International Journal of Scientific Research in Science and Technology
Print ISSN: 2395-6011 | Online ISSN: 2395-602X (www.ijsrst.com)
doi : https://doi.org/10.32628/IJSRST

A Blockchain-Based Covid Vaccine Booking and Vaccine Management System

Dandu Srivamsi[1], Punugupati Sai Kumar[2], Dr. M. D. Anto Praveena[3]
(UG Students)[1&,2] (Professor)[3]
Department of Computer Science, Sathyabama Institute of Science and Technology, India

Article Info
Volume 9, Issue 5
Page Number : 246-253

Publication Issue
September-October-2022

Article History
Accepted : 10 Sep 2022
Published : 25 Sep 2022

ABSTRACT

Immunization is all about using Blockchain for managing and tracing the vaccine stocks, logistics, and transparent distribution. Immunization gives you continuous visibility and enables actionable insights to track vaccine distribution and ensure a fair and equitable distribution. Immunization allows you to book your vaccination appointments and will also allow you to keep track of the vaccine being distributed. Blockchain helps in maintaining the integrity and transparency of the whole process right from the inception of the vaccine.

Keywords : Machine Learning Algorithms, Classifiers, Cervical Cancer, Ensemble Classification.

I. INTRODUCTION

The prevalence of coronavirus leads to respiratory infections with symptoms ranging from the common cold to more severe diseases such as Middle East Respiratory Syndrome (MERS) and Severe Acute Respiratory Syndrome (SARS). Since then, the eyes of the world have been on the pharmaceutical sector as industry leaders race to test, produce and distribute a vaccine to combat COVID-19. On March 11, WHO concluded that COVID-19 could be a pandemic. Worldwide the partners are working together to reduce the spread of disease by developing multiple vaccines. Once a vaccine is approved by WHO for common people's disposal, attention will turn to the orchestration and the planning done by the respective Governments for the vaccine distribution and the methods to be used by them such as shipping, storage, and distribution, especially if special storage condition is required. The most challenging factor is the demand for the vaccine. The immunization campaign is critical due to vaccine roll out and its success depends upon the transparent supply chain. The vaccine registration can be done us a blockchain consensus algorithm. The algorithm creates a new block to the chain and confirms the transaction. The blockchain algorithm is necessary for security while registering for the vaccine, which prevents fraud and enables trust. It requires more computational power and time. Real-time visibility can be obtained by providing detailed information about the cost and security analysis incurred by the stakeholders within the chain. In terms of latency and efficiency, the proposed blockchain system shows promising results.
The healthcare industry is loaded with immense data and those data are stored independently, hence there

would be no collision among the information stored. The test detail collection helps reduce pressure on healthcare and hospitals. In this project, we are implementing a website for a transparent and tamperproof vaccine distribution system. Patients can register, then log in, and may share their knowledge on our website. We also keep tracking the transactions and the vaccine being used. Blockchain technology could be a distributed ledger that ensures a transparent, safe, and secure exchange of data among supply chain stakeholders. Smart contracts are used for observing and tracking the right vaccine distribution. This enables people to believe that vaccines are effective and do their daily chores without any fear.

II. RELATED WORKS

A planning model for the WHO-EPI vaccine distribution network in developing countries: In many developing countries, inefficiencies in the supply chain for the World Health Organization's Expanded Program on Immunization (EPI) vaccines are of grave concern; these inefficiencies result in thousands of people not being fully immunized and creates a significant risk of disease epidemics. Thus, there is a great deal of interest in these countries in building tools to analyze and optimize how vaccines flow down several levels of the supply chain from manufacturers to vaccine recipients. This article develops a mathematical model for typical vaccine distribution networks in developing countries. This model has been successfully adapted for supply chains in three different countries (Niger, Thailand, and Vietnam), and its application to several issues of interest to public health administrators in developing countries are discussed.

Optimal influenza vaccine distribution with equity: This paper is concerned with the optimal influenza vaccine distribution in a heterogeneous population consisting of multiple subgroups. We employ a compartmental model for influenza transmission and formulate a mathematical program to minimize the number of vaccine doses distributed to effectively extinguish an emerging outbreak in its early stages. We propose an equity constraint to help public health authorities consider fairness when making vaccine distribution decisions. We develop an exact solution approach that generates a vaccine distribution policy with a solution quality guarantee. We perform sensitivity analyses on key epidemic parameters in order to illustrate the application of the proposed model. We then analyze the scalability of the solution approach for a population consisting of subgroups based on geographic location and age. We finally demonstrate the proposed model's ability to consider vaccine coverage inequity and discuss a derivative-free optimization approach, as an alternative solution method that can consider various different objective functions and constraints. Our results indicate that consideration of group-specific transmission dynamics is paramount to the optimal distribution of influenza vaccines.

Optimizing vaccine distribution networks in low and middle-income countries: Vaccination has been proven to be the most effective method to prevent infectious diseases. However, there are still millions of children in low and middle-income countries who are not covered by routine vaccines and remain at risk. The World Health Organization – Expanded Programme on Immunization (WHO-EPI) was designed to provide universal childhood vaccine access for children across the world and in this work, we address the design of the distribution network for WHO-EPI vaccines. In particular, we formulate the network design problem as a mixed integer program (MIP) and present a new algorithm for typical problems that are too large to be solved using commercial MIP software. We test the algorithm using data derived from four different countries in sub-Saharan Africa and show that the algorithm is able to obtain high-quality solutions for even the largest problems within a few minutes.

Optimizing national immunization program supply chain management in Thailand: an economic analysis,

Public Health: Objectives: This study aimed to conduct an economic analysis of the transition of the conventional vaccine supply and logistics systems to the vendor-managed inventory (VMI) system in Thailand.
Study design: Cost analysis of health care program.
Methods: An ingredients-based approach was used to design the survey and collect data for an economic analysis of the immunization supply and logistics systems covering procurement, storage, and distribution of vaccines from the central level to the lowest level of vaccine administration facility. Costs were presented in 2010 US dollars.
Results: The total cost of the vaccination program including the cost of vaccine procured and logistics under the conventional system was US$0.60 per packed volume procured (cm3) and US$1.35 per dose procured compared to US$0.66 per packed volume procured (cm3) and US$1.43 per dose procured under the VMI system. However, the findings revealed that the transition to the VMI system and outsourcing of the supply chain system reduced the cost of the immunization program to US$6.6 million per year because of the reduction of unopened vaccine wastage.
Optimal but inequitable prophylactic distribution of vaccine, Epidemics: The final epidemic size (R_∞) remains one of the fundamental outcomes of an epidemic, and measures the total number of individuals infected during a "free-fall" epidemic when no additional control action is taken. As such, it provides an idealized measure for optimizing control policies before an epidemic arises. Although the generality of formulae for calculating the final epidemic size has been discussed previously, we offer an alternative probabilistic argument and then use this formula to consider the optimal deployment of the vaccine in spatially segregated populations that minimizes the total number of cases. We show that for a limited stockpile of vaccines, the optimal policy is often to immunize one population to the exclusion of others. However, as greater realism is included, this extreme and arguably unethical policy is replaced by an optimal strategy where vaccine supply is more evenly spatially distributed.
Continuous Genetic Algorithms in the Optimization of Logistic Networks: Applicability Assessment and Tuning: Globalization opens up new perspectives for handling goods distribution in logistic networks. However, establishing an efficient inventory policy is challenging by virtue of the analytical and computational complexity. In this study, the goods distribution process that was governed by the order-up-to policy, implemented in either a distributed or centralized way, was investigated in the logistic systems with complex interconnection topologies. Uncertain demand may be imposed at any node, not just at conveniently chosen contact points, with a lost-sales assumption that introduces a non-linearity into the node dynamics. In order to adjust the policy parameters, the continuous genetic algorithm (CGA) was applied, with the fitness function incorporating both the operational costs and customer satisfaction level. This study investigated how to select the parameters of the popular inventory management policy when operating in non-trivial networked structures. Moreover, precise guidelines for the CGA tuning in the considered class of problems were provided and evaluated in extensive numerical experiments.

III. METHODOLOGY

Proposed System

In the prop the used system we are using a Blockchain which helps in maintaining the integrity and transparency of the whole process right from inception of the vaccine. block chain helps in managing and tracking the vaccine stocks, logistics and, transparent distribution.

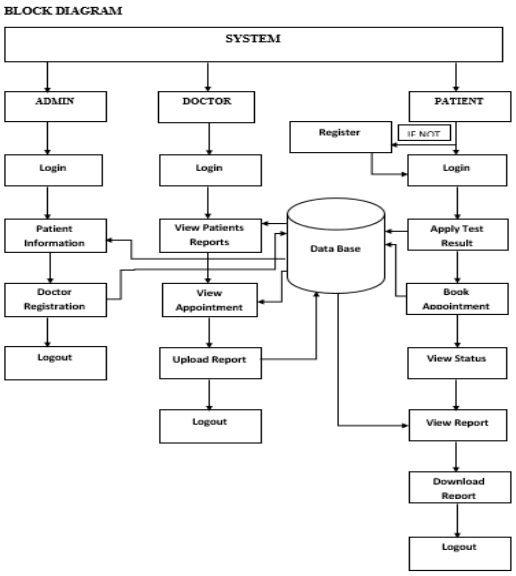


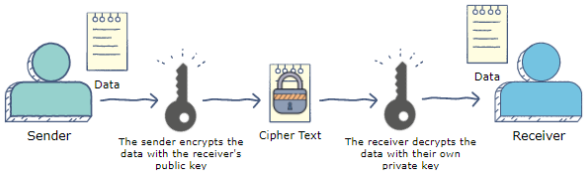
Figure 1 : Block diagram

IV. IMPLEMENTATION

The project has been implemented by the sing below listed algorithm.

DATA ENCRYPTION:

Data encryption translates data into another form, or code so that only people with access to a secret key (formally called a decryption key) or password can read it. Encrypted data is commonly referred to as cipher text, while unencrypted data is called plaintext. Currently, encryption is one of the most popular and effective data security methods used by organizations. Two main types of data encryption exist - asymmetric encryption, also known as public-key encryption, and symmetric encryption.



PURPOSE:

The purpose of data encryption is to protect digital data confidentiality as it is stored on computer systems and transmitted using the internet or other computer networks. The outdated data encryption standard (DES) has been replaced by modern encryption algorithms that play a critical role in the security of IT systems and communications.

These algorithms provide confidentiality and drive key security initiatives including authentication, integrity, and non-repudiation. Authentication allows for the verification of a message's origin, and integrity provides proof that a message's contents have not changed since it was sent. Additionally, non-repudiation ensures that a message sender cannot deny sending the message.

DATA DECRYPTION

Decryption is the process of transforming data that has been rendered unreadable through encryption back to its unencrypted form. In decryption, the system extracts and converts the garbled data and transforms it to texts and images that are easily understandable not only by the reader but also by the system. Decryption may be accomplished manually or automatically. It may also be performed with a set of keys or passwords. One of the foremost reasons for implementing an encryption-decryption system is privacy. As information travels over the World Wide Web, it becomes subject to scrutiny and access from unauthorized individuals or organizations. As a result, data is encrypted to reduce data loss and theft. Some of the common items that are encrypted include email messages, text files, images, user data and directories. The person in charge of decryption receives a prompt or window in which a password may be entered to access encrypted information.

Implementation:

This module includes home page, user registration, user login, doctor login pages

The user registers himself and takes the preliminary tests and can check the details of the disease and can book the appointment for taking vaccines and in the token confirm page can check whether his booking has been confirmed or not by the hospital management. A Doctor logs into his account and can check about his information in the home page, the home page also shows the number of visitors he has had and the appointment verify page shows the

appointments booked by patients and the doctor can either confirm. Patient can register, can login, fill the information related to the medications taken for other sickness and the doctor can decide when the person needs to take the vaccine. Meanwhile the patient can book appointment for the preferred hospital. Patient can see the appointment status in their login.

The user registers himself and takes the preliminary tests and can check the details of the disease and can book the appointment for taking vaccines and in the token confirm page can check whether his booking has been confirmed or not by the hospital management.

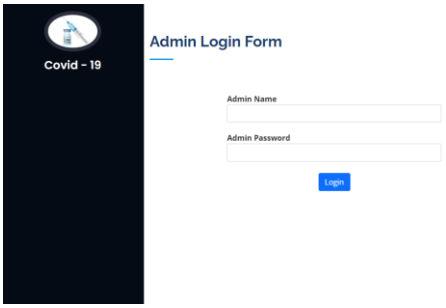
In the Admin module, admin can add the doctor's information along with doctor's information and view the patient health reports. In the Doctor module a doctor can add text information. View user test information and confirm user information.

V. Results and Discussion

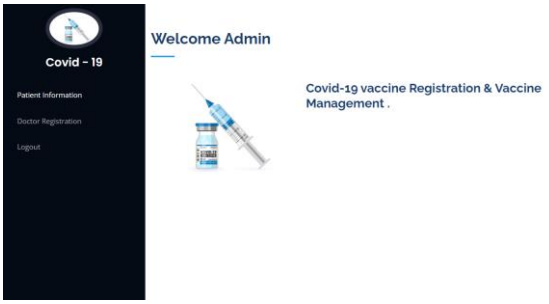
The following screenshots are depicted the flow and working process of project.

Home Page: This is the home page the project where can get all the facilities by using this application.

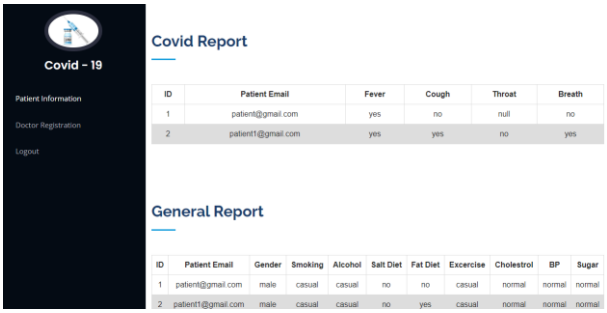
Admin Login Page: Admin should login by providing valid credentials.



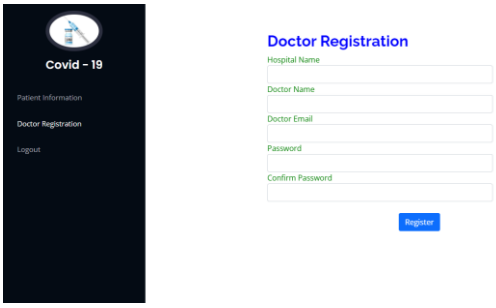
Admin Home Page: Admin can view the home page of the project with all facilities can accessed by the admin.



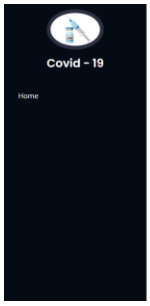
Patient Information: This page displays the patient information.



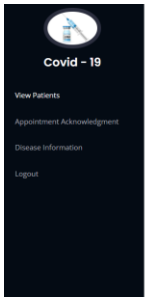
Doctor Registration Page: Doctor can register by providing required details.



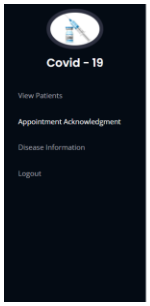
Doc Login Form: Doctor can login with valid credentials.



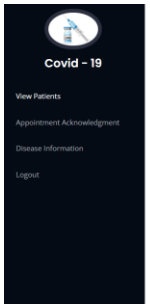
View patients: Doctor can view the patients.



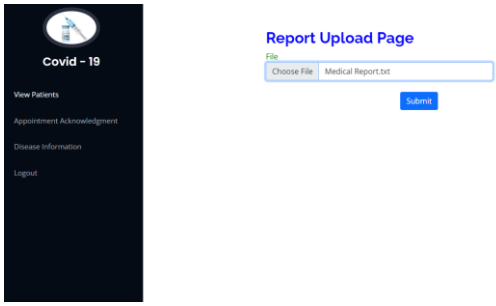
Appointment Request: This page contains appointment requested by the patient.



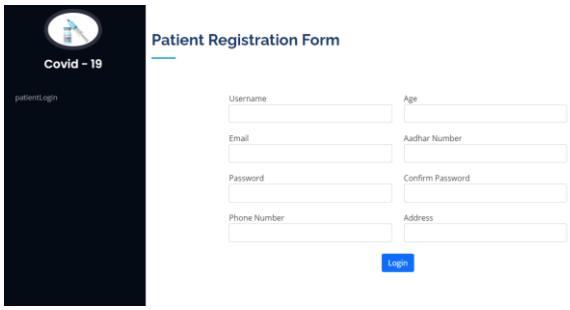
Disease Information: This page contains the information about the particular disease.



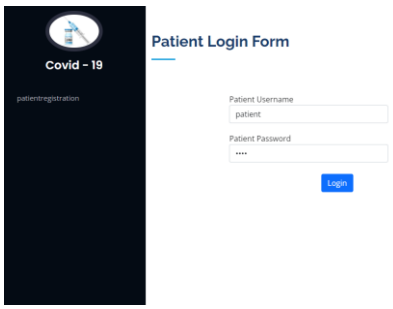
Report Upload Page: Doctor can upload reports related to particular patient.



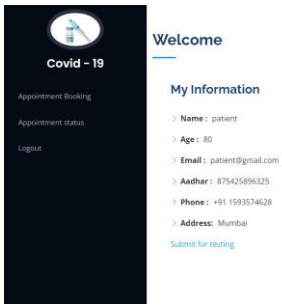
Patient Registration: Patient can register with the help of this patient registration page.



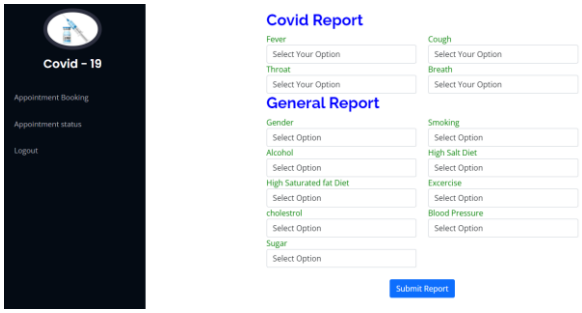
Patient Login Form: Patient can login with valid credentials.



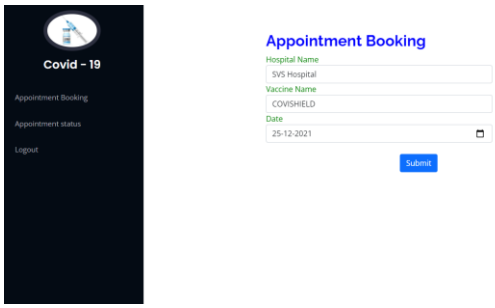
Patient information: This page contains all the information of patients.



Report page: Here patient can view the report.

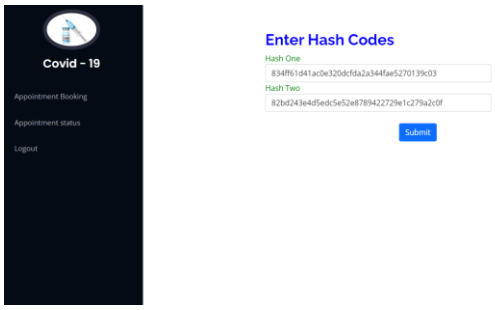


Appointment booking: Patient can book appointment.

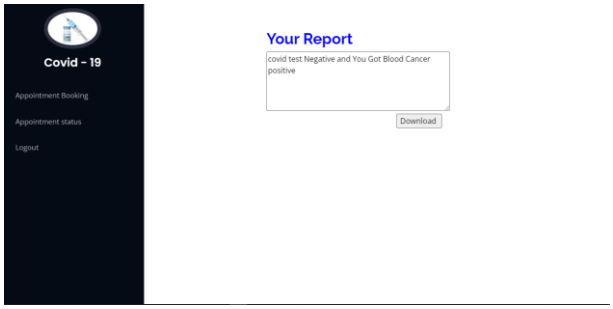


Appointment Status: Patient can view the status of his/her requested appointment.

Hash Codes: This page contains hash codes.



Patient Report: Patient can their report.



VI. CONCLUSION

In the research, the blockchain based system was implemented to trace the registration, transparency, storage and delivery of Covid-19 vaccine. Based on the findings, a blockchain solution is proposed for transparent vaccine distribution which manages the following:

1. Tracing the storage and delivery of Covid-19 vaccine with increased efficiency and transparency.
2. Assuring valid registration and monitoring the waiting test for immunization.
3. Providing a clear public reporting system.

Thus, Immunization is all about managing and tracing the vaccine stockss, logistics and transparent distribution. Immunization gives you continuous visibility and enables actionable insights to track vaccine distribution and ensure a fair and equitable. Immunization allows you to book your vaccination appointments and will also allow you to keep track of the vaccine being distributed.

VII. REFERENCES

[1]. Sheng-I Chen, Bryan A. Norman, Jayant Rajgopal, Tina M. Assi, Bruce Y. Lee & Shawn T. Brown (2014) A planning model for the WHO-EPI vaccine distribution network in developing countries, IIE Transactions, 46:8, 853-865

[2]. Shakiba Enayati, Osman Y. Özaltın, Optimal influenza vaccine distribution with equity, European Journal of Operational Research, Volume 283, Issue 2, 2020, Pages 714-725

[3]. Yuwen Yang, Hoda Bidkhori, Jayant Rajgopal, Optimizing vaccine distribution networks in low and middleincome countries, Omega, Volume 99, 2021, 102197, ISSN 0305-0483

[4]. A. Riewpaiboon, C. Sooksriwong, N. Chaiyakunapruk, P. Tharmaphornpilas, S. Techathawat, K. Rookkapan, A. Rasdjarmrearnsook, C. Suraratdecha,

Optimizing national immunization program supply chain management in Thailand: an economic analysis, Public Health, Volume 129, Issue 7, 2015, Pages 899-906.

[5]. Matt J. Keeling, Andrew Shattock, Optimal but unequitable prophylactic distribution of vaccine, Epidemics,Volume 4, Issue 2, 2012, Pages 78-85

[6]. Ignaciuk, P.; Wieczorek, Ł. Continuous Genetic Algorithms in the Optimization of Logistic Networks: Applicability Assessment and Tuning. Appl. Sci. 2020, 10, 7851.

[7]. Tsung-Ting Kuo, Hyeon-Eui Kim, Lucila OhnoMachado, Blockchain distributed ledger technologies for biomedical and health care applications, Journal of the American Medical Authorized licensed use limited to: IEEE Xplore. Downloaded on November 27,2021 at 07:26:58 UTC from IEEE Xplore. Restrictions apply. Informatics Association, Volume 24, Issue 6, November 2017, Pages 1211–1220

[8]. R. T. Hasanat, M. Arifur Rahman, N. Mansoor, N. Mohammed, M. S. Rahman and M. Rasheduzzaman, "An IoT based Real-time Datacentric Monitoring System for Vaccine Cold Chain," 2020 IEEE East-West Design & Test Symposium (EWDTS), Varna, Bulgaria, 2020, pp. 1-5

[9]. Khezr, S.; Moniruzzaman, M.; Yassine, A.; Benlamri, R. Blockchain Technology in Healthcare: A Comprehensive Review and Directions for Future Research. Appl. Sci. 2019, 9, 1736.

[10]. Hölbl, M.; Kompara, M.; Kamišalić, A.; Nemec Zlatolas, L. A Systematic Review of the Use of Blockchain in Healthcare. Symmetry 2018, 10, 470.

[11]. Marbouh, D., Abbasi, T., Maasmi, F. et al. Blockchain for COVID-19: Review, Opportunities, and a Trusted Tracking System. Arab J Sci Eng 45, 9895–9911 (2020). https://doi.org/10.1007/s13369- 020-04950-428. A. Kalla, T. Hewa, R. A. Mishra, M. Ylianttila and M. Liyanage, "The Role of Blockchain to Fight Against COVID19," in IEEE Engineering Management Review, vol. 48, no. 3, pp. 85-96, 1 thirdquarter,Sept. 2020

[12]. Fusco, A.; Dicuonzo, G.; Dell'Atti, V.; Tatullo, M. Blockchain in Healthcare: Insights on COVID-19. Int. J. Environ. Res. Public Health 2020, 17, 7167.

[13]. MK, Manoj; Srivastava, Gautam; Rama Krishnan Somayaji, Siva; Reddy Gadekallu, Thippa; Reddy Maddikunta, Praveen Kumar; Bhattacharya, Sweta, An Incentive Based Approach for COVID-19 using Blockchain Technology, November 2020, https://ui.adsabs.harvard.edu/link_gateway/2020 ar Xiv201101468M/arxiv:2011.01468 (Accessed 5 December 2020)

[14]. Ramirez Lopez, Leonardo Juan; Beltrán Álvarez, Nicolas (2020): Blockchain application in the distribution chain of the COVID-19 vaccine: a designing understudy. Advance. Preprint. https://doi.org/10.31124/advance.12274844.v1 (Accessed 5 December 2020)

[15]. Laura Lovett, Blockchain could be the key to vaccine distribution, MOBIHEALTHNEWS, November 25, 2020, https://www.mobihealthnews.com/news/blockc hain -could-be-key-vaccine-distribution-says-ibm (Accessed 5December 2020).

Cite this article as :

Dandu Srivamsi, Punugupati Sai Kumar, Dr.M. D. Anto Praveena, "A Blockchain-Based Covid Vaccine Booking and Vaccine Management System", International Journal of Scientific Research in Science and Technology (IJSRST), Online ISSN : 2395-602X, Print ISSN : 2395-6011, Volume 9 Issue 5, pp. 246-253, September-October 2022.
Journal URL : https://ijsrst.com/IJSRST229547