

Online Oxygen Supply Management System

¹Prof. Priyanka Kakade, ²Walhekar Vishal, ³Shete Dnyaneshwar,
⁴Madane Sunil, ⁵Bharsat Bhavesh

^{1,2,3,4,5}*Department of Computer Engineering,*
^{1,2,3,4,5}*Brahma Valley College of Engineering and Research Institute,*
^{1,2,3,4,5}*Nashik, Savitribai Phule Pune University, Maharashtra, India*

Abstract- The Online Oxygen Supply Management System is a web-based application designed to manage and streamline the supply, distribution, and monitoring of oxygen cylinders for hospitals, healthcare centers, industries, and individual consumers. During medical emergencies and periods of high demand, the availability and timely delivery of oxygen become critical. Traditional oxygen supply management methods often involve manual record keeping, delayed communication, inventory inaccuracies, and inefficient distribution processes. The proposed system aims to overcome these challenges by providing a centralized digital platform for oxygen inventory management, order processing, supplier coordination, and customer service.

The system enables registered users to search for available oxygen cylinders, place online orders, track delivery status, and make secure payments through an integrated interface. Suppliers and administrators can monitor stock levels, update cylinder availability, manage customer requests, and generate reports for effective decision-making. Real-time inventory tracking helps prevent shortages and ensures efficient allocation of oxygen resources. The system also maintains detailed records of customers, suppliers, orders, deliveries, and payment transactions, reducing paperwork and improving operational efficiency.

The project is developed using modern web technologies with a database management system that ensures secure storage and retrieval of information. Features such as user authentication, order history, notification services, and automated inventory updates enhance system reliability and user convenience. By digitizing the oxygen supply chain, the system minimizes human errors, improves transparency, and enables faster response during emergencies.

Overall, the Online Oxygen Supply Management System provides an efficient, reliable, and scalable solution for managing oxygen distribution. It supports better resource utilization, timely delivery, and effective communication between suppliers and consumers, ultimately contributing to improved healthcare services and emergency preparedness.

I. INTRODUCTION

Oxygen is one of the most essential medical resources required for patient care in hospitals, clinics, emergency centers, and home healthcare services. It plays a critical role in the treatment of respiratory diseases, surgical procedures, intensive care units (ICUs), and emergency situations. The demand for oxygen cylinders significantly increases during health crises, natural disasters, and pandemics. Ensuring the timely availability and efficient distribution of oxygen is therefore vital for saving lives and maintaining quality healthcare services.

Traditional oxygen supply management systems are often based on manual processes, including paper-based records, telephone bookings, and physical inventory tracking. These methods are time-consuming, prone to human errors, and inefficient in handling large numbers of requests. Customers frequently face difficulties in locating available oxygen cylinders, while suppliers struggle to manage inventory, monitor deliveries, and maintain accurate records. Such challenges can lead to delays, shortages, and poor resource utilization, especially during emergency situations.

The Online Oxygen Supply Management System is designed to address these issues by providing a centralized digital platform that automates the management of oxygen cylinder supply and distribution. The system allows customers to register, search for available oxygen cylinders, place orders online, and track the status of their deliveries in real time. Suppliers can update stock information, manage customer requests, schedule deliveries, and monitor inventory through an integrated dashboard. Administrators can oversee all operations, maintain system records, and generate reports for effective decision-making.

The proposed system utilizes modern web technologies and database management systems to ensure secure data storage, quick information retrieval, and reliable communication between users and suppliers. Features such as user authentication, inventory management, order tracking, payment processing, notifications, and reporting enhance the overall efficiency of oxygen distribution operations.

By digitizing the oxygen supply chain, the system reduces paperwork, minimizes operational delays, improves transparency, and ensures better utilization of available resources. It also helps healthcare organizations and suppliers respond more effectively to emergency demands while providing customers with a convenient and reliable service. The Online Oxygen Supply Management System serves as a scalable and efficient solution for modern oxygen distribution management, contributing to improved healthcare support and emergency preparedness.

One of the key features of the proposed system is its user-friendly interface, which enables customers to easily search for oxygen cylinders based on their location, quantity requirements, and urgency. The online ordering facility eliminates the need for physical visits or lengthy phone calls, making the process faster and more convenient. Customers can view product details, select the

required type of oxygen cylinder, place orders, and receive confirmation instantly. The system also provides order tracking functionality, allowing users to monitor the status of their orders from placement to delivery.

The supplier module plays a crucial role in managing oxygen cylinder inventory and order fulfillment. Suppliers can add new cylinder details, update stock quantities, manage refill operations, and process customer orders through a centralized dashboard. The system automatically records all transactions, reducing paperwork and minimizing human errors. Suppliers can also analyze demand trends through generated reports, helping them plan inventory requirements more effectively. This improves operational efficiency and ensures better service delivery.

II. MOTIVATION

The motivation behind the development of the Online Oxygen Supply Management System arises from the increasing need for an efficient, reliable, and transparent mechanism for managing oxygen cylinder distribution. Oxygen is a critical resource in healthcare and various industrial sectors, where uninterrupted availability is essential for saving lives and maintaining operations. Despite its importance, many organizations still rely on traditional manual methods for inventory management, order processing, and delivery coordination. These conventional approaches often result in delays, errors, miscommunication, and inefficient utilization of available oxygen resources.

The major motivation for this project is the difficulty faced by customers in obtaining oxygen cylinders during urgent situations. In traditional systems, customers are often required to contact multiple suppliers, visit distribution centers physically, or depend on manual inquiries to check stock availability. This process is time-consuming and stressful, particularly during medical emergencies when every minute is important. An online platform can simplify this process by allowing users to check availability, place orders, and track deliveries from any location.

Inventory management is also a significant concern for oxygen suppliers. Manual record-keeping methods can lead to inaccurate stock information, duplication of records, and difficulties in tracking cylinder movement. Such issues may result in overstocking, understocking, or delays in replenishment. The proposed system provides real-time inventory monitoring and automated record management, helping suppliers maintain optimal stock levels and improve operational efficiency.

The project is further motivated by the need to improve transparency and accountability in oxygen distribution. In many traditional systems, there is limited visibility into the status of orders, delivery schedules, and stock levels. Customers often remain unaware of when their oxygen cylinders will arrive, while administrators face challenges in monitoring supplier performance. The Online Oxygen Supply Management System addresses these issues by providing real-time updates, order tracking, and centralized monitoring facilities for all stakeholders.

III. PROBLEM STATEMENT

The management and distribution of oxygen cylinders are critical activities in healthcare institutions, emergency services, and industrial sectors. Oxygen is a life-saving resource required for patients suffering from respiratory diseases, critical illnesses, accidents, and other medical emergencies. However, many oxygen suppliers and healthcare organizations still depend on traditional manual methods for inventory management, order processing, and delivery coordination. These methods are often inefficient, time-consuming, and prone to human errors, leading to delays in oxygen supply and difficulties in resource management.

One of the major problems in the existing system is the lack of real-time information regarding oxygen cylinder availability. Customers and healthcare facilities frequently face difficulties in locating suppliers with sufficient stock during emergencies. The absence of a centralized platform forces users to contact multiple suppliers manually, resulting in delays and inconvenience. In emergency situations, such delays can have serious consequences for patient health and safety.

Another significant issue is inefficient inventory management. Manual record-keeping methods make it difficult for suppliers to accurately track stock levels, cylinder refilling status, and distribution records. Inaccurate inventory information can lead to shortages, overstocking, mismanagement of resources, and interruptions in oxygen supply. Furthermore, the lack of automated monitoring systems makes it challenging to predict future demand and maintain adequate stock levels.

Order processing and delivery management also present considerable challenges. Traditional systems often rely on telephone calls, paper-based records, and manual coordination between suppliers and customers. This increases the possibility of communication errors, duplicate entries, misplaced records, and delays in order fulfillment. Customers are often unable to track the status of their orders, leading to uncertainty and reduced satisfaction.

IV. LITERATURE SURVEY

1) Supply chain management in health care : state of the art and potential

Purpose – This paper seeks to concentrate on the question whether any parallels can be found between the industrial sector and health care services with respect to the developments that have taken place in the area of Supply Chain Management. Starting from an analysis of existing literature, it is intended that different modes of Supply Chain integration will be discussed. Also, in doing so, it is intended that the lessons learned from the studies presented in this special issue will be summarized and placed into the perspective of future research that can be considered as necessary. **Design/methodology/approach** – This paper adopted an exploratory, qualitative approach based on an analysis of existing literature in the area of Supply Chain Management in Health Services. Additionally, material from the case studies presented in this special issue is used

to assess the current body of knowledge regarding Supply Chain Management in Health Services. Findings – Starting from a classification of existing research, five main research areas with respect to Supply Chain Management in a health care setting are defined. Additionally, it is concluded that next to studies with a mono-disciplinary focus, an interdisciplinary focus on Supply Chain Management issues in health services seems to be necessary. Originality/value – This paper contributes to both the supply chain management literature and literature in the area of healthcare management by identifying some important research areas which are linked to both fields. This paper helps both academics and managers to gain a better understanding of the complexity of supply chain management in health services.

2) New Trends in Healthcare Supply chain

This paper focuses on the new trends to optimize costs in healthcare supply chain operations that include virtual centralization of supply chains, supply utilization management practices, use of RFID technologies, use of analytics, streamlining workflow etc. The application of these techniques can provide affordable healthcare solutions in developing countries.

3) Best Practices in Healthcare Supply Chain Management to Improve the Performance of Healthcare Services

Healthcare and pharmaceutical supply chain operation is complex to manage. Healthcare service is one of the primary areas in the supply management system where the cost reductions are the predictable outcome. Healthcare supply chain management is the process of managing, distributing, monitoring product or service in the hospital which dealing with suppliers, customers and other channel members. There are a lot of techniques to practice SCM since it was introduced in year 1982, but what is the best practice to improve the quality, performance of the healthcare supply chain and at the same time reducing cost and increase value is remain question. In this paper will review the best practice in healthcare supply chain management to improve the performance of healthcare services by providing the overview of the SCM into definition, issues and challenges, the processes with lean and agile strategies, the role of procurement, logistics and quality management and the improvement in the SCM practices. In each of the topic the benefits of SCM practices will be discussed

4) The Role of Supply Chain Management in Healthcare Service Quality

Healthcare organizations in sub-Saharan Africa are facing many supply chain management challenges that can be addressed through effective operational and management decisions. The objective of this article is to investigate supply chain management in healthcare service quality in developing countries, particularly in Ethiopia. The primary method was used to collect data from 384 managers and procurement officers from private healthcare sectors to identify the quality and dimensions of healthcare services. The results of our study show that the combination of the timely delivery of health care products, specification, the standard of healthcare product suppliers, and

after-sales services in private health sectors in Ethiopia is associated with the quality of healthcare. The scope of this article is focused on the hiring of proper human resources and highly skilled professionals in the supply chain departments to improve the quality of supply chain healthcare services. As a practical contribution, this article may help healthcare supply chain managers and organizations to do their jobs better or build some competitive advantage by addressing the issues and difficulties related to individual healthcare managers, organizations, and their partners.

5) Risk Management in the Service Supply Chain: Evidence From the Healthcare Sector

Service supply chain management is more and more complex and managers find that old-style methods fall short in effectively addressing many associated challenges. Although risk management in supply chains is continuing to obtain momentous attention in the extant literature, investigation on risk aspects connecting to tactical sourcing crossways various industry segments from a transnational viewpoint is scant. The objective of this study is to investigate the effect of social ties, institutional support and inter-agency collaboration in mitigating service supply chain risk in the healthcare sectors. Qualitative and quantitative approaches were used to collect data from 171 respondents from Ethiopia. Partial least squares structural equation model is applied to examine the association among these latent variables and the dependent variable. The result of the study indicates inter-agency collaboration plays a critical role in managing service supply chain risk, especially in volatility, uncertainty, complexity, and ambiguity environment. As for practical contributions, results may be helpful to policymakers, managers and organizations to do their jobs better or build competitive advantage by responding the issues and problems related to healthcare individual managers, organizations and their partners.

V. METHODOLOGY

The proposed Online Oxygen Supply Management System is developed using a web-based architecture that automates and simplifies the complete oxygen supply chain. The system connects administrators, suppliers, and customers through a centralized platform, enabling efficient inventory management, online ordering, secure payment processing, and real-time order tracking. The methodology is designed to improve operational efficiency, reduce manual effort, and ensure the timely availability of medical oxygen.

Requirement Analysis: The first stage involves identifying the functional and non-functional requirements of the system by analyzing the existing oxygen distribution process. The study focuses on the difficulties faced by customers in locating oxygen suppliers, delays in order processing, inaccurate inventory records, and the lack of a centralized management platform. Based on these observations, system requirements such as user management, inventory control, online booking, payment processing, and report generation are defined.

System Design: After gathering the requirements, the overall system architecture is designed. The application follows a client-server model where users access the system through a web browser, while all data is stored in a centralized database. Separate modules are created for administrators, suppliers, and customers. Database tables are designed to store user information, supplier details, oxygen cylinder information, stock records, customer orders, payment details, and delivery status. The user interface is developed to provide easy navigation and improve user experience.

User Registration and Authentication: The system provides secure registration and login facilities for all users. Customers create accounts to purchase oxygen cylinders, suppliers register to manage inventory and process orders, and administrators manage the overall system. Authentication mechanisms ensure that only authorized users can access specific modules, improving data security and preventing unauthorized access.

Supplier and Inventory Management: Suppliers maintain oxygen inventory through the system by adding new products, updating stock availability, modifying prices, and managing refill services. Whenever an order is placed, the inventory is automatically updated to reflect the available stock. This real-time inventory management helps eliminate stock mismatches and prevents overbooking of oxygen cylinders.

Online Order Processing: Customers can search for oxygen cylinders based on type, capacity, availability, or price. After selecting the required product, customers place orders by entering delivery details and confirming the purchase. The system validates stock availability before confirming the order and immediately notifies the supplier for further processing.

Administration Module: The administrator has complete control over the system. Administrative functions include managing users, verifying suppliers, monitoring inventory, approving products, tracking customer orders, generating reports, and maintaining database security. The administrator can also identify low-stock situations and monitor system performance to ensure uninterrupted oxygen supply.

System Testing: Before deployment, the application undergoes comprehensive testing, including unit testing, integration testing, system testing, and user acceptance testing. These tests ensure that all modules function correctly and meet user requirements. After successful testing, the system is deployed on a web server, where it can be accessed by authorized users through the internet. Regular maintenance, software updates, and database backups are performed to ensure system reliability, security, and continuous improvement.

Table: Technology Stack

Component Programming Language	Technology/ Library Java	Purpose Primary development environment
Frontend Framework	JSP, HTML, CSS, Bootstrap	User interface development
Backend Framework	Spring Boot	API development and business logic
Database	MySQL	Storage of customer, supplier, inventory, and order data
Authentication	Spring Security	Secure user authentication and authorization
Oxygen Data Source	Admin Input Module	Real-time oxygen stock and supplier data management
Inventory Management Engine	Custom Management Algorithm	Oxygen Cylinder availability and allocation
Data Processing	Java , MySQL, Queries	Order processing and inventory analysis
Version Control	GitHub	Source code management
Containerisation	Docker	Portable deployment

VI. CONCLUSION

The Online Oxygen Supply Management System is a comprehensive web-based solution developed to improve the management, monitoring, and distribution of oxygen cylinders. The system addresses the limitations of traditional manual methods by providing an automated platform for inventory management, online ordering, payment processing, delivery tracking, and report generation. By integrating all these functions into a single system, it ensures efficient coordination among customers, suppliers, and administrators.

The implementation of this system significantly reduces paperwork, minimizes human errors, and enhances the accuracy of inventory records. Real-time monitoring of oxygen cylinder availability helps suppliers maintain adequate stock levels and prevents shortages during emergencies. The online ordering facility enables customers to quickly search for available oxygen cylinders, place orders, and track deliveries, thereby improving accessibility and convenience.

The system also increases transparency and accountability by maintaining centralized records of inventory, orders, payments, and deliveries. Administrators can monitor all activities, generate

reports, and make informed decisions based on accurate and up-to-date information. This improves operational efficiency and supports effective resource planning and management.

Furthermore, the Online Oxygen Supply Management System plays a vital role in ensuring the timely availability of oxygen, especially during medical emergencies and periods of high demand. The use of modern web technologies and database management systems enhances reliability, security, and scalability, making the system suitable for hospitals, healthcare centers, oxygen suppliers, and industrial organizations.

In conclusion, the Online Oxygen Supply Management System provides an efficient, secure, and user-friendly platform for managing oxygen supply operations. It improves service quality, optimizes resource utilization, reduces operational challenges, and contributes to better healthcare support. The successful implementation of this project demonstrates how digital technology can be effectively used to streamline critical resource management and ensure that oxygen reaches those who need it most in a timely and reliable manner.

REFERENCES

- [1] Watkins K. Oxygen for all, During COVID 19 (Coronavirus) And beyond; 2020. Available from: <https://blogs.worldbank.org/en/health/oxygen-all-during-covid-19-coronavirus-and-beyond>. [Last assessed on 2024 Oct 21].
- [2] Ministry of Health & Family Welfare & Government of India. Guidelines for Management of COVID-19 in Children; 2021. p. 1-9. Available from: <https://covid19dashboard.mohfw.gov.in/pdf/GuidelinesforManagementofCOVID19inCHILDREN18June2021final.pdf>. [Last assessed on 2024 Oct 21].
- [3] World Health Organization. COVID-19 Oxygen Emergency Impacting More Than Half a Million People in Low- and Middle Income Countries Every Day, as Demand Surges; 2021. Available from: https://www.who.int/news/item/25-02-2021-COVID-19-oxygenemergencyimpacting-more-than-half-a-million-people-in-low-and-middle-income-countries-every-day-as-demand-surges#_ftn2. [Last accessed on 2022 May 16].
- [4] World Health Organization. Living Guidance for Clinical Management of COVID-19; 2021. Available from: <https://www.who.int/publications/i/item/WHO-2019-nCoV-clinical-2021-2>. [Last accessed on 2022 May 16].
- [5] Kiruba G. Kauvery Hospital. Oxygen Conservation Strategies; 2022. Available from: <https://www.kauveryhospital.com/kauverianscientific-journals/oxygen-conservationstrategies>. [Last accessed on 2022 May 19].
- [6] Blakeman T, Branson R. Oxygen supplies in disaster management. *Respir Care* 2012; 58:173-83.
- [7] Bhattacharyya D. Coronavirus timeline: Major developments around covid-19 India pandemic 2020, My India; 2020. Available from: <https://www.mapsofindia.com/myindia/india/timeline-of-india-covid-19-pandemic-2020>. [Last accessed on 2024 Oct 28].

- [8] Mirza M, Verma M, Sahoo SS, Roy S, Kakkar R, Singh DK. India's multi-sectoral response to oxygen surge demand during COVID-19 pandemic: A scoping review. *Indian J Community Med* 2023;48:31-40.
- [9] Usher AD. Medical oxygen crisis: A belated COVID-19 response. *Lancet* 2021;397:868-9.
- [10] Jain R, Sharma C. Oxygen supply in hospitals: Requisites in the current pandemic. *Anesth Essays Res* 2021;15:253-6.
- [11] Hardavella G, Karampinis I, Frille A, Sreter K, Rousalova I. Oxygen devices and delivery systems. *BreatheM(Sheff)* 2019;15:e108-16.