A PROJECT REPORT ON

HEALTHCARE MANAGEMENT SYSTEM

SUBMITTED TO THE SAVITRIBAI PHULE PUNE UNIVERSITY, PUNE
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OF

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SUBMITTED BY

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ZCOER
PUNE

CERTIFICATE

This is to certify that the Project Entitled

HEALTHCARE MANAGEMENT SYSTEM

Submitted by

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is a bonafide student of this institute and the work has been carried out by him under the supervision of **Prof. Balaji Chaugule** and it is submitted towards the partial fulfilment of the requirement of Savitribai Phule Pune University, Pune for the award of the degree of Bachelor of Engineering (Information Technology)

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ABSTRACT

In order to deliver a material flow with an ideal cost and time usually, supply chain management becomes more crucial in the developing globe. To build a better network of suppliers for their end consumers, several industries concentrate on supply chain management optimization and qualifications. Supply chain management is important for the quality of the services provided and patient satisfaction, particularly in the healthcare industry, where it applies to both pharmaceutical items and hospital supplies. As a result, the relevance of supply chain management in healthcare is highlighted by numerous research. The purpose of this study is to present a review of the literature on supply chain management in the healthcare industry in order to provide context by highlighting significant examples and studies that run concurrently with the most recent research. Additionally, by examining research in the literature, this literature review will evaluate a perspective to comprehend how to manage a complicated supply chain in the healthcare sector.

Keywords: Healthcare supply chain, Virtual centralization, Vendor Managed inventory Learning.

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CHAPTER 1

INTRODUCTION

1.1 OVERVIEW

Supply chain management (SCM) is a term used to describe a group of businesses that move products from suppliers, product assemblers, merchandisers, and transportation firms to the final consumer. A supply chain can also be defined as the flow of products, services, and information that begins with raw materials and ends with the end user.

The research continues to highlight the growing significance of supply chain management. It can be challenging to create performance measurement criteria in a supply chain, which makes evaluating performance in supply chains, especially multi-vendor supply chains, challenging. Additionally, supply chain management fosters collaboration between regional and international businesses in order to manage interactions among all supply chain participants and to combine the excellence of management processes. Due to logistics, pharmaceutical products, and patient happiness, supply chain management is becoming more significant in the healthcare sector to provide higher quality services than in other industries. Additionally, the healthcare industry has seen a tremendous amount of change. We Rapid over the past few years. Even though the methods and techniques have issues in industrial settings, many healthcare organizations are aware of the need of using a better methodology and method to implement their supply chain management plans. In both the public and private sectors, increasing supply chain management effectiveness is closely related to raising healthcare quality. In this investigation, research about supply chain management in the healthcare industry published between 2000 and 2018 will be investigated. The study is divided into four main sections: introduction, literature review, analysis, and conclusion and discussion.

1.2 MOTIVATION

- The world is changing incredibly fast, and we are not all aware of it.
- Big data storage of decentralized data storage as well as information system.
- The different attack issues in centralized database architectures.
- There is no automatic attack recovery in central data architectures.
- The decentralized architecture provides the automatic data recovery from different attacks.
- After the analysis of this system, we move to develop the decentralized system architecture.

1.3 PROBLEM DEFINITION AND OBJECTIVES

Problem Definition

To design and developed a system for supply chain management using blockchain technology, in this work system carried out three different modules like suppler, vendor and admin as well. Each transaction has stored into the blockchain which eliminate all network data attacks in P2P environment for health care systems

Objectives

- To eliminate the fraud in real estate as well as Supply Chain management-based transactions.

- Implement the system using blockchain technology with automatic at- tack recovery in multiple data nodes.
- To study and analysis the basic execution of blockchain in distributed databases environment
- To develop system for supply chain management for medicine using custom blockchain.
- To design new hash generation, smart contract, and mining approach for pro-posed blockchain.
- To validate the system with various consensus algorithm in Peer to Peer (P2P) environment

1.4 PROJECT SCOPE AND LIMITATIONS

Scope

Blockchain, the digital ledger technology that can securely maintain continuously growing lists of data records and transactions, has the power to potentially trans form medicine and health care supply chain management, according to industry experts. By simplifying and expediting the way the transaction industry processes data in such areas as revenue cycle management, health data interoperability and supply chain validation, blockchain has the power to dramatically reduce back-office data input and maintenance costs and improve data accuracy and security

Limitations

- Modify the transaction data, it may cause double spending attack.
- To stop the block verifying transaction.
- To stop miner mining any available block.

1.5 METHODOLOGIES OF PROBLEM SOLVING

- Input: Let S be the S= A1, A2, A3
  Where, A1: Set of Attributes set toMedicine

A2: Set of Access policy generated by distributor companies.

A3: Medicine Upload.

- Output: O = S, A S= Check Attributes set to medicine by company's Values= Create Order distributor and user information by medicine.
- Functions: S= F1, F2, F3, F4 F1=Get Attributes medicine Data collection F2= Access policy generated by user, distributor, and companies F3=Transaction order by user, distributor, and companies F4= For each transaction system creates the hash block and add into the current blockchain
- Success Conditions: Block chain valid and Invalid displayed
- Failure Conditions: Error message for failure

CHAPTER 2

LITERATURE SURVEY

2.1 LITERATURE SURVEY

In a fog-based vehicle ad-hoc network, there is a privacy preservation and secure data exchange system [1]. By evaluating vital information and applying data confidentiality with the assistance of Hierarchical Attribute-Based Encryption (HABE) with an efficient key exchange, a Privacy Preservation and Secure DataSharing Scheme in Fog Based Vehicular Ad-hoc Network is developed. To securemessage transmission between cars, the proposed approach additionally employssymmetric encryption and just a Hash-based Message Authentication Code (HMAC)calculation using the shared secret key. It also enables fine-grained access controlbefore outsourcing data to the cloud server, ensuring privacy is dependent onownership, reducing the amount of data transferred to the cloud server in a shortperiod of time, and lowering bandwidth needs owing to quick analytics at the edge. In a mobile environment, a Blockchain-powered crowdsourcing method with privacypreservation [2]. BPCM, a blockchain-powered crowdsourcing approach thatconsiders privacy in a mobile setting. A blockchain-based mobile crowdsourcingarchitecture is meant to protect participants' privacy as well as the integrity ofservice requests and delivery. Then, to cluster the requestors and pro- duce servicestrategies, density-based spatial clustering of applications with noise (DBSCAN)and improved dynamic programming (IDP) are used. Furthermore, simple additiveweighting (SAW) and multiple criterion decision making (MCDM) are used to findthe best approach for optimizing service time, boosting profitability, and

lowering provider energy use.

Integration concerns, opportunities, obstacles, and future research objectives for privacy protection in blockchain-based IoT systems [3]. By concentrating on apps that we use every day, we can address the privacy concerns raised by blockchain integration in IoT applications. We also go through how to implement five privacy-preserving mechanisms in blockchain-based IoT systems: anonymization, encryption, private contracts, mixing, and differential privacy. Finally, we explore the obstacles and future perspectives for blockchain-based IoT systems privacy research. This study may be used to design future privacy preservation techniques for IoT systems that use blockchain to handle a variety of privacy issues.

For the internet of connected automobiles, an edge computing-enabled compute of-floating technique with privacy protection [4]. In terms of technology, the privacy conflicts of computing jobs in IoV are codified. Then, for a vehicle, vehicle-to-vehicle (V2V) communication-based routing is intended to get routing vehicles from the origin vehicle, with the computing task placed at the destination vehicle. To achieve multi-objective optimization, the NSGA-II (non-dominated sorting genetic algorithm II) is used to improve ECD execution time and energy usage while also preventing privacy conflicts across computing activities. Finally, experimental assessments are carried out in order to confirm ECO's efficiency and efficacy.

Fed Opt: Towards Federated Learning Communication Efficiency and Privacy Preservation [5]. In order to increase communication efficiency and privacy protection in FL, a novel technique called Federated Optimization (FedOpt) was developed. To make FedOpt work, we created a new compression technique called Sparse Com- pression Algorithm (SCA) for fast transmission, and then combined additively ho- mom orphic encryption with differential privacy to avoid data leakage. In order to implement the learning task, the suggested FedOpt seamlessly trades off communication efficiency and privacy protection. FedOpt outperforms state-of-the-art FL methods, according to the findings of the experiments. We look at three major assessment criteria in particular: model correctness, communication efficiency, and computing overhead.

Efficient Certificate-Less Aggregate Signature Scheme for Vehicular Ad Hoc Net-

works with Conditional Privacy Preservation Enhanced Smart Grid System [6]. ECLAS is a certificate-less aggregation mechanism for VANETs that may be used in a smart grid scenario. The suggested technique uses elliptic curve cryptography to enable conditional privacy preservation for communicative vehicles by adding time verified pseudo-identification and solving the KGC (Key Generation Center) escrow is- sue. According to the performance assessment, the suggested approach is more efficient than comparable research work because it avoids costly calculation procedures such as bilinear pairings. Similarly, when considering the security requirements of VANETs systems applicable in a smart grid context, communication costs are withinthe optimal range for most relevant operations.

A Survey on the Use of Blockchain to Preserve Privacy in Resource-Constrained IoT Devices [7]. The uses of IoT in many industries and the privacy challenges that IoT in resource-constrained devices faces. We go through some of the uses of blockchain across a wide range of fields, as well as the opportunity it provides to address IoT privacy concerns. Then, based on the deployment of blockchain in IoT, we survey various studies. The purpose of this study is to review current research on blockchain application in IoT for privacy protection. After reviewing current solutions, we've determined that the blockchain is the most effective method for avoiding identity disclosure, monitoring, and tracking in the IoT.

A Decentralized Healthcare Blockchain for IoT that Preserves Privacy [8]. the usage of a blockchain to enable safe healthcare big data management and analysis Blockchains, on the other hand, are computationally costly, need high band- width, and require additional processing capacity, making them unsuitable for most resource-constrained IoT devices aimed for smart cities. In this paper, we attempt to address the concerns 5using blockchain and IoT devices. We of- fer a new framework of modified blockchain models that are ideal for IoT devices and depend on the network's distributed nature as well as other privacy and security features. Our model's added privacy and security features are based on sophisticated cryptographic primitives. Over a blockchain-based network, the solutions presented here make IoTapplication data and transactions more secure and anonymous.

For Connected Vehicles, a Distributed Blockchain-Based Message Authentication

Scheme [9]. Using blockchain technology, create a message authentication mechanism for anonymity and decentralization of information. For safe authentication, we present the public-private key and message authentication code (MAC). In this study, we include proof of work (Pow) and Practical Byzantine Fault Tolerance (PBFT) into the proposed authentication procedure as consensus algorithms for assembling blockchain systems. Finally, we show that the suggested technique is safe against attacks such as internal attacker impersonation as well as common assaults.

Secured Traffic Monitoring on VANETs through Distributed Incentive-Based Monitoring [10]. a distributed trust management system with an incentive-based secure event detection model based on the Byzantine fault-tolerant Paxus algorithm and game theory The proposed approach is unique in that, unlike existing models, it can assess the correctness of broadcast information when malicious cars make up the bulk of the ROI compared to non-malicious vehicles. The VENTOS, SUMO, and Omnet++ simulators were used to test the proposed system's feasibility and efficacy by addressing all conceivable use-case situations and under the impact of at least onenon-malicious vehicle at each RSU.

CHAPTER 3

SOFTWARE REQUIREMENT SPECIFICATION

3.1 ASSUMPTION DEPENDENCIES

1. The new nodes agree with the transaction of block which is sending by the old nodes.
2. The new nodes do not agree with the transaction of block which is sending by the old nodes.
3. The old nodes agree with the transaction of block which is sending by the new nodes.
4. The old nodes do not agree with the transaction of block which is sending by the new nodes

3.2 FUNCTIONAL REQUIREMENT

The system contains following modules:

1. Admin
2. Make transaction
3. Block Generation and blockchain validation
4. Consensus Algorithm validation and block chain recovery

5. Results Generation

This system highlights the implementation of e-transaction system using blockchain for such a proposal from a practical point view in both development/deployment and usage contexts. Concluding this work is a potential roadmap for blockchain technology to be able to support complex applications. In the system carried out transaction system for online user, where end user easily accesses the system and make the trans-action without using any third-party validation. The system cannot be generating any high-level hardware configuration requirement, it possible to make vote using traditional configuration. The able to perform the transaction without any hardware device with drastic security manner. In this data is processed in multiple servers so the transactions are processed in sequencing P2P distributed network. This illuminates the quality-of-service issue and time limits. This is a middleware system in which the processing environment in which the load will be balanced using threads. The request generated will be parallels saved on all nodes in a Blockchain manner. We use the Hash generation algorithm and the Hash will be generated for the given string. Before executing any transaction, we use peer to peer verification to vali- date the data. If any chain is invalid then it will recover or update the current server block chain. This will validate till the all nodes are verified and commit the query. Mining algorithm is used for checking the hash generated for thequery till the valid hash is generated.

Implementation Procedure

- We create a multiple Distributed ledger and e-transaction transnational data and stored all transnational data into multiple data nodes.
- Each node will hold the specific block for each transaction.
- Same block has replaced for all nodes, and generates a valid block chain.
- System will retrieve data from all data nodes and commit the transaction, it should be any kind of DDL, DML as well as DCL transactional query.
- If any block chain invalid during the validation of data servers, then system will automatically recover whole blockchain using majority of servers.

- We will address and eliminate the runtime server attacks and recover it using own blockchain.
- System will provide each transactional validation, for all servers

3.3 EXTERNAL REQUIREMENTS

3.3.1 User Interface

The Interface will be in the form of an application. It is designed to be functional and minimal in its styling. All options will be displayed in a menu-based format. Web app will be used to setup the page layout and add minimal styling to make the interface user friendly.

3.3.2 Software Interfaces

It will also have a MySQL relational database. The main backend processing will be done using advance java framework including connecting to and accessing the database and processing requests.

3.3.3 Communication Interface

All the program's features are available offline. You only need an internet connection to download the application, update it and (optionally) to get some target images for your personal profile. Our Project belongs to android based, so connecting user at online with request and response form. For that HTTP protocol we are going to us. HTTP protocol: The Hypertext Transfer protocol is an application protocol for distributed, collaborative, and hypermedia information systems. HTTP is the foundation of data communication for the World Wide Web. Hypertext is structured text that uses logical links (hyperlinks) between nodes containing text.

3.4 NON-FUNCTIONAL REQUIREMENTS

3.4.1 Usability

The system is designed keeping in mind the usability issues considering the end-users who are developers/programmers. It provides detailed help which would lead to better and faster learning. Navigation of system is easy.

3.4.2 Security

The system provides security to the randomly generated private key by performing encryption to it for encrypting patient data and thus protects from other nodes in the network. The network is free from malicious node and misbehaving node attacks.

3.4.3 Reliability

Our system can provide user an efficient search each time. So, the user can reliable on the system. Because system can guarantee user to provide his/her interested data every time in least amount of time

3.5 SYSTEM REQUIREMENTS

3.5.1 Hardware Resources Required

- System: Pentium IV 2.4 GHz.
- Hard Disk: 500 GB
- Monitor: 15 VGA Color
- Ram: 8 GB

3.5.2 Software Resources Required

Platform:

- Operating system: Windows XP/7 Higher
- Programming Language: JAVA/J2EE/

- Tools: Eclipse, Heidi SQL, JDK 1.7 or Higher
- Database: MySQL 5.1

3.6 ANALYSIS MODELS: AGILE MODEL

The below table show our project plan, how whole procedure will execute base on SDLC phases. This plan is the basis for the execution and tracking of all the project activities. It shall be used throughout the life of the project and shall be kept up to date to reflect the actual accomplishments and plans of the project. Below figure shows the software project plan. Requirement gathering and plan for the initial part of the project was as follows: While requirement gathering and analysis of pro-posed system, we to understand the problem definition and reliability of system. It also includes gathering information about required software and hardware. SDLC

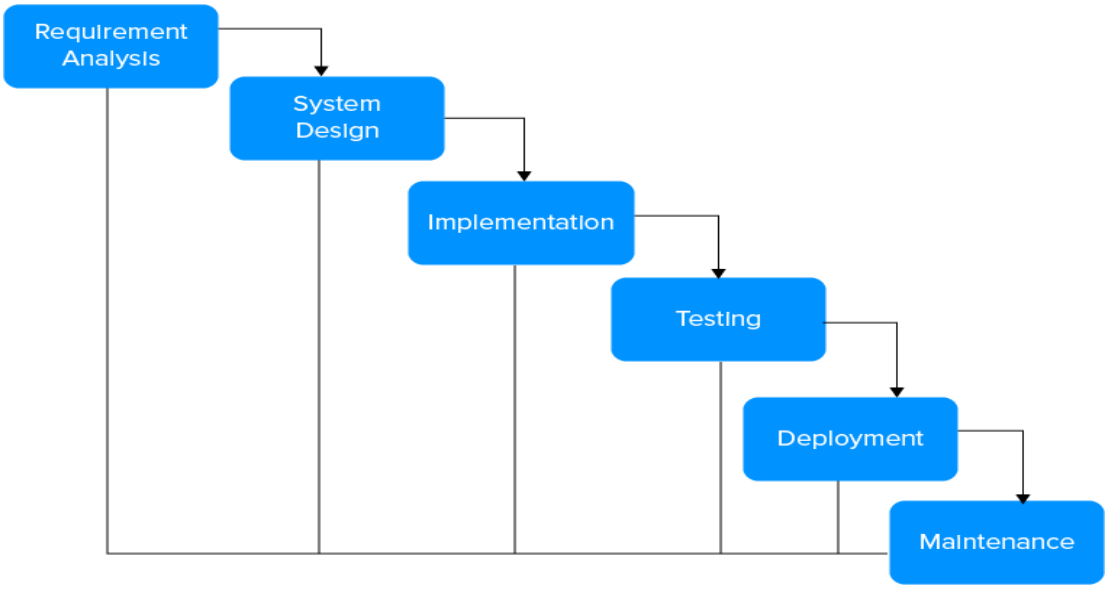

Figure 3.1: Waterfall Model

Waterfall model is being depicted by our system.

- The initial stage is requirement analysis stage here the data is being gathered which is to be provided as an input to the system.
- Second stage is the design stage where all the data is being formatted into a particular matrix. The scores are used to generate the matrix.

- Third stage is the coding stage in which the system performs its main functionality of mapping of the classes and getting the exact prototype.
- Testing is done in the fourth phase in order to test the word with the probabilistic label.
- In the maintenance phase it is the last phase wherein the system has to depictand maintain the probabilistic labels of the respective words.

CHAPTER 4

SYSTEM DESIGN

4.1 SYSTEM ARCHITECTURE

This system highlights the implementation of e-transaction using blockchain for such a proposal from a practical point view in both development/deployment and usage contexts. Concluding this work is a potential roadmap for blockchain technology to be able to support complex applications. Building an electronic transaction system that satisfies the legal requirements of legislators has been a challenge for a long time. Distributed ledger technologies are an exciting technological advancement in the information technology world.

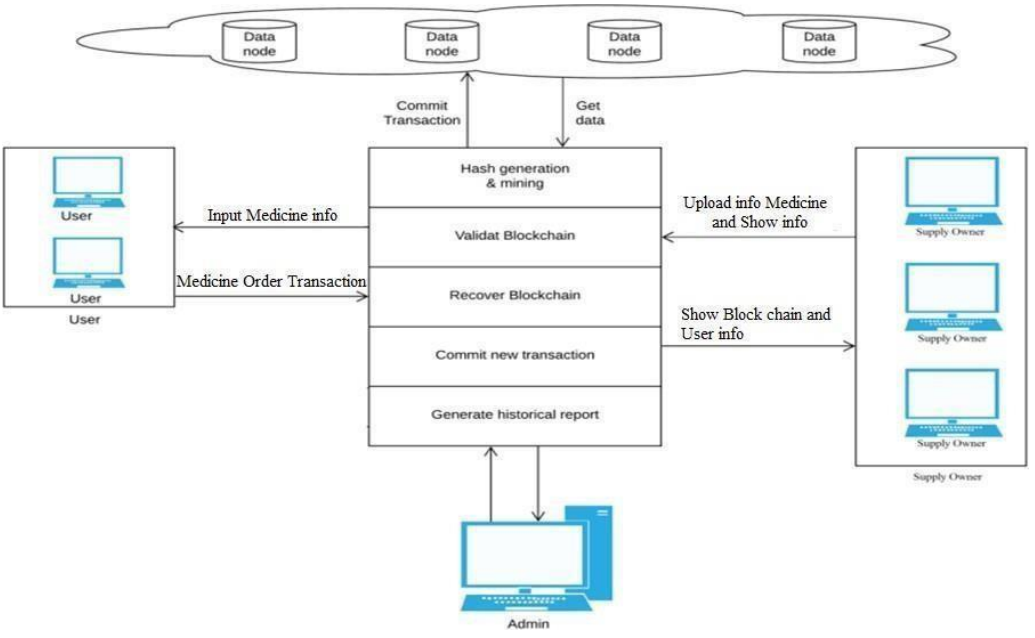

Figure 4.1: Architecture diagram

4.2 USAGE SCENARIO

4.2.1 User profiles

User: The user sends a request for the text to be checked for Medicine Details.

Admin: Admin manages the website and configure a system to send responds to user requests. His/ Her another role is to maintain the algorithm and the server.

4.2.2 Use-cases

Sr No.	Use Case	Description	Actors	Assumptions
1	Webpage	Getting Show of Medicine Details	User	User click on button
2	Enter Order Medicine	Show Medicine Details from web page	User	Error message will be displayed
3	Transaction Store Block Chain System	Transaction and Block chain the model	admin	Admin transaction store on new data

Table 4.1: Use Cases

4.2.3 Use Case View

Use Case Diagram. Example is given below

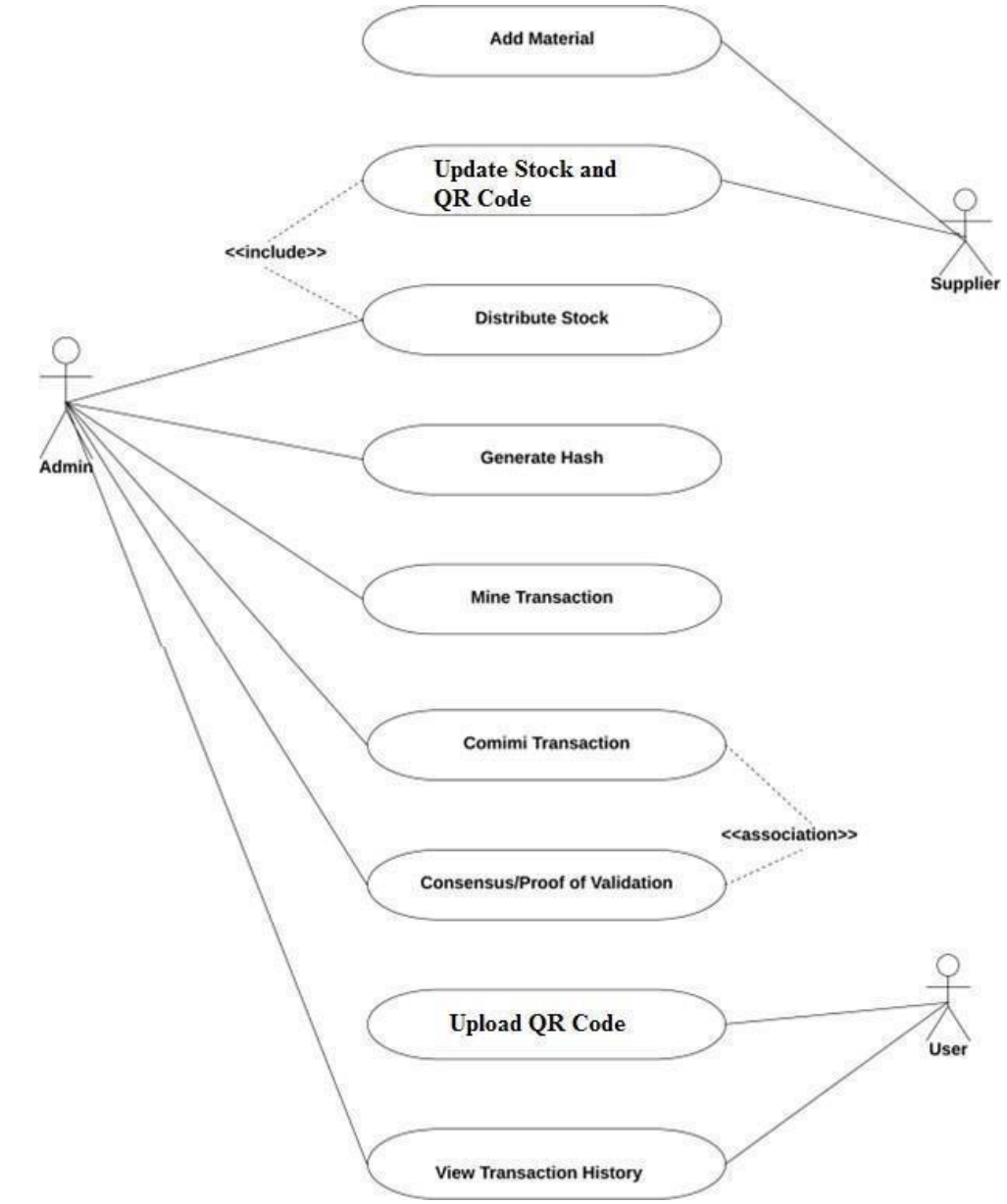

Figure 4.2: Use case diagram

4.3 FUNCTIONAL MODEL AND DESCRIPTION

A description of each major software function, along with data flow (structured analysis) or class hierarchy (Analysis Class diagram with class description for object-oriented system) is presented.

4.3.1 Data Flow Diagram

4.3.1.1 Level 0 Data Flow Diagram

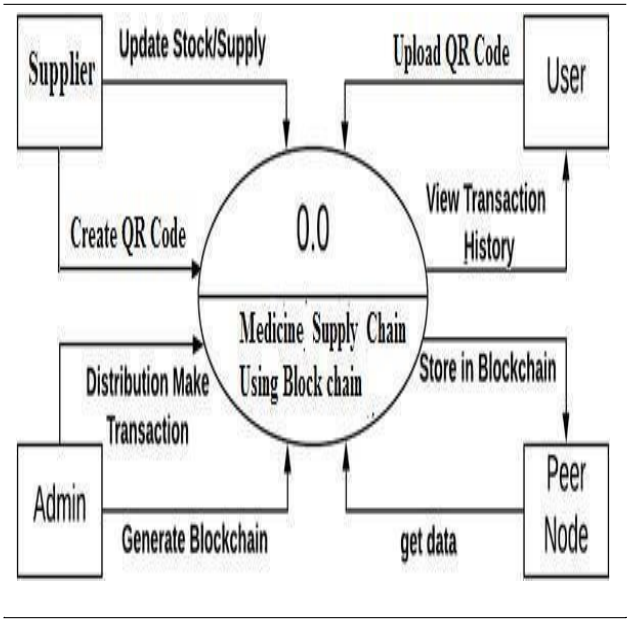

Figure 4.3: Level0: Dfd

4.3.1.2 Level 1 Data Flow Diagram

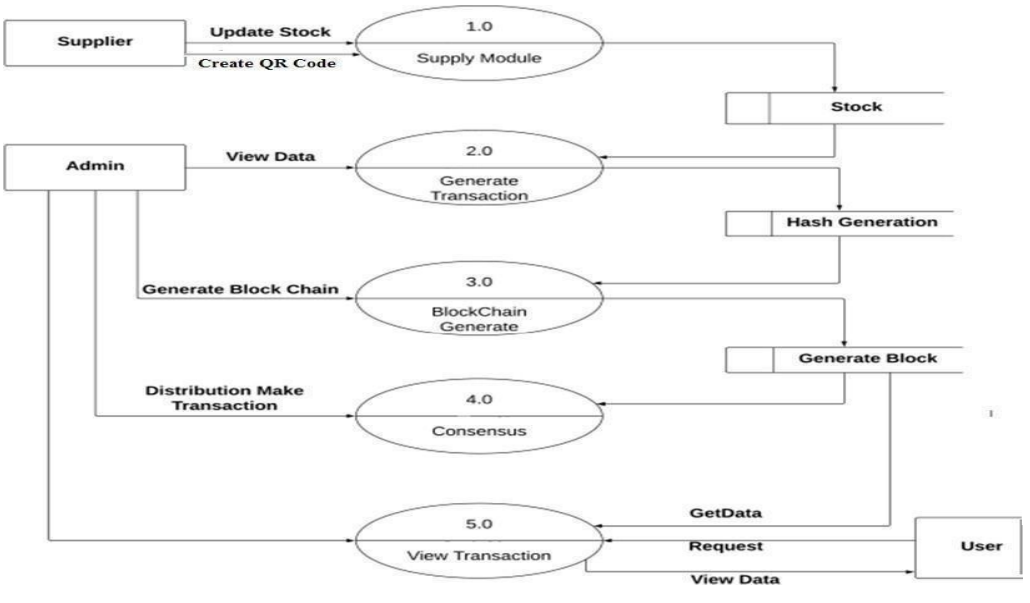

Figure 4.4: Data flow daigram-1

4.3.2 Class diagram

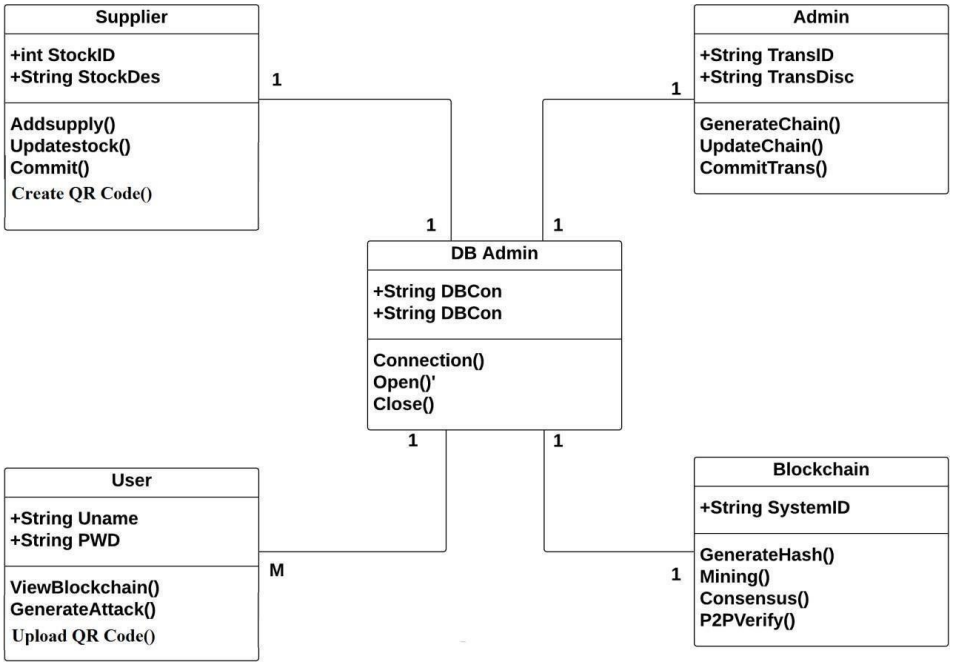

Figure 4.5: Class diagram

4.3.3 Sequences diagram

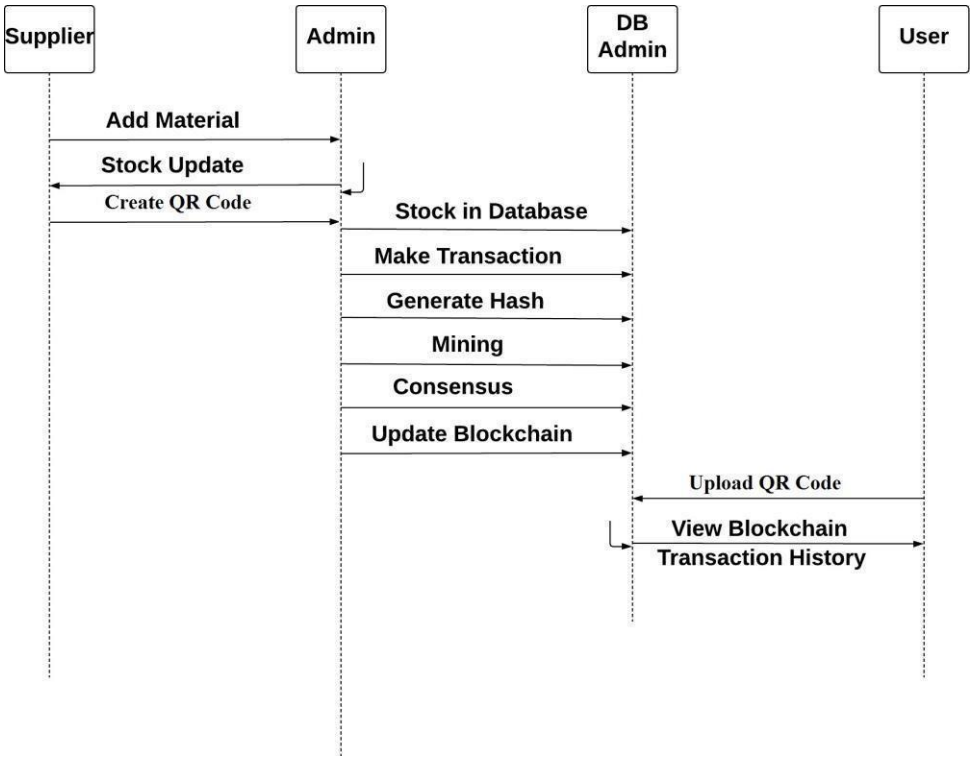

Figure 4.6: Sequences diagram

4.3.4 Activity diagram

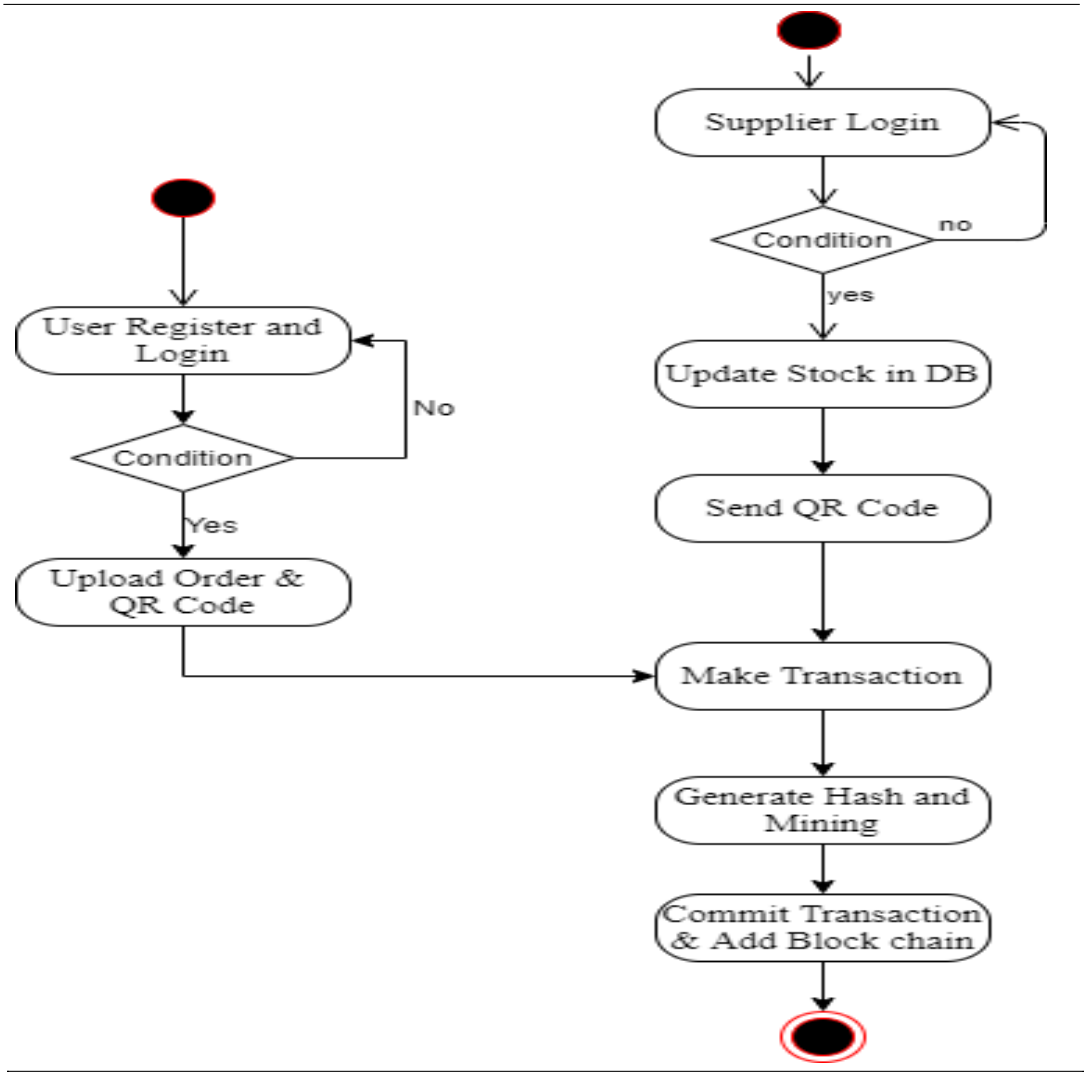

Figure 4.7: Activity diagram

CHAPTER 5

PROJECT IMPLEMENTATION

5.1 OVERVIEW OF PROJECT MODULES

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4. Consensus Algorithm validation and recovery
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- If any block chain invalid during the validation of data servers, then system will automatically recover whole blockchain using majority of servers.
- We will address and eliminate the runtime server attacks and recover it using own blockchain.
- System will provide each transactional validation, for all servers

5.2 TOOLS AND TECHNOLOGIES USED

5.2.1 Java SE 8

Java Platform, Standard Edition (Java SE) lets you develop and deploy Java ap- plications on desktops and servers. Java users the rich user interface, performance, versatility, portability, and security that today’s applications require.

5.2.1 Eclipse

Eclipse is an integrated development environment (IDE) used in computer programming, and in 2014 was the most widely used Java IDE in one website's poll. It contains a base workspace and an extensible plug-in system for customizing the environment. Eclipse is written mostly in Java and its primary use is for developing Java applications, but it may also be used to develop applications in other programming languages via plug-ins. The initial codebase originated from IBM Visual Age. The Eclipse software development kit (SDK), which includes the Java development tools, is meant for Java developers. Eclipse software development kit (SDK) is free and open-source software, released under the terms of the Eclipse Public License, although it is incompatible with the GNU General Public License.

5.2.2 Apache Tomcat

The Apache Tomcat software is an open-source implementation of the Java Servlet, Java Server Pages, Java Expression Language and Java WebSocket technologies. The Java Servlet, Java Server Pages, Java Expression Language and Java WebSocket specifications are developed under the Java Community Process. The Apache Tomcat software is developed in an open and participatory environment and released under the Apache License version 2. The Apache Tomcat project is intended to be a collaboration of the best-of-breed developers from around the world. Apache Tomcat software powers numerous large-scale, mission-critical web applications across a diverse range of industries and organizations.

5.2.3 MySQL

MySQL is an open-source relational database management system (RDBMS). The MySQL™ software delivers a very fast, multi-threaded, multi-user, and robust SQL (Structured Query Language) database server. MySQL Server is intended for mission-critical, heavy-load production systems as well as for embedding into mass-deployed software. MySQL is offered under two different editions: the open-source MySQL Community Server and the proprietary Enterprise Server. MySQL Enterprise Server is differentiated by a series of proprietary extensions which install as server plugins,

but otherwise shares the version numbering system and is built from the same code base.

5.2.4 Heidi SQL

Heidi SQL is free software, and has the aim to be easy to learn.” Heidi” lets you see and edit data and structures from computers running one of the database systems MariaDB, MySQL, Microsoft SQL, or PostgreSQL. Invented in 2002 by Ansgar, with a development peak between 2009 and 2013, Heidi SQL belongs to the most popular tools for MariaDB and MySQL worldwide.

CHAPTER 6

RESULTS

6.0.1 Outcome

Blockchain generation after each successful transaction

6.1 SCREENSHOTS

Following diagram shows the training of model and how it had been logged in software

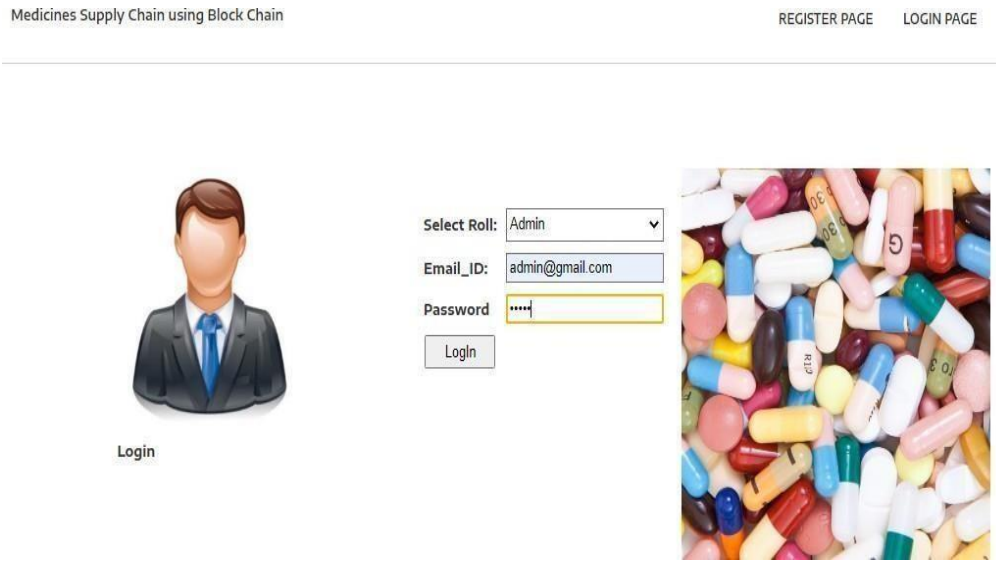


Figure 6.1: Admin Login Page

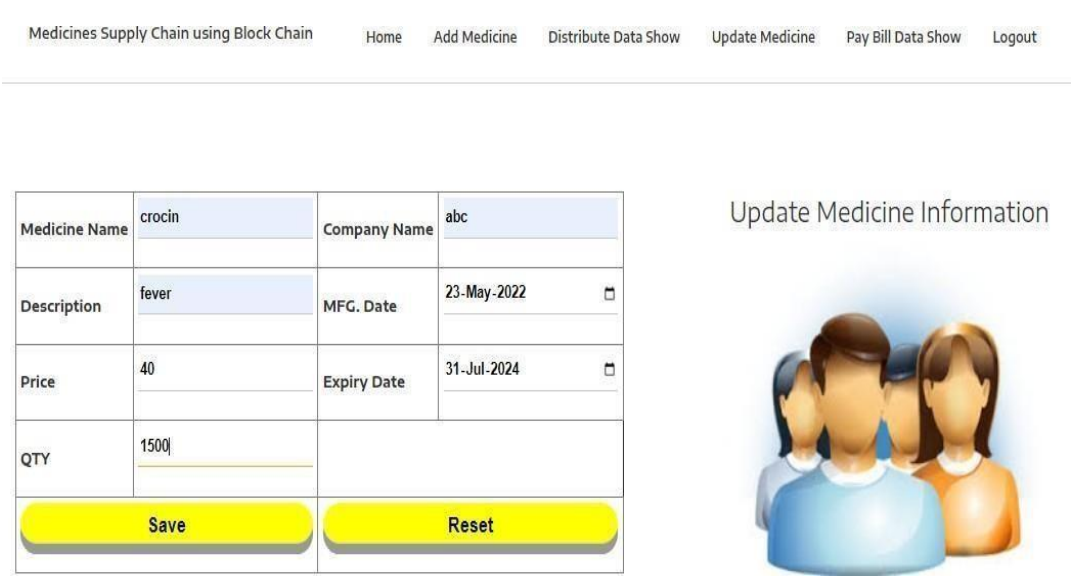
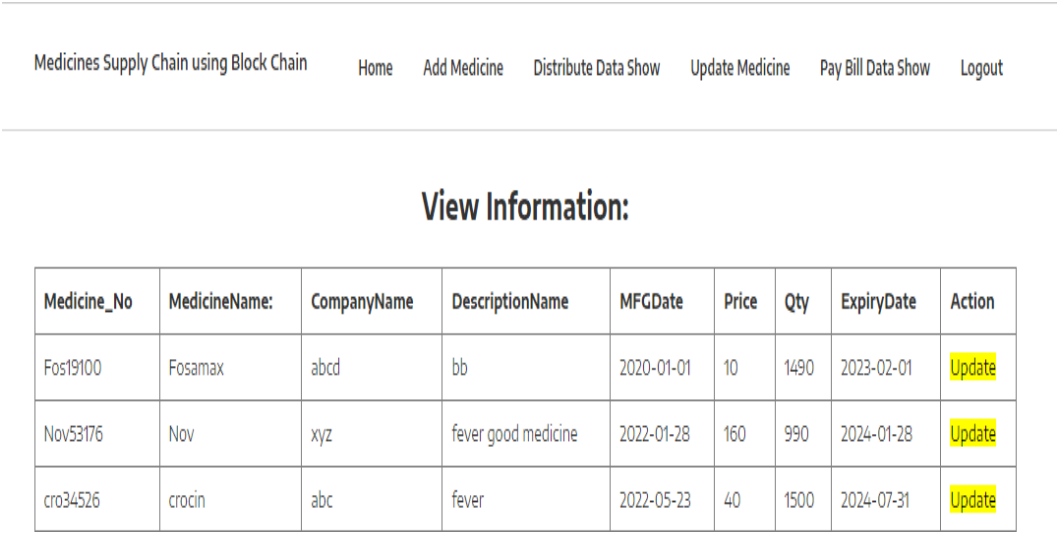


Figure 6.2: Add Medicine Page



Medicine_No	MedicineName:	CompanyName	DescriptionName	MFGDate	Price	Qty	ExpiryDate	Action
Fos19100	Fosamax	abcd	bb	2020-01-01	10	1490	2023-02-01	Update
Nov53176	Nov	xyz	fever good medicine	2022-01-28	160	990	2024-01-28	Update
cro34526	crocin	abc	fever	2022-05-23	40	1500	2024-07-31	Update

Figure 6.3: Update Medicine Page

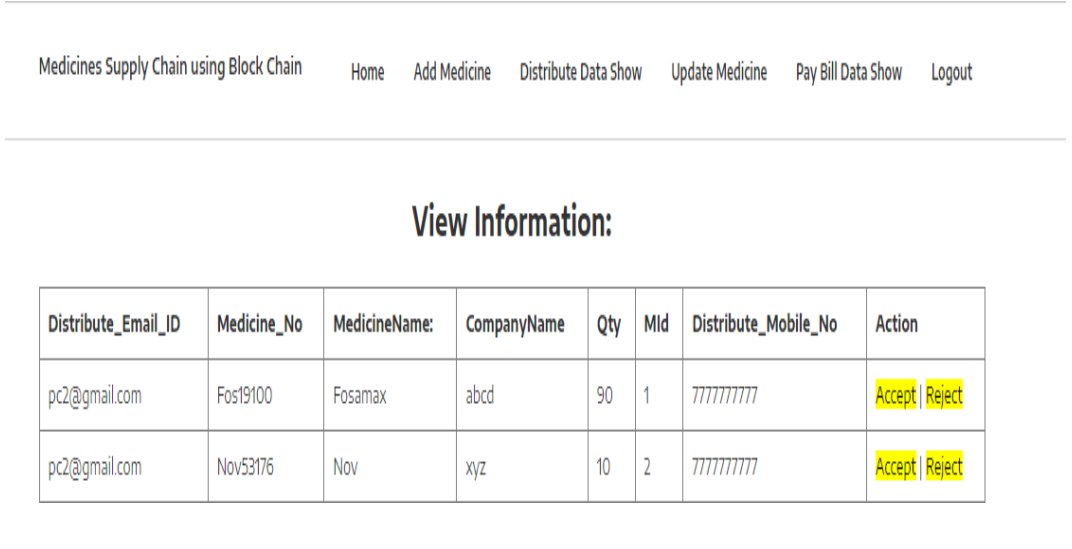


Figure 6.4: Distributor Request Page

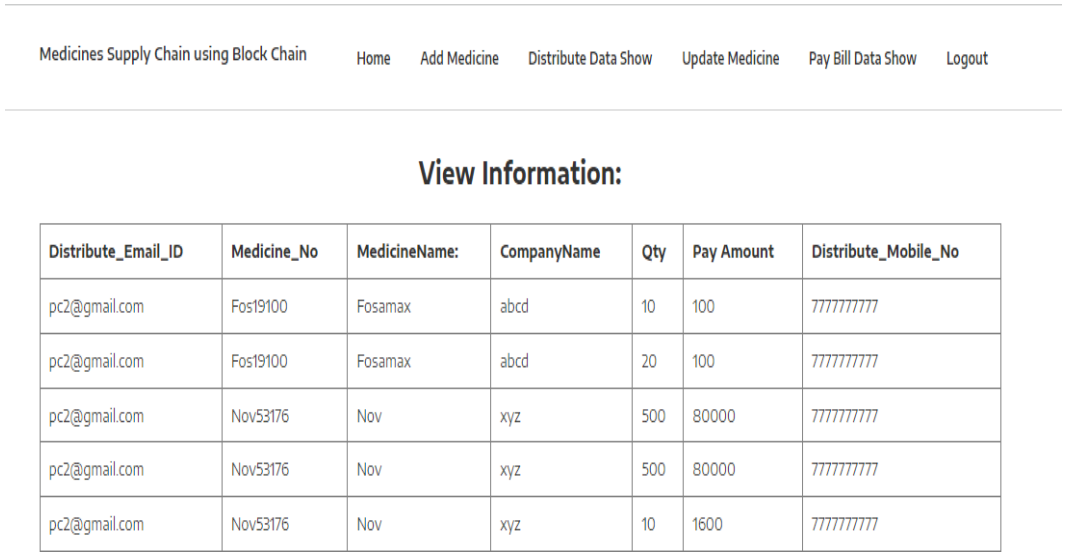


Figure 6.5: Distributor Show Payment Page

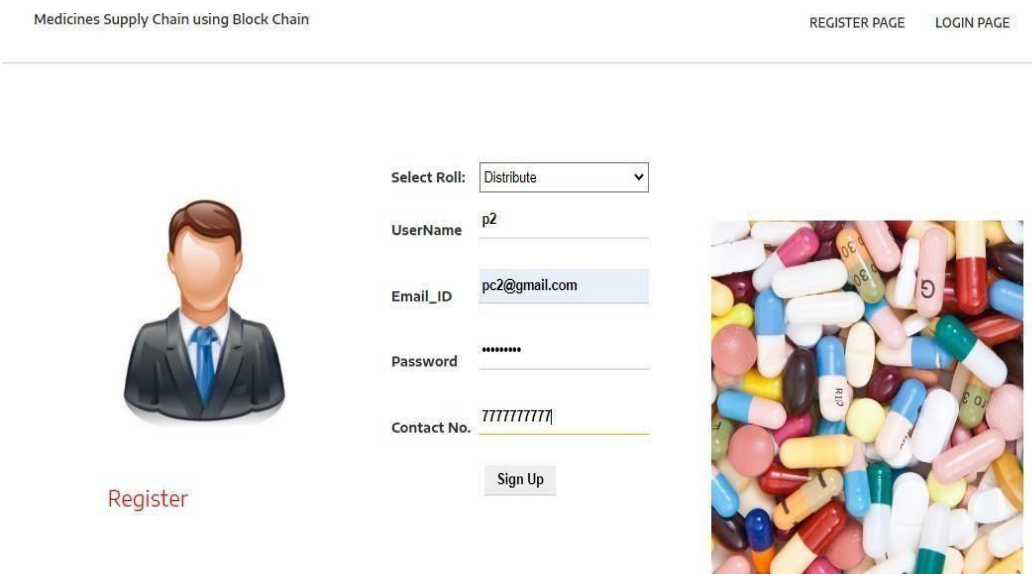


Figure 6.6: Distribute Register Page

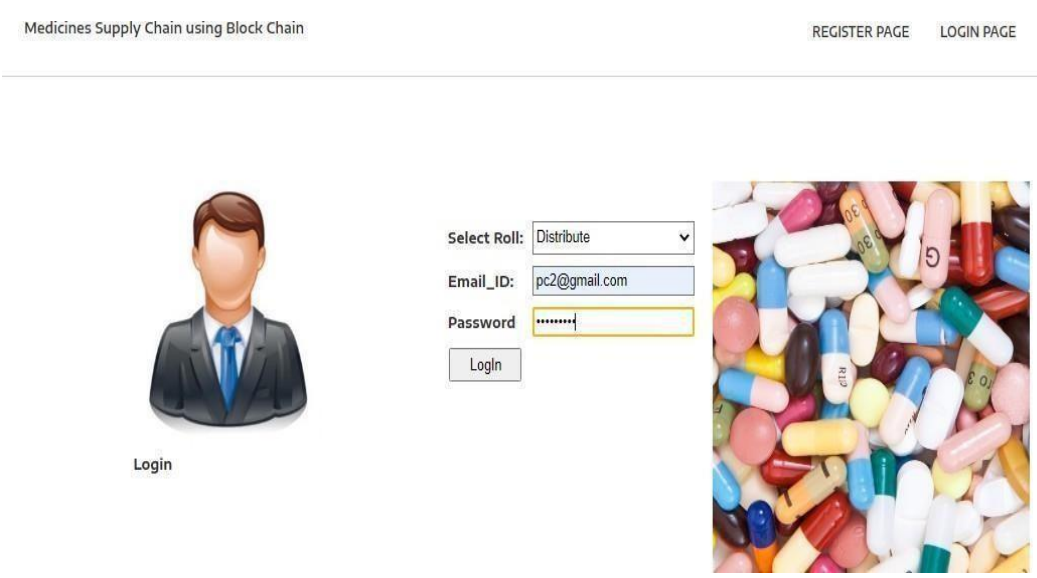


Figure 6.7: Distribute Login Page

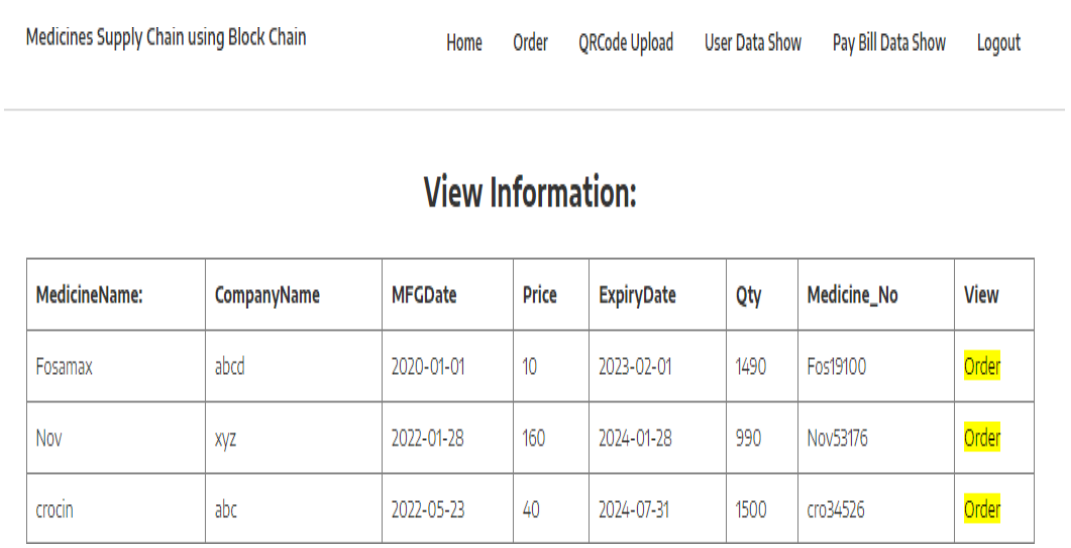


Figure 6.8: Order Medicine Page

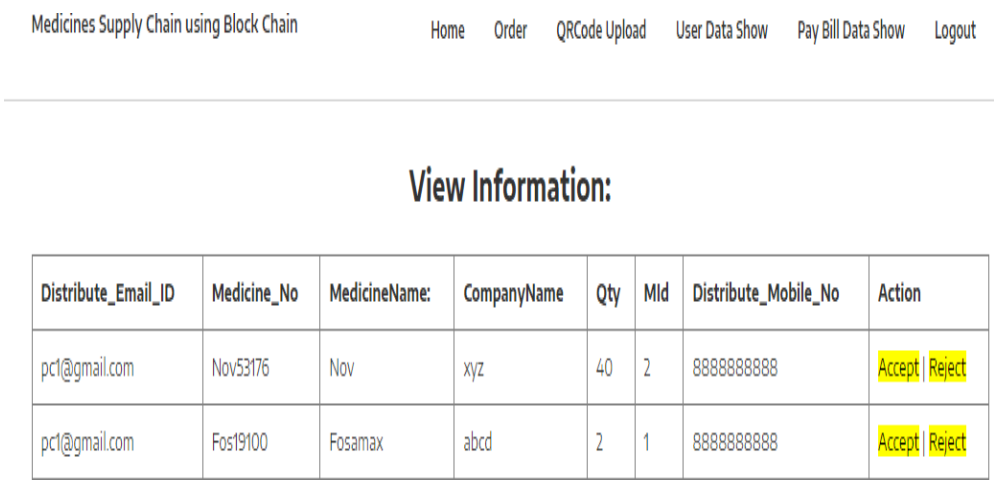


Figure 6.9: User Request Page

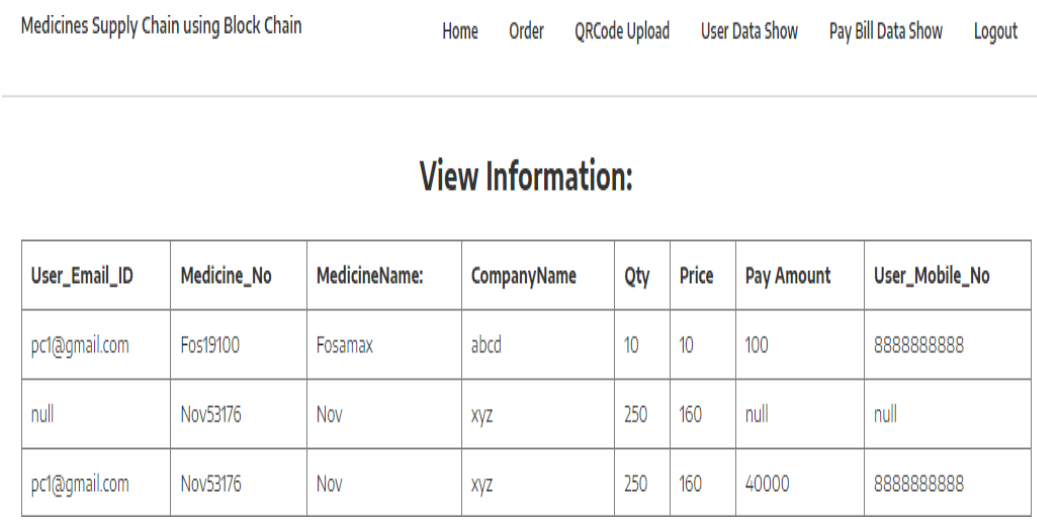


Figure 6.10: User Show Payment Page

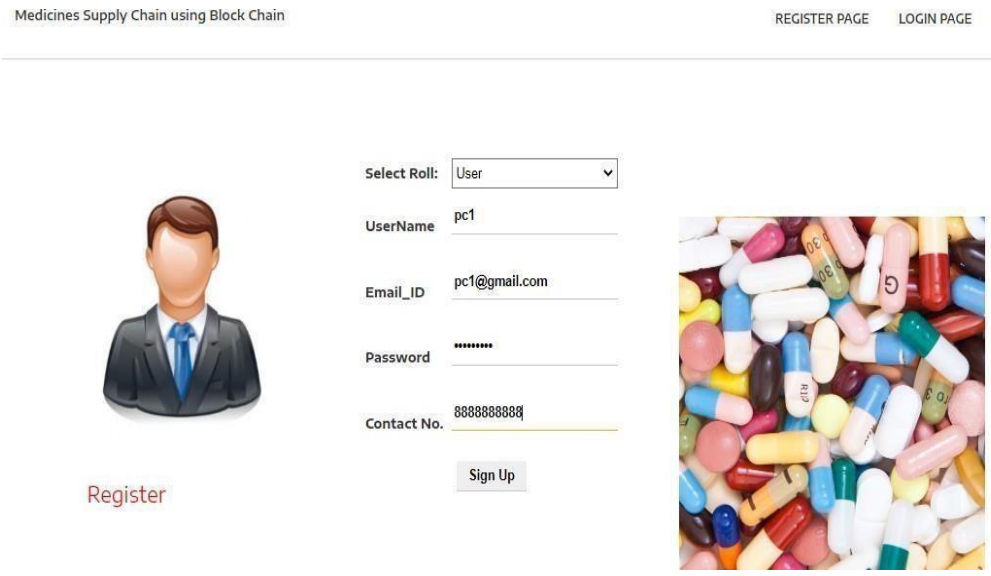


Figure 6.11: User Register Page

Figure 6.12: User Login Page

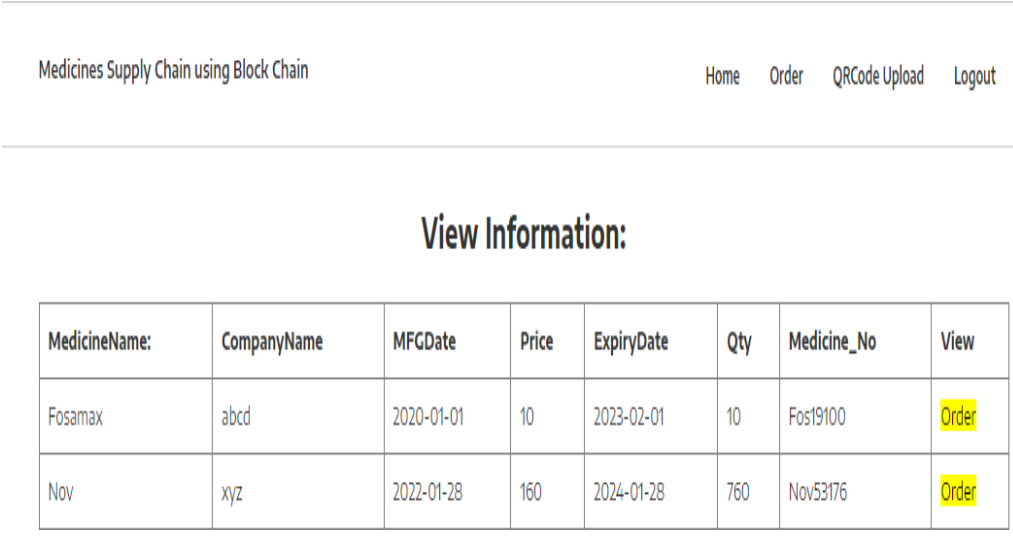


Figure 6.13: Order Medicine Page

CHAPTER 7

CONCLUSION

7.1 CONCLUSIONS

It is not an easy topic to understand the structure of supply chain management for the healthcare business, but its importance is growing. This study looked at 43 publications regarding pharmaceutical and hospital supply chain management from the literature, which contains many studies on supply chain management in the healthcare sector. First, there is a significant gap regarding publications in the literature due to the lack of mathematical modelling.

Almost 15% of the papers analyzed did not include any supply chain management mathematical modelling. In terms of operations research, models may aid in the optimization of inventory, costs, and other operational issues.

Consider evaluating pharmaceutical or hospital SCM as another classification for the supply chain emphasis area. Hospital studies are more thorough than pharmaceutical SCM papers. In order to raise the effectiveness and lower the costs of the healthcare supply chain, studies about pharmaceutical SCM and hospital SCM may increase in proportion to the importance of the medical sector and hospital operations. Finally, there aren't many studies about how supply chain management is evaluated in conjunction with industry 4.0 applications in health care systems to adapt to the most recent issues.

7.2 FUTURE WORK

To implement the proposed system on multiple peers to peer network, with fog com-putting which reduce the transactional data processing time.

7.3 APPLICATIONS

7.3.1 Peer to peer communication transaction applications.

7.3.2 Bitcoin transaction applications.

7.3.3 Zeb pay transaction application

7.3.4 Bittrex app

7.3.5 Polonia’s applications

7.3.6 Coin exchange applications

CHAPTER 8

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ANNEXURE A

ALGORITHMIC DESIGN

Hash Generation

Input: Genesis block, Previous hash, data d,

Output: Generated hash H according to given data

Step 1: Input data as d

Step 2: Apply SHA 256 from SHA family

Step 3: Current Hash= SHA256(d)

Step 4: Return Current Hash

Protocol for Peer Verification

Input: User Transaction query, Current Node Chain Code[chain], Other Remaining Nodes blockchain Nodes Chain [Nodeid] [chain],

Output: Recover if any chain is invalid else execute current query

Step 1: User generate the any transaction DDL, DML or DCL query

Step 2 : Get current server blockchain

Chain ← Code [Chain]

Step 3: For each

$Nodes\ Chain[Nodeid,Chain] \sum_{i=1}^{n} (GetChain)$

End for

Step 4: Foreach (read I into Node Chain)

If (!. equals Node Chain[i] with (Chain))

Flag 1

Else Continue Commit

QueryStep 5: if (Flag == 1)

Count = SimilaryNodesBlockchian()

Step 6 : Calculate the majority of server

Recover invalid blackchin from specific node

Step 7: End if

End for

End for

Mining Algorithm for valid hash creation

Input: Hash Validation Policy P [], Current Hash Values hash_Val

Output: Valid hash

Step 1 : System generate the hash_Val for it transaction using Algorithm 1

Step 2 : if (hash_Val.valid with P[])

Valid hash

Flag =1

Else

Flag=0

Mine again randomly

Step 3 : Return valid hash when flag=1

ANNEXURE B
PUBLICATION DETAILS

Sr. No	Name of Journal	Date
1	International Journal of Advanced Research in Science, Communication and Technology(IJARSCT)	31/03/2023
P 2	International Journal of Advanced Research in Science, Communication and Technology	28/05/2023

Table 1: Publication Details

ANNEXURE C

PLAGIARISM REPORT

Chapters	Report
Introduction	00 %
Literature Survey	05 %
Theoretical Background	04 %
Software Requirement Specification	01 %
System Design	00 %
Planning & Implementation	02 %
Testing	00 %
Results & Outcomes	00 %
Conclusion	00 %

Table A.1: Plagiarism of all report

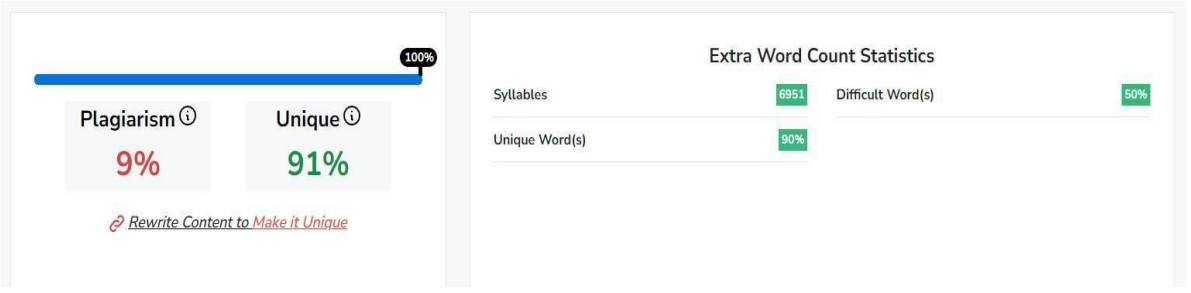

Table A.1: Plagiarism report

Paper Published	Acceptance Rate / Report
Paper 1 – IJARSCT	82 %
Paper 2 – IJARSCT	94 %

Table A: 2 Plagiarism report of paper published

INTERNET SOURCES:

<1% - collegedunia.com › reviews › 165921-saurabh-review
<1% - www.questinc.com › company › blog-posts
<1% - www.mdpi.com › 2304/8158/11-15 › 2295
<1% - quizlet.com › 13360359 › ch1-scm-flash-cards
<1% - www.gartner.com › glossary › supply-chain
2% - link.springer.com › chapter › 10
<1% - writingcenter.gmu.edu › writing-resources › imrad
1% - www.ncbi.nlm.nih.gov › pmc › articles
1% - www.warehouseanywhere.com › resources › healthcare
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<1% - www.coursehero.com › file › 142489413
<1% - docs.oracle.com › cd › E19225-01
<1% - pdfs.semanticscholar.org › 4210 › 936ef212b5b1b1245b
<1% - www.researchgate.net › publication › 344507642
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Impact Factor: 7.301

Pharmaceutical and Medical Supply Chain Management

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Students, Department of Information Technology[2,3,4,5]
Zeal College of Engineering and Research, Pune, Maharashtra, India

Abstract: *In order to deliver a material flow with an ideal cost and time usually, supply chain management becomes more crucial in the developing globe. To build a better network of suppliers for their end consumers, several industries concentrate on supply chain management optimization and qualifications. Supply chain management is important for the quality of the services provided and patient satisfaction, particularly in the healthcare industry, where it applies to both pharmaceutical items and hospital supplies. As a result, the relevance of supply chain management in healthcare is highlighted by numerous research. The purpose of this study is to present a review of the literature on supply chain management in the healthcare industry in order to provide context by highlighting significant examples and studies that run concurrently with the most recent research. Additionally, by examining research in the literature, this literature review will evaluate a perspective to comprehend how to manage a complicated supply chain in the healthcare sector.*

Keywords: Healthcare supply chain, Virtual centralization, Vendor Managed inventory Learning

I. INTRODUCTION

Supply chain management (SCM) is a term used to describe a group of businesses that move products from suppliers, product assemblers, merchandisers, and transportation firms to the final consumer [1]. A supply chain can also be defined as the flow of products, services, and information that begins with raw materials and ends with the end user [2]. The research continues to highlight the growing significance of supply chain management [3]. It can be challenging to create performance measurement criteria in a supply chain, which makes evaluating performance in supply chains, especially multi-vendor supply chains, challenging [4]. Additionally, supply chain management fosters collaboration between regional and international businesses in order to manage interactions among all supply chain participants and to combine the excellence of management processes [5].Due to logistics, pharmaceutical products, and patient happiness, supply chain management is becoming more significant in the healthcare sector as a way to provide higher-quality services than in other industries. Additionally, the healthcare industry has seen a tremendous amount of change.

Rapid over the past few years. Despite the fact that the methods and techniques have issues in industrial settings, many healthcare organizations are aware of the need of using a better methodology and method to implement their supply chain management plans [6]. In both the public and private sectors, increasing supply chain management effectiveness is closely related to raising healthcare quality.

In this investigation, research about supply chain management in the healthcare industry published between 2000 and 2018 will be investigated. The study is divided into four main sections: introduction, literature review, analysis, and conclusion and discussion. The introduction provides background information and a brief introduction to supply chain management in healthcare. The literature review examines the topics and methods of supply chain management in healthcare.

II. LITERATURE SURVEY

From a case study in Singapore, Kumar, Ozdamar, and Zhang (2008) investigated a cost-cutting strategy for the medical suppliers. They also concluded that although while information technology (IT) initiatives start out with a high initial cost due to the lack of professionals, some just-in-time (JIT), reengineering, and outsourcing

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reductions may be cost- effective. Cost savings from information technology can be achieved during the first stages of supplier identification [7].

Mei boom, Schmidt-Bake, and Western (2011) explained how a different study focused on organizational shortcomings influencing patient care and how Supply Chain Management principles could be used to address them. Additionally, they offered a literature review that included industrial healthcare processes. They have mainly concentrated on integration, appropriate IT procedures, and supplier lead times [8].

While there are some applications of RFID systems that can be installed in a cost-effective manner [9], the current RFID systems in the healthcare supply chain are too expensive to apply. This was the focus of a different study by Kumar, Swanson, and Tran (2009). RFID devices enable healthcare supply chains to be more effective and cost-reductive. Attaran (2012), on the other hand, has discussed key success factors and the most recent challenges in implementing RFID systems within healthcare supply chain management, and the advantages and disadvantages of applying RFID systems in supply chains have been identified in terms of costs and procedures [10]. A distribution model for inventory has been put up by Uchiyama and Priya (2013), combining the supply chains for hospitals and pharmacies. With the help of the model they proposed, they were able to determine an ideal proposal for lead time and available lot size by illuminating a numerical example [11]. The model they proposed considered the lead time, time and space availability, customer service levels, and other factors as well. Pharmaceutical Supply Chains have been assessed by Stannic, Harrington, and Sari (2017) in terms of manufacturing and distribution models. Additionally, they divided the modeling into categories and concluded that Pharmaceutical Supply Chain definitions are heavily focused on production-centered definitions and have shortcomings to reflect patient consumptions [12].

A Literature Review on Supply Chain Management in Healthcare 571 konyalioglua@itu.edu.tr

In terms of agility and lean manufacturing, healthcare supply chains have been examined by Aronsson, Abrahamson, and Spans (2011). By establishing a supply chain orientation, they attempted to comprehend how the process of healthcare supply chains can be agile and lean and what is required by applying an empirical analysis with the help of agile and lean philosophies in supply chain management in healthcare to develop the effectiveness of healthcare supply chains [13]. Given that patient care services are difficult to foresee and there are numerous independent private and public companies, Shah, Goldstein, Unger, and Henry (2008) sought to explore the work design by improving it for a supply chain management in healthcare. These businesses typically work together and have a rhythm when it comes to supply chain operations. They used four independent organizations to define the various supply chain processes in the healthcare sector and to comprehend the mechanisms involved [14]. In the healthcare industry, Sinha and Koonce (2009) found a gap between rising demand and the present high-quality supply, as well as an issue with cost and time effectiveness in both developing and established nations. To educate healthcare supply chain management and to incorporate continual improvement as a definition of quality and technical advancements, they have developed a framework made up of the three A's: access, affordability, and awareness [15]. Cook et al. (2001) examined whether supply chain management is effective in the service sector as it is in the manufacturing sector. They demonstrated increased quality, decreased prices, and shortened lead times, all of which are outcomes of a highly effective healthcare supply chain [16]. The rise in pharmaceutical supply chain efficiency is explained by a different study. In this study, an Australian e-commerce project gives the health care sector access to an information system integration and receives better data as a result [17]. An e- commerce integration-based supply chain model was presented by Chandra and Kachan in 2004. They also demonstrated various techniques for inventory and purchasing procedures, including optimization and simulation [18]. Kim (2004) conducted another e-commerce study that incorporates statistical findings to determine the effects of B2B e-commerce in the health care sector. He carried out a survey and analyzed the findings to demonstrate that internet-based integration enhances supply chain management in the healthcare industry [19]. McCone-Sweet et al. (2005) investigated the application of supply chain management in the healthcare industry. They discovered some limitations, including lack of leadership, ambiguous incentives, data collection and evaluation, team operations for procurement, and all parties in the chain. The key issue is the practical application of leaders' and managers' understanding of the supply chain, which has a direct impact on supply chain performance [20]. Kim conducted a real-world study at a hospital, which shown that by enhancing the supply chain management system, inventory levels could be reduced by

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over 30%. Pharmaceutical inventory management procedures and purchasing practices are part of this development. At each stage of the supply chain, inventory levels were optimized using a transparent approach. This solution links the ordering process to the online system and improves the accuracy of demand forecasting. Costs decreased as a result of a drop in inventory [21].

Regarding the challenges of supply chain management in the healthcare industry, see Langberg (2005). He examined the state of management systems at the time and investigated the reasons for the lack of technology utilization. 572 T. Belek et al. konyalioglua@itu.edu.tr He offers guidance for next research on implementing new technologies to enhance the healthcare supply chain [22].

The e-adoption of the healthcare supply chain was a different topic that Zheng et al. (2006) researched. They created a framework that takes into account supply, business, and health in terms of how each enterprise should use e-commerce in light of the English National Health Service [23]. Boldacious et al. (2007) provide a standard supply chain model for the service industry. The essential parts of the chain are incorporated in the proposed model and include capacity, demand, customer and supplier relationships, service management, and order operations management. This concept can be used in the healthcare industry [2]. In order to characterize each component, such as entities, data and information flows, processes, etc., Kisto et al. (2007) researched the healthcare supply chain and analyzed its information system. In order to enhance the value of the healthcare supply chain management system, they also propose new technical alternatives [24].

As a case study, Sousa et al. (2011) developed dynamic programming to optimize the issues with a pharmaceutical company's global supply chain. The study's goal was to increase the company's net present value by considering tax rates as well as production and distribution costs that are spread out across several locations. Additionally, they divided the problem into core and secondary subproblems before creating this model [25]. Rahimi and Mohaddessin (2010) looked at the supply chain managements' flexibility in the healthcare industry, particularly in hospitals. Since the current system necessitates an agile and lean system for hospitals in terms of delivery systems, they did a case study to assess the perspective of legality in hospitals on behalf of a professional supplier [26]. Walker et al. (2008) conducted research on crucial elements of green supply chain management and efforts in the private and public sectors, such as internal and external hurdles to putting environmental principles into practice. In order to understand how laws, affect a hospital's suppliers, researchers also looked at a private healthcare provider as a case study. They concluded that hospitals typically chose local suppliers to support the localeconomy [27].

Bako and Choi (2013) looked at various components of a supply chain, such as distributors, manufacturers, and the healthcare industry, to evaluate the adoption and response of IOS in hospitals. They concluded that IOS implementation is extremely complicated and that internal pressures can have varied effects on healthcare supply chains [28]. In their 2016 article, Kwon et al. highlighted the significance of supply chain management in the healthcare industry in terms of patient spending in comparison to the rate of readmission. In order to boost supplier profit and enhance the supply chain process, they also looked into the three key strategic areas [29].

III. PROBLEM STATEMENT

To provide a framework for an online medical chain supplier portal.

Lack of visibility and highly manual processes can lead to increased costs throughout the healthcare supply chain. Healthcare Supply Chain Management comprises several processes, involvement of different team members, movement of pharmaceutical drugs, medical devices, and other essential items. Suppliers, work together in the entire supply chain process to deliver the best service to a patient by providing a framework for an online medical chain supplier portal.

IV. PROPOSED SYSTEM

In order we propose an efficient Healthcare Management system which takes into consideration all the appropriate parameters including Customer, Blood Bank location and Medical Store location to detect medical supply suitability.

The supply chain is made up of all procedures and actions used to deliver goods or services to a customer. The supply chain may connect any number of medical facilities and blood banks.

A customer may supply another customer, resulting in a variety of supplier/customer interactions along the entire chain.

Depending on the products and markets, the distribution system may be direct from supplier to client.

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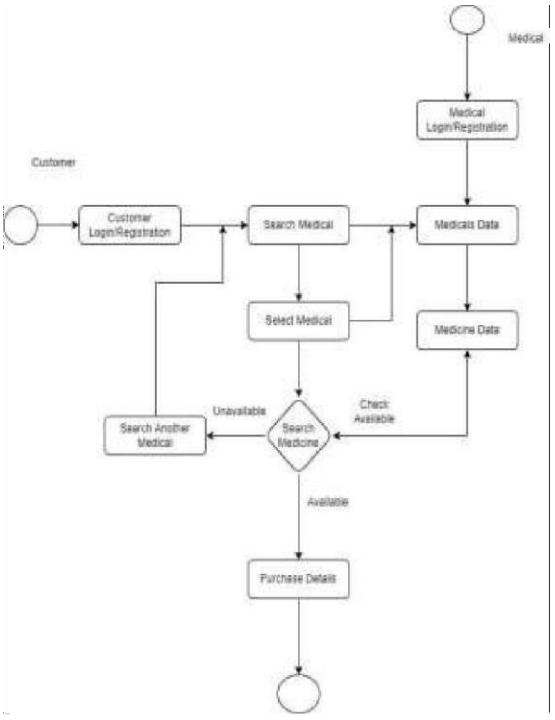

Fig: Proposed System Architecture

4.0 Hardware Configuration

- Processor: 2 gigahertz (GHz) or faster processor.
- RAM: 4 gigabyte for 32-bit or 4 GB for 64bit.
- Hard disk space: 16GB.

4.1 Software Configuration

- Operating System: Windows OS
- Coding Language: JavaScript
- Other Tools: HTML, CSS, Cloud Database

Healthcare Management System captures and stores the medical history, tablets data, details of their previous selling of tablets, upcoming requirements if any, customer, want the details and stock of tablet available in a specific medical store. The proposed system can also be used by helps eliminate the need of tablet to get these details on every visit of customer to that store. This System can be used for comparative analysis of Medical Store Suppliers Techniques and Customer requirements.

V. EXPERIMENTAL RESULTS

The Trained model is used for prediction of the fake reviews and genuine reviews. Different libraries are available in Python that helps in machine learning, classification projects. Several of those libraries have improved the performance of this project.

For user interface we have used Web technologies to build website. Healthcare Management System helps to reduce costs, increase supply chain efficiency and, depending on how it is implemented, build greater agility and resilience into the healthcare value chain.

Expiry of medicines should be checked on a regular basis in case of manual entries. Ensure an adequate supply of medicines at all times.

Allows clear and transparent communication this not only provides visibility of the supply chain but also increases effective communication and collaboration among the healthcare supply chain. The supply chain is made up of all procedures and actions used to deliver goods or services to a customer.

The supply chain may connect any number of medical facilities and blood banks.

A customer may supply another customer, resulting in a variety of supplier/customer interactions along the entire chain.

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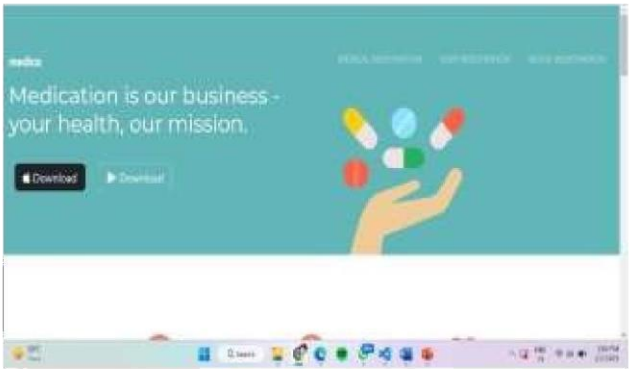

Fig: Front-end part of website using HTML & CSS

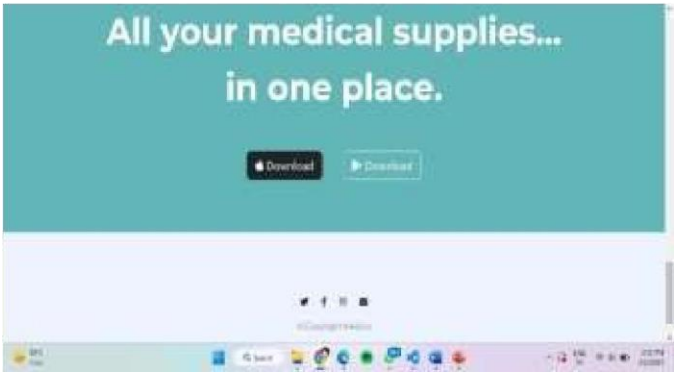

Fig: Front-end part of website using HTML & CSS

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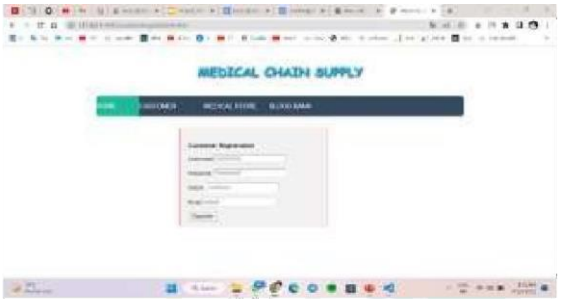

Fig: Medical Registration

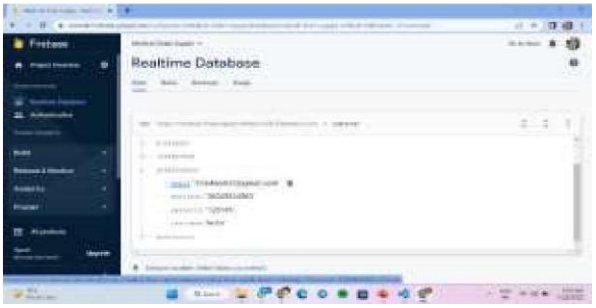

Fig: Firebase Connectivity

VI. CONCLUSION

It is not an easy topic to understand the structure of supply chain management for the healthcare business, but its importance is growing. This study looked at 43 publications regarding pharmaceutical and hospital supply chain management from the literature, which contains many studies on supply chain management in the healthcare sector. First, there is a significant gap regarding publications in the literature due to the lack of mathematical modelling.

Almost 15% of the papers analyzed did not include any supply chain management mathematical modelling. In terms of operations research, models may aid in the optimization of inventory, costs, and other operational issues.

Consider evaluating pharmaceutical or hospital SCM as another classification for the supply chain emphasis area. Hospital studies are more thorough than pharmaceutical SCM papers. In order to raise the effectiveness and lower the costs of the healthcare supply chain, studies about pharmaceutical SCM and hospital SCM may increase in proportion to the importance of the medical sector and hospital operations. Finally, there aren't many This is used for faster computations over the weights(gradients) in neural networks. Second, “scikit-learn” is amachine learning library for Python which featuresdifferent algorithms and Machine Learning function packages. NLTK, natural language toolkit is helpful in word processing and tokenization. The project makes use of Anaconda Environment which is an open-source distribution for Python which simplifies package management and deployment. It is best for large scale data processing studies about how supply chain management is evaluated in conjunction with industry 4.0 applications in health care systems to adapt to the most recent issues.

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Healthcare Management System

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Abstract: *In order to deliver a material flow with an ideal cost and time usually, supply chain management becomes more crucial in the developing globe. To build a better network of suppliers for their end consumers, several industries concentrate on supply chain management optimization and qualifications. Supply chain management is important for the quality of the services provided and patient satisfaction, particularly in the healthcare industry, where it applies to both pharmaceutical items and hospital supplies. As a result, the relevance of supply chain management in healthcare is highlighted by numerous research. The purpose of this study is to present a review of the literature on supply chain management in the healthcare industry in order to provide context by highlighting significant examples and studies that run concurrently with the most recent research. Additionally, by examining research in the literature, this literature review will evaluate a perspective to comprehend how to manage a complicated supply chain in the healthcare sector.*

Keywords: *Healthcare Supply Chain, Virtual Centralization, Vendor Managed Inventory, Learning.*

I. INTRODUCTION

Supply chain management (SCM) is a term used to describe a group of businesses that move products from suppliers, product assemblers, merchandisers, and transportation firms to the final consumer. A supply chain can also be defined as the flow of products, services, and information that begins with raw materials and ends with the end user. The research continues to highlight the growing significance of supply chain management. It can be challenging to create performance measurement criteria in a supply chain, which makes evaluating performance in supply chains, especially multi-vendor supply chains, challenging. Additionally, supply chain management fosters collaboration between regional and international businesses in order to manage interactions among all supply chain participants and to combine the excellence of management processes. Due to logistics, pharmaceutical products, and patient happiness, supply chain management is becoming more significant in the healthcare sector to provide higher quality services than in other industries.

Additionally, the healthcare industry has seen a tremendous amount of change. We Rapid over the past few years. Even though the methods and techniques have issues in industrial settings, many healthcare organizations are aware of the need of using a better methodology and method to implement their supply chain management plans. In both the public and private sectors, increasing supply chain management effectiveness is closely related to raising healthcare quality.

In this investigation, research about supply chain management in the healthcare industry published between 2000 and2018 will be investigated. The study is divided into four main sections: introduction, literature review, analysis, and conclusion and discussion. The introduction provides background information and a brief introduction to supply chain management in healthcare. The literature review examines the topics and methods of supply chain management in healthcare.

II. LITERATURE SURVEY

Title: Case Studies in Healthcare Supply Chain Management

1. Cost- Cutting Strategy for Medical Suppliers

Authors: Kumar, Oldsmar, and Zhang (2008)

Published: 2008

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Summary: The study explores a cost-cutting strategy for medical suppliers in Singapore. It emphasizes that while information technology (IT) initiatives may have high initial costs due to a lack of professionals, cost-effective approaches such as just-in-time (JIT)inventory management, reengineering, and outsourcing can be implemented.

2. Addressing Organizational Shortcomings in Patient
Authors: Mei boom, Schmidt-Bake, and Western
(2011)
Published: 2011
Summary: This study focuses on organizational shortcomings affecting patient care and suggests the use of Supply Chain Management principles to address them. It includes a literature review covering industrial healthcare processes. The study highlights the importance of integration, appropriate It procedures, and efficient supplier lead times to improve patient care.

3. Cost and Effectiveness of RFID Systems in Healthcare Supply Chains Authors: Kumar, Swanson, and Tran (2009)
Published: 2009
Summary: The study examines the cost and effectiveness of RFID systems in the healthcare supply chain. It states that while some cost-effective applications of RFID exist, the current RFID systems in use are generally too expensive. The study emphasizes that RFID devices have the potential to enhance the effectiveness and cost-efficiency of healthcare supply chains.

4.Distribution Model for Hospital and Pharmacy
Supply Chains
Authors: Uchiyama and Priyank (2013)
Published: 2013
Summary: The study proposes a distribution model that combines the supply chains of hospitals and pharmacies. It aims to optimize inventory management by considering factors such as lead time, time and space availability, and customer service levels. The study provides a numerical example to determine an ideal proposal for lead time and available lot size. The model offers insights into improving efficiency in hospital and pharmacy supply chains.

5.Assessment of Pharmaceutical Supply Chains
Authors: Stannic, Harrington, and Sari (2017)
Published: 2017
Summary: This study assesses manufacturing and distribution models in pharmaceutical supply chains. It examines various aspects of pharmaceutical supply chains and identifies areas for improvement. The study explores ways to optimize these supply chains to enhance efficiency and effectiveness. These case studies delve into cost-cutting strategies, organizational shortcomings, the use overfed systems, distribution models, and the assessment of healthcare supply chain management.

III. PROBLEM STATEMENT

To provide a framework for an online medical chain supplier portal. Lack of visibility and highly manual processes can lead to increased costs throughout the healthcare supply chain. Healthcare Supply Chain Management comprises several processes, involvement of different team members, movement of pharmaceutical drugs, medical devices, and other essential items. Suppliers, work together in the entire supply chain process to deliver the best service to a patientby providing a framework for an online medical chain supplier portal.

IV. PROPOSED SYSTEM

The objective of our proposed healthcare management system is to create an efficient and effective supply chain for medical supplies by considering various parameters such as customer requirements, blood bank locations, and medical

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store locations. The system utilizes the N-closest neighborhood algorithm (NCN) to determine the suitability of medical supplies based on a vast dataset and user input. The focus of this paper is on the classification algorithm used in the system. The architecture of the system revolves around the supply chain, which encompasses all the procedures and actions involved in delivering goods or services to customers.

The supply chain can connect multiple medical facilities and blood banks, and interactions between suppliers and customers can occur at various points along the chain. Depending on the products and markets, the distribution system may involve a direct flow from the supplier to the client.

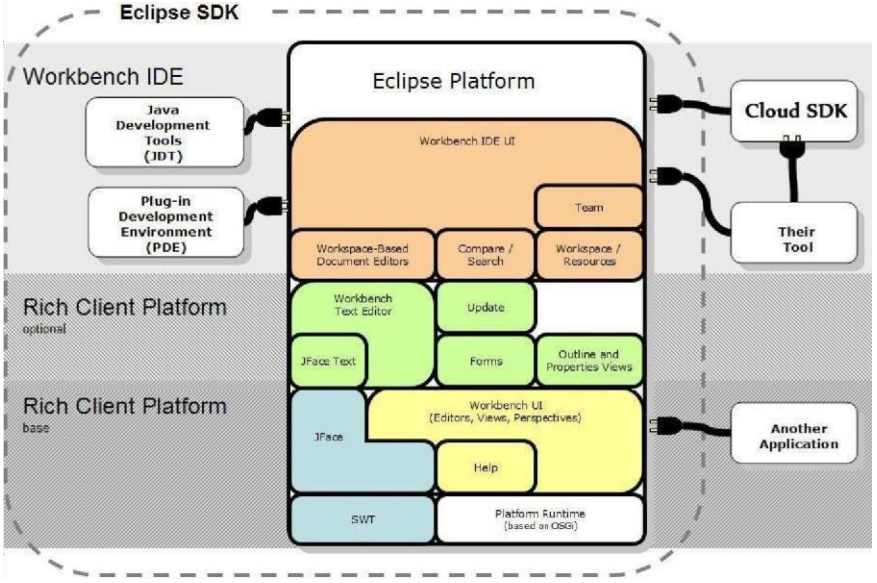

Fig: System Architecture

The healthcare management system captures and stores crucial information such as medical histories, tablet data, details of previous tablet sales, upcoming requirements, and customer preferences. It also maintains a record of the stock of tablets available in specific medical stores. By utilizing this system, customers can access their medical details and tablet stock information without the need to visit the store in person for every query. This eliminates the hassle for customers and enhances their overall experience.

Furthermore, the proposed system enables comparative analysis of different medical store suppliers' techniques andcustomer requirements. It allows for a comprehensive evaluation of suppliers 'performance in meeting customer demandsand ensures that the medical supplies are readily available when needed. In summary, our proposed healthcare management system aims to create an efficient supply chain for medical supplies by leveraging data analysis, customerpreferences, and location-based algorithms. By implementing this system, we can enhance the overall healthcareexperience for customers and improve the effectiveness of medical supply distribution.

V. IMPLEMENTATION

Hardware Configuration:

Processor:2 gigahertz (GHz) or faster processor.
RAM:4 gigabytes for 32-bit or 4 GB for 64bit.
Hard Disk Space:16GB.

Software Configuration:

Operating System: Windows OS
Coding Language: JavaScript
Other Tools: HTML, CSS, Cloud Database

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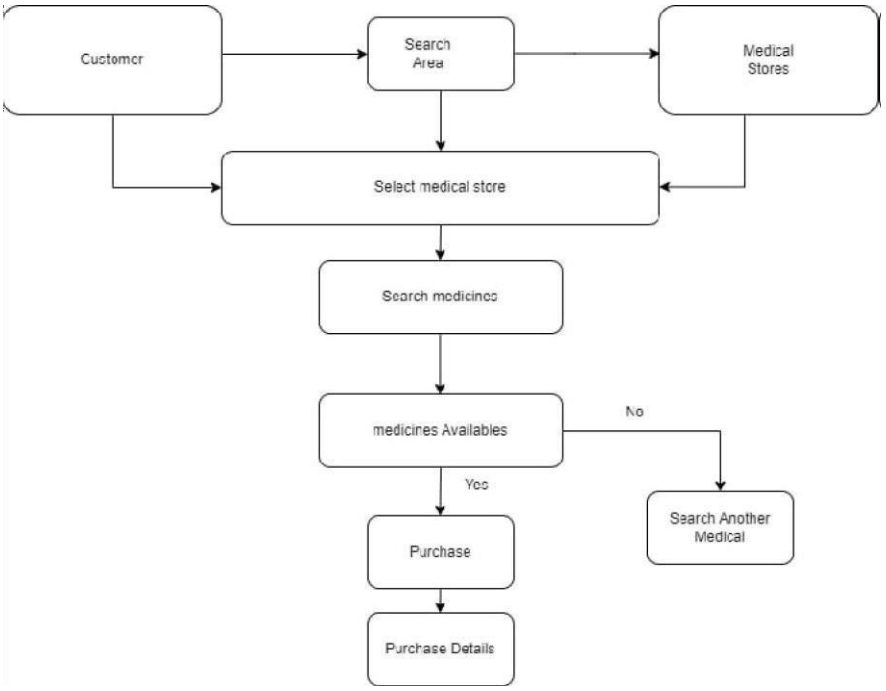

Figure 1: Activity Diagram

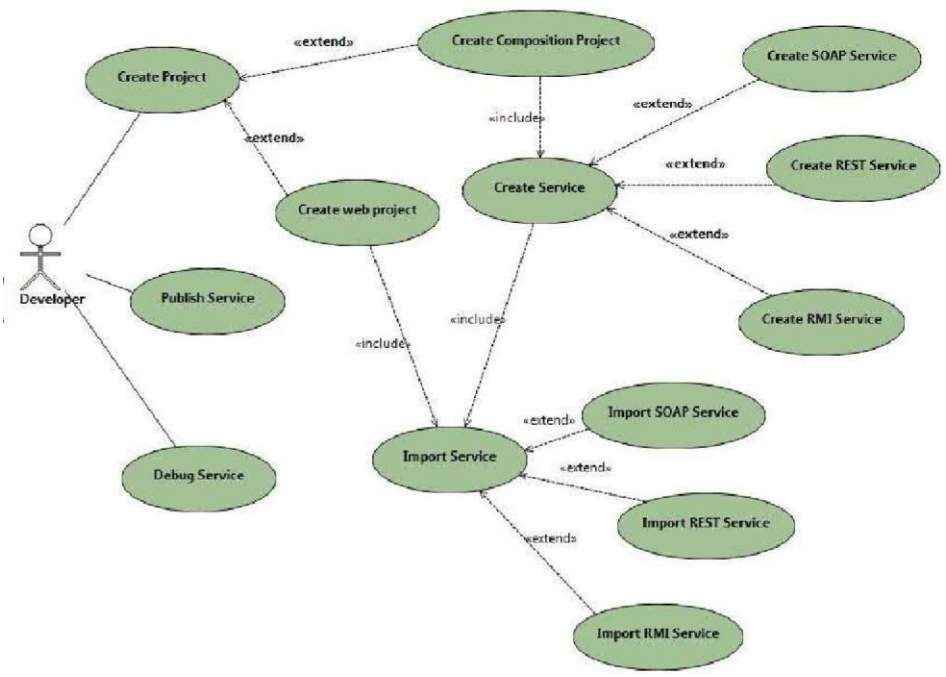

Figure 2: Use Case Diagram

VI. RESULTS

In our experimental study of the healthcare supply chain management system, we have successfully implemented a comprehensive solution that addresses the challenges and complexities of delivering goods and services to consumers in the healthcare industry. The supply chain encompasses a network of blood banks, medical facilities, and customers, creating a dynamic environment with various supplier-customer interactions.

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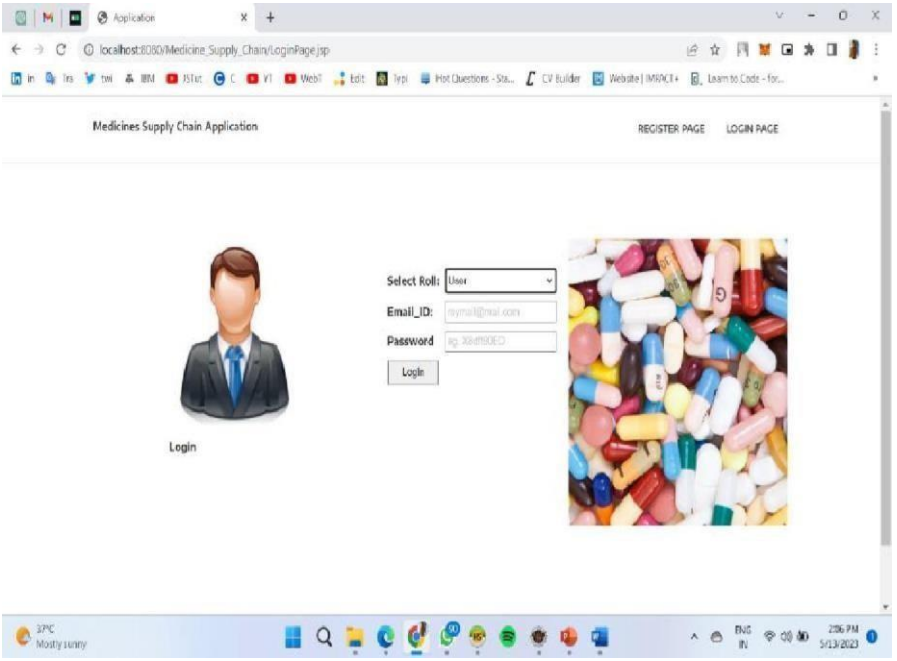

Fig 1: User, Admin, and Distributor Login Page

To provide a user-friendly experience, we have developed a web-based interface using modern web technologies. This interface serves as the primary platform for user's, administrators, and distributors to access and manage the healthcare management system. It enables seamless communication and collaboration, facilitating efficient handling of the entire supply chain.

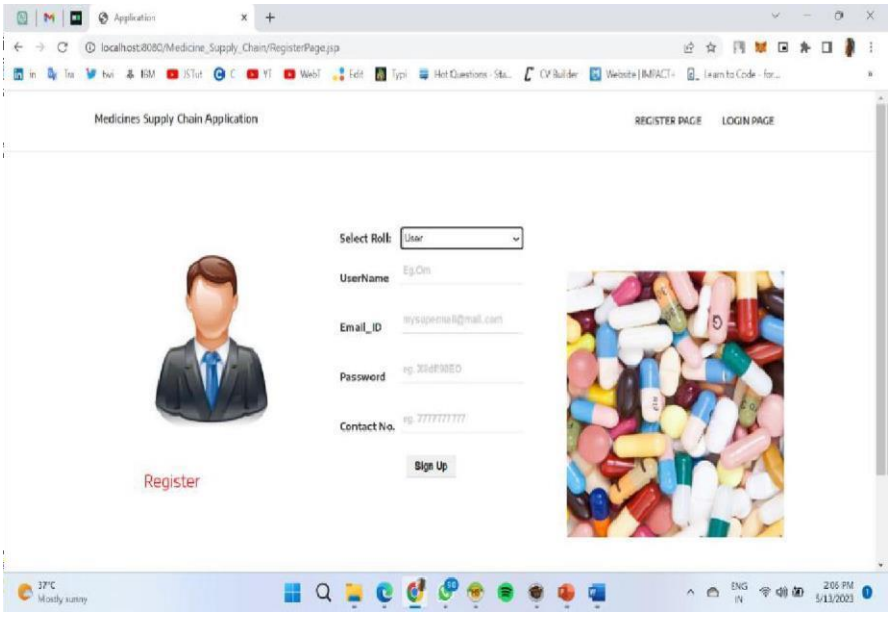

Fig 2: User and Distributor Registration Page

One of the significant achievements of our system is the reduction of costs. By optimizing processes and improving supply chain efficiency, we have been able to minimize expenses associated with healthcare products and services. This cost reduction contributes to overall affordability and accessibility for consumers.

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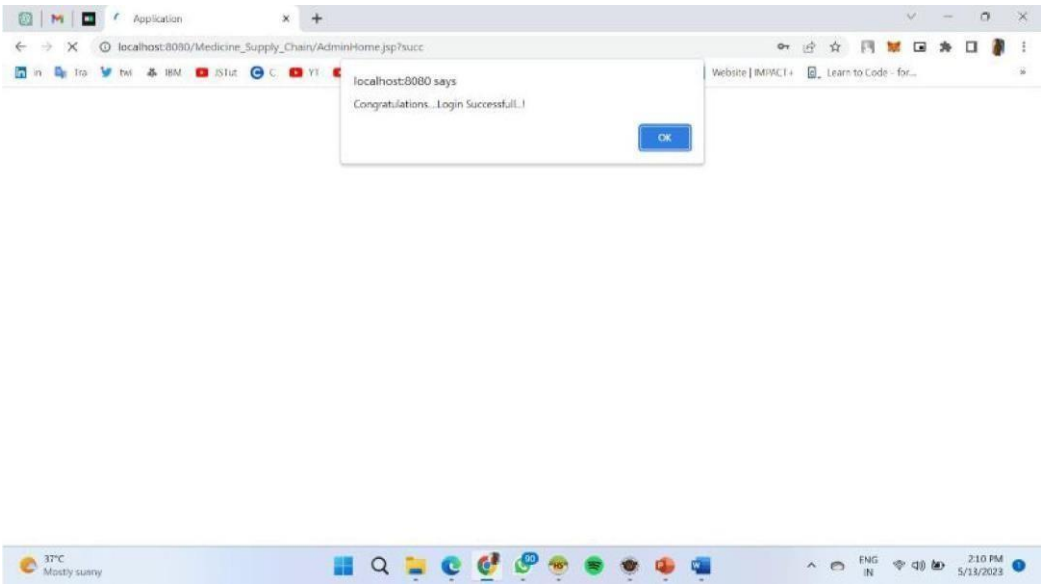

Fig 3: Login Successful

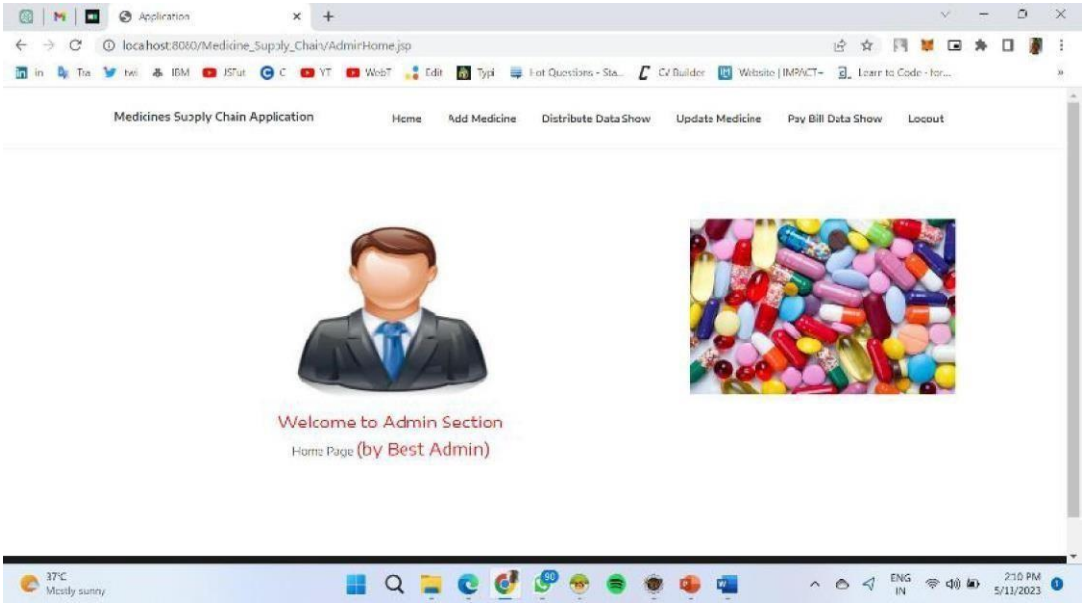

Fig 4: User dashboard

Furthermore, our system enhances supply chain efficiency, ensuring that medicines and other medical supplies are available when needed. Regular checks are conducted to monitor the expiry of medicines, especially in cases where manual entries are involved. By always maintaining an adequate supply of medicines, we improve patient care and avoid stockouts.

Clear and transparent communication is a key advantage of our system. It provides visibility into the entire supply chain, enabling stakeholders to track the movement of goods and services. Effective communication and collaboration among healthcare supply chain participants, including customers, suppliers, and distributors, are facilitated, resulting in improved coordination and operational efficiency.

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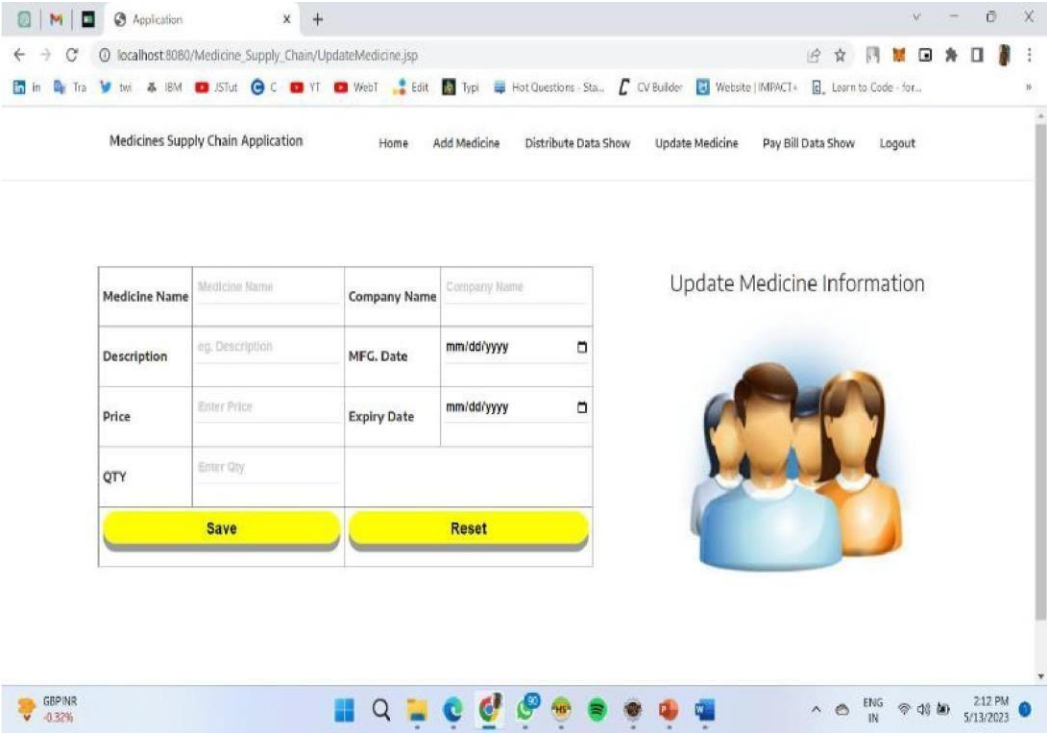

Fig 5: Update Medicine information

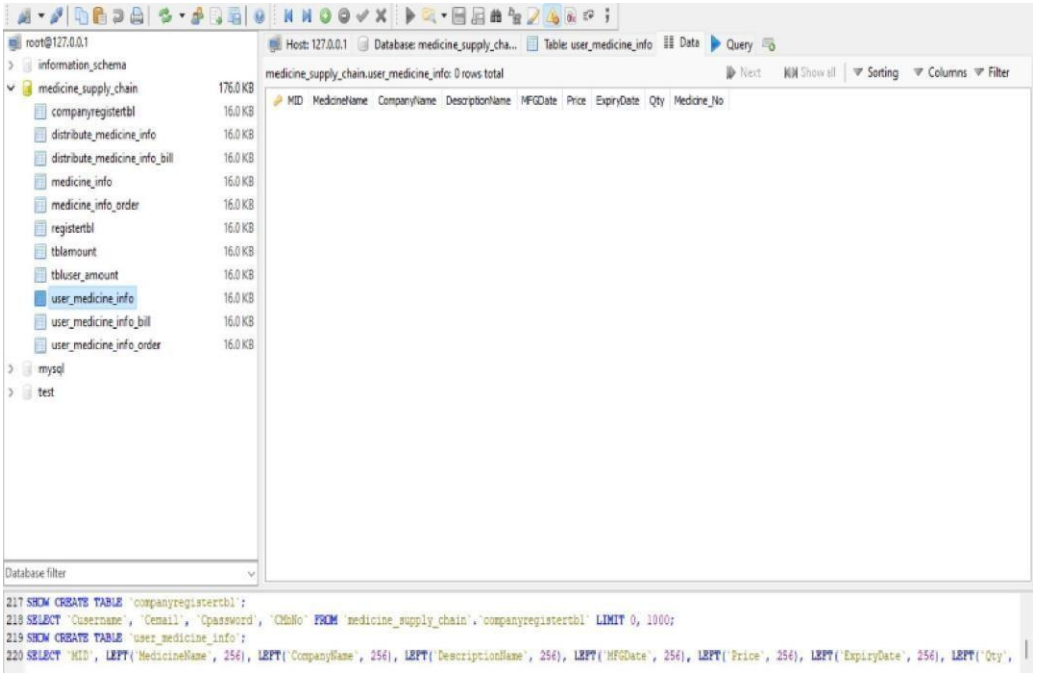

Fig 6: Save database on AWS

In conclusion, our experimental results demonstrate the successful implementation of a healthcare supply chain management system. The system effectively handles the complexities of the supply chain, ensuring cost reduction, increased efficiency, and improved communication. Users, administrators, and distributors can navigate the system seamlessly, leading to better healthcare outcomes for consumers.

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VII. CONCLUSION

It is not an easy topic to understand the structure of supply chain management for the healthcare business, but its importance is growing. This study looked at 43 publications regarding pharmaceutical and hospital supply chain management from the literature, which contains many studies on supply chain management in the healthcare sector. First, there is a significant gap regarding publications in the literature due to the lack of mathematical modelling. Almost 15% of the papers analyzed did not include any supply chain management mathematical modeling. In terms of operations research, models may aid in the optimization of inventory, costs, and other operational issues. Consider evaluating pharmaceutical or Hospitals as another classification for the supply chain emphasis area. Hospital studies are more thorough than pharmaceutical SCM papers.

In order to raise the effectiveness and lower the costs of the healthcare supply chain, studies about pharmaceutical SCM and hospital SCM may increase in proportion to the importance of the medical sector and hospital operations. Finally, there are not many studies about how supply chain management is evaluated in conjunction with industry 4.0 applications in healthcare systems to adapt to the most recent issues. Furthermore, the integration of supply chain management with Industry 4.0 applications in healthcare systems remains an underexplored area. Understanding how supply chain management can adapt to the latest advancements in technology and automation can lead to enhanced efficiency and better patient outcomes.

Overall, the study highlights the need for continued research and innovation in healthcare supply chain management. By addressing the identified gaps and leveraging emerging technologies, healthcare organizations can achieve more effective and cost-efficient supply chain operations, ultimately benefiting patients and the healthcare industry.

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