Pharmaceutical and Medical Supply Chain Management

Prof. Balaji A. Chaugule[1], Saurabh Chavan[2], Nikhil Chavan[3], Rohit Shinde[4], Tamanna Mulani[5]

Professor, Department of Information Technology[1]
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 organisations 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 healthAcare quality.

In this investigation, research about supply chain management in the healthcare industry published between 2000 and 2018 will be looked into. 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) looked into a cost-cutting strategy for the medical suppliers. They also came to the conclusion 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

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

Meijboom, Schmidt-Bakx, and Westert (2011) explained how a different study focused on organisational 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 Uthayakumar and Priyan (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 took into account the lead time, time and space availability, customer service levels, and other factors as well. Pharmaceutical Supply Chains have been assessed by Settanni, Harrington, and Srai (2017) in terms of manufacturing and distribution models. Additionally, they divided the modelings into categories and came to the conclusion that Pharmaceutical Supply Chain definitions are heavily focused on production-centered definitions and have shortcomings to reflect patient consumptions [12].

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In terms of agility and lean manufacturing, healthcare supply chains have been examined by Aronsson, Abrahamsson, and Spens (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 organisations to define the various supply chain processes in the healthcare sector and to comprehend the mechanisms involved [14]. In the healthcare industry, Sinha and Kohnke (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 Kachhal 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 analysed the findings to demonstrate that internet-based integration enhances supply chain management in the healthcare industry [19]. McKone-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

over 30%. Pharmaceutical inventory management procedures and purchasing practises are part of this development. At each stage of the supply chain, inventory levels were optimised 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 Langabeer (2005). He examined the state of management systems at the time and looked into the reasons for the lack of technology utilisation. 572 T. Beldek 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]. Baltacioglu 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 characterise each component, such as entities, data and information flows, processes, etc., Kitsiou et al. (2007) researched the healthcare supply chain and analysed 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 optimise the issues with a pharmaceutical company's global supply chain. The study's goal was to increase the company's net present value by taking into account 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]. Rahimnia and Moghadasian (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 leagility 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 came to the conclusion that hospitals typically chose local suppliers to support the local economy [27].

Bhakoo 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 came to the conclusion 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.
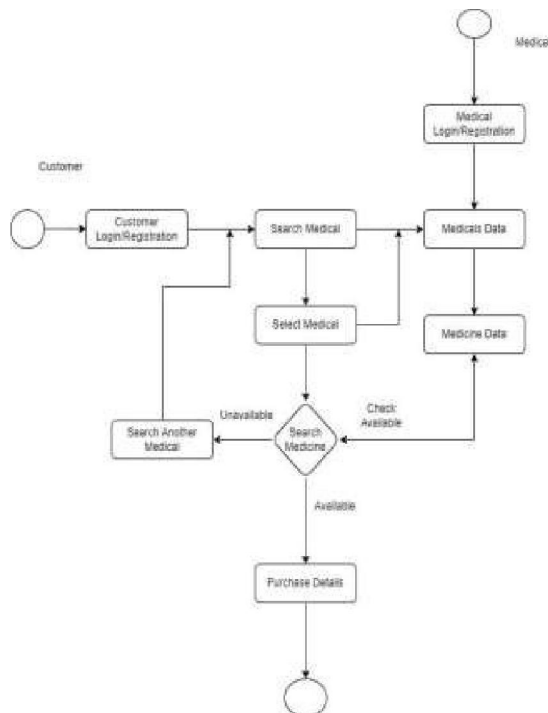
Fig: Proposed System Architecture

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.

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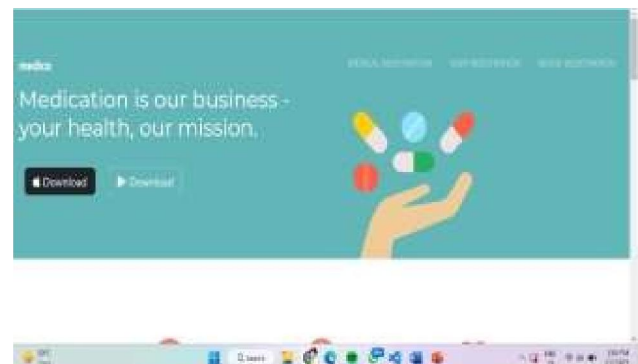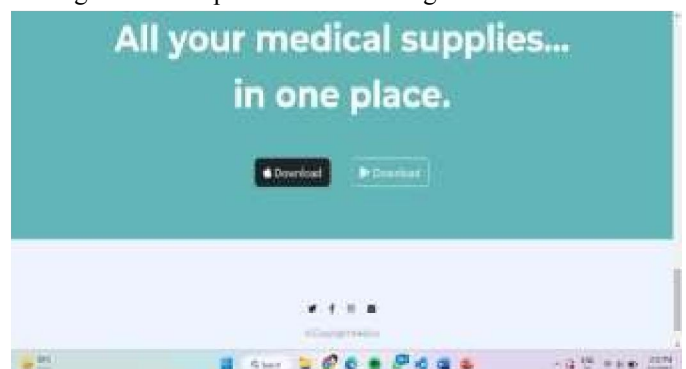

Fig: Front-end part of website using HTML & CSS

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

4.2 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.

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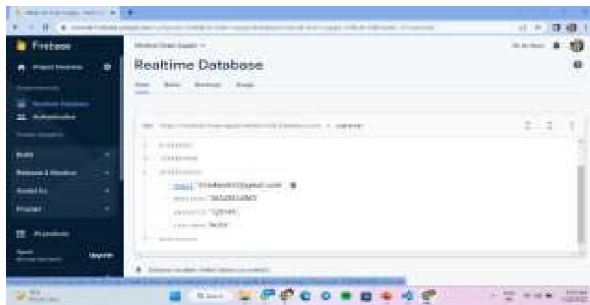
Fig: Medical Registration

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 analysed 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. Last but not least, there aren't many

This is used for faster computations over the weights (gradients) in neural networks. Second, "scikit-learn" is a machine learning library for Python which features different 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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