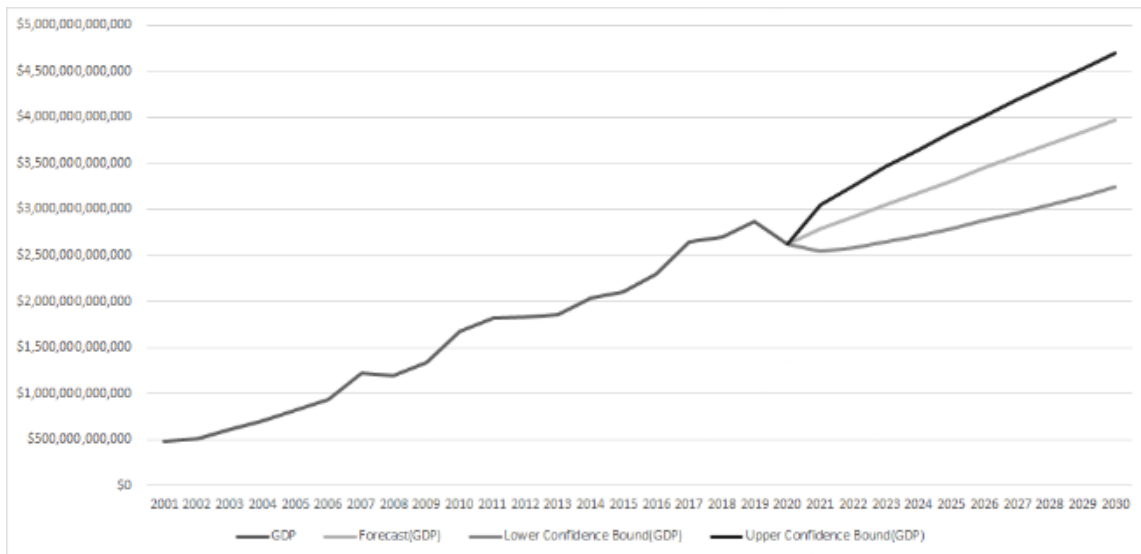


**Figure 4**: India's GDP Forecast up to 2030

## 4.2.    Effects of Vaccines on Economy

India is the largest manufacturer of vaccines in the world and during the pandemic. India's scientists discover 2 new vaccines Covaxin and Covishield which were exported to many developing nations including Bangladesh, Myanmar, Brazil, Egypt, Argentina, and this data goes further to 94 big and small countries. India sent out immunizations worth $3,327 million, with the most elevated in esteem terms ($879 million) coming in 2019-20. Figure 5 shows that the highest vaccines were exported to Bangladesh with 103 lakh vaccines and the average export was 7 lakhs.
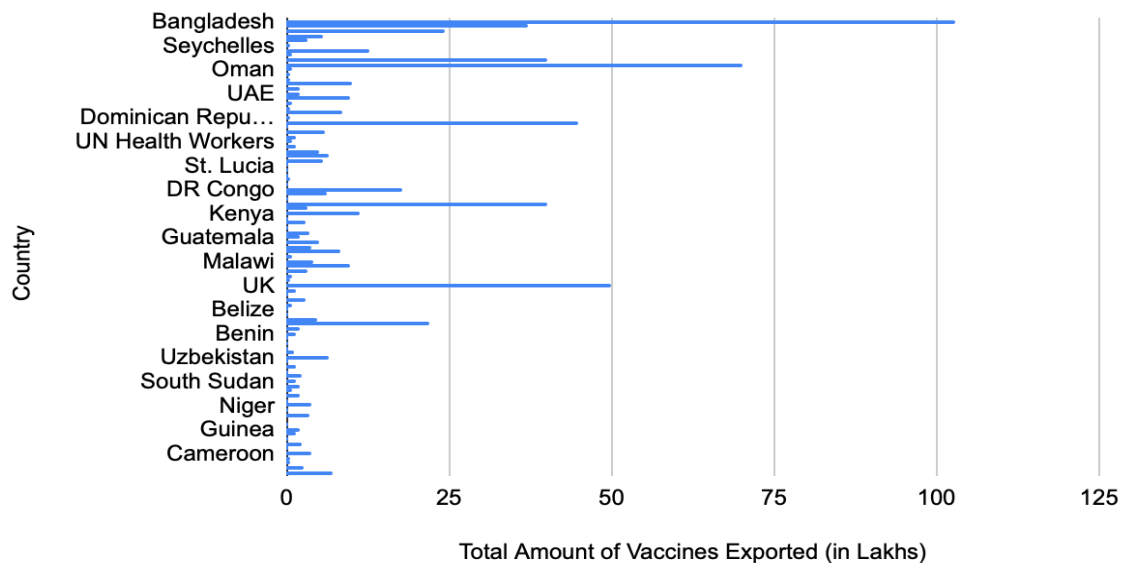


**Figure 5:** Vaccines exported by India to other nations

## 5. Conclusion

Many reports show how the economy is affected by certain factors and the fact that the economy was substantially affected in the time of Covid-19 as there were lockdowns and all economic activities were shut down. The situation was very critical and everyone was in a panic. But the smart devices such as smartphones and tablets were of great use that helped in spreading awareness in this crucial time when people needed the correct information. Big data was used to analyze the situation and how the surge of Covid-19 was impacting the economy whether in a positive way or negative but mostly negative. Smartphone applications like COWIN and Aarogya Setu were of great help and helped manage the data of millions of vaccination drives. We used Big Data to analyze Covid-19's economic impact, but it has a broad range of uses. It can be further used to analyze the territorial effects of Covid-19 and Big Data can be utilized to determine what age group of the population was affected the most so that appropriate measures can be implemented. To conclude further that the economy will take its time to regain momentum but on the brighter side as a developing nation, India was the torchbearer in this time of pandemic and helped many other nations to overcome it as well.

## 6. References

[1] Haleem, A., Javaid, M., Khan, I. H., & Vaishya, R. (2020). Significant Applications of Big Data in COVID-19 Pandemic. *Indian journal of orthopaedics*, *54*(4), 1–3. Advance online publication. https://doi.org/10.1007/s43465-020-00129-z.

[2] Barbate, V., Gade, R. N., & Raibagkar, S. S. (2021). COVID-19 and Its Impact on the Indian Economy. Vision, 25(1), 23–35. https://doi.org/10.1177/09722262921989126.

[3] Cuzzocrea, A., Saccà, D., & Ullman, J. D. (2013). Big data: A research agenda. In *Proceedings of the 17th International Database Engineering & Applications Symposium* (pp. 198–203). New York: ACM. https://doi.org/10.1145/2513591.2527071.

[4] Wu, J., Wang, J., Nicholas, S., Maitland, E., & Fan, Q. (2020). Application of Big Data Technology for COVID-19 Prevention and Control in China: Lessons and Recommendations. *Journal of medical Internet research*, *22*(10), e21980. https://doi.org/10.2196/21980

[5] Chopra, M., Singh, S. K., Aggarwal, K., & Gupta, A. (2022). Predicting Catastrophic Events Using Machine Learning Models for Natural Language Processing. In B. Gupta, D. Peraković, A. Abd El-Latif, & D. Gupta (Ed.), Data Mining Approaches for Big Data and Sentiment Analysis in Social Media (pp. 223-243). IGI Global. http://doi:10.4018/978-1-7998-8413-2.ch010

[6] Ichhpujani P., Thakur S. (2018) What Is a "Smart" Device?. In: Smart Resources in Ophthalmology. Current Practices in Ophthalmology. Springer, Singapore. https://doi.org/10.1007/978-981-13-0140-7_1.

[7] Krishna Kumar Department of Hydro & Renewable Energy, IIT, Roorkee, Uttarakhand, India Narendra Kumar Department of Information Technology, DIT University, Dehradun, Uttarakhand, India Rachna Shah National Informatics Centre, Dehradun, Uttarakhand, India - Role of IoT to avoid spreading of COVID-19 - DOI - 10.1016/j.ijin.2020.05.002.

[8] Gupta A., Bansal A., Mamgain K., Gupta A. (2022) An Exploratory Analysis on the Unfold of Fake News During COVID-19 Pandemic. In: Somani A.K., Mundra A., Doss R., Bhattacharya S. (eds) Smart Systems: Innovations in Computing. Smart Innovation, Systems and Technologies, vol 235. Springer, Singapore. https://doi.org/10.1007/978-981-16-2877-1_24

[9] Ramakumar, R., & Kanitkar, T. (2021). IMPACT OF COVID-19 PANDEMIC ON THE INDIAN ECONOMY: A CRITICAL ANALYSIS. *Investigación Económica*, *80*(315), 3–32. DOI - https://doi.org/10.22201/fe.01851667p.2021.315.76845.

[10] Harding, M., Hersh, J. Big Data in economics. IZA World of Labor 2018: 451 doi: 10.15185/izawol.451

[11] Ali, Imran. (2021). A STUDY ON IMPACT OF COVID-19 ON INDIAN ECONOMY.

[12] Garg, K. D., Gupta, M., & Kumar, M. (2021). *The Impact of COVID-19 Epidemic on Indian Economy Unleashed By Machine Learning*. *1022*, 012085. doi:10.1088/1757-899x/1022/1/012085.

[13] Kumra, Anya. (2020). IMPACT OF COVID-19 ON THE INDIAN ECONOMY. International Journal of Advanced Research. 8. 17-33. 10.21474/IJAR01/11461. http://dx.doi.org/10.21474/IJAR01/11461.

[14] Al-Ayyoub, M., Al-Mnayyis, N., Alsmirat, M. A., Alawneh, K., Jararweh, Y., et al. (2018). SIFT based ROI extraction for lumbar disk herniation CAD system from MRI axial scans. Journal of Ambient Intelligence and Humanized Computing, 1-9.

[15] Al-Ayyoub, M., AlZu'bi, S., Jararweh, Y., Shehab, M. A., et al. (2018). Accelerating 3D medical volume segmentation using GPUs. Multimedia Tools and Applications, 77(4), 4939-4958

[16] AlZu'bi, S., Shehab, M., Al-Ayyoub, M., Jararweh, Y., et al. (2020). Parallel implementation for 3d medical volume fuzzy segmentation. Pattern Recognition Letters, 130, 312-318.

[17] Amrita (2021), Game Theory for Cyber Security during COVID-19 Pandemic: A Holistic Approach, Insights2Techinfo, pp.1

[18] Ruchi Bhatnagar and Deepak Sinha (2021) Smart Adoption of IoT in Covid 19 Pandemic paves new era of sustainable future world, Insights2Techinfo, pp.1

[19] Tan, L., Yu, K., Bashir, A. K., Cheng, X., Ming, F., Zhao, L., & Zhou, X. (2021). Toward real-time and efficient cardiovascular monitoring for COVID-19 patients by 5G-enabled wearable medical devices: A deep learning approach. Neural Computing and Applications, 1-14.

[20] Nguyen, G. N., Le Viet, N. H., Elhoseny, M., Shankar, K., et al. (2021). Secure blockchain enabled Cyber–physical systems in healthcare using deep belief network with ResNet model. Journal of Parallel and Distributed Computing, 153, 150-160.

[21] Singh, K. S. (2021). Linux Yourself (1st ed.). Routledge.

[22] Sudhakar Kumar, Sunil Kr Singh, Naveen Aggarwal, Kriti Aggarwal, "Evaluation of automatic parallelization algorithms to minimize speculative parallelism overheads: An experiment", pp 1517-1528, 2021 Journal of Discrete Mathematical Sciences and Cryptography, Volume 24, Issue 5, Taylor & Francis, (2021).

[23] Aggarwal, K., Singh, S. K., Chopra, M., & Kumar, S. (2022). Role of Social Media in the COVID-19 Pandemic: A Literature Review. In B. Gupta, D. Peraković, A. Abd El-Latif, & D. Gupta (Ed.), Data Mining Approaches for Big Data and Sentiment Analysis in Social Media (pp. 91-115). DOI-10.4018/978-1-7998-8413-2.ch004

[24] Akshat Jain, Sunil Kr. Singh, Ankit Gupta, Ashim Bhasin, Swastikaa Moudgil, "Does Demonetization and Cashless Economy Really Go Hand in Hand!", International Journal of Data Mining and Emerging Technologies, ISSN(P): 2249-3212, Vol. 8, No. 2, pp132-142, Nov. 2018. DOI: 10.5958/2249-3220.2018.00015.0

[25] Inderpreet Singh, Sunil Kr. Singh, Sudhakar Kumar, Kriti Aggarwal (2021), "Dropout-VGG based Convolutional Neural Network for Traffic Sign Categorization", in the proc. of 2nd Congress on Intelligent Systems (CIS 2021), Lecture Notes on Data Engineering And Communication Technologies. Springer, Berlin, Heidelberg.

[26] Gupta A., Singh Sunil K., Ahuja K., Gupta A. (2020) Good Morning Turning to Spam Morning. In: Gunjan V., Garcia Diaz V., Cardona M., Solanki V., Sunitha K. (eds) ICICCT 2019 – System Reliability, Quality Control, Safety, Maintenance and Management. 2019. Springer, Singapore