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Oxygen Supply Management System

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Abstract: ***The COVID'19 pandemic, recent spike of Omicron variant and the upsurge in air pollution in metropolitan cities like Delhi has highlighted the importance of oxygen cylinders andother equipment's. The various units in the health system such as: General wards, Emergency transport, Delivery rooms, Operating theaters, Intensive care units (ICU) also require a regular supply of oxygen. Thus, timely and powerful planning for reliable oxygen supply and delivery is needed to protect and save lives of people who are in need. Due to the unavailability of a proper channel of acquiring Oxygen during the pandemic, forced people to search for the supply of oxygen through phone calls and various social media platforms. But only few people got reliable suppliers and many could not get their demand satisfied at the right time. Even hospitals faced the same situation. To combat such problems, in this project we propose a unique system for Oxygen Supply Management to people and hospitals which can meet the crisis in an effective way. In order to overcome the shortage of oxygen in the coming times, this proposed system will be launched as a digital platform to fast-pace the supply chain to both people and hospitals.***
Index Terms: Covid-19, pandemic, Omicron

I. INTRODUCTION

Medical oxygen is used by patients in healthcare facilities for life support and for medical treatment. It is vital to ensure that the medical oxygen supply system provides a safe and reliable supply of oxygen to healthcare facilities and patients as end user. This Oxygen Supply Management SystemWebsite helps connect the users and hospitals with the OxygenSuppliers. The Oxygen Suppliers can put up Oxygen Cylindersand equipments such as Concentrators, Regulators etc. On the website which can be purchased by the users and hospitals as per the availability. This system provides an option of renting certain oxygen devices on monthly basis. The various Oxygendevices available on the website are as follows:

1) *Oxygen Concentrator:* An electrically powered medical de- vice designed to concentrate oxygen from ambient air. Used to deliver oxygen at the bedside, typically through an attached nasal cannula to a patient requiring oxygen therapy. The clinical purpose is to deliver continuous, clean, low flow and concentrated oxygen[1].
2) *Oxygen Cylinder:* Compressed oxygen and medical air cylin- ders are dedicated refillable containers for holding medical gases in a high-pressure, non-liquid state[2]. They are fitted with a valve and a pressure regulator that also includes a flow regulator in the integral valve.
3) *Venturi Mask:* Venturi masks which are also known as air- entrainment mask are considered high-flow oxygen therapy devices. This is because venturi masks are able to provide total inspiratory flow at a specified FiO2 to patients therapy. The kits usually include multiple jets, which are usually color-coded, in order to set the desired FiO2[3].
4) *Nasal Cannula:* Inorder to deliver supplemental oxygen toa person in need of respiratory help, this device is used. It consists of a tube which on one end splits into two prongs which are placed in the nostrils for airflow.[4]
5) *Regulators:* The oxygen flow control regulators are devices which are designed to reduce and regulate oxygen pressure from a cylinder to levels that are considered safe for a patient. Therefore, it is a device that regulates the flow from an oxygencylinder.

II. OBJECTIVES OF THE STUDY

Various factors such as rising air pollution in Delhi, Covid- 19 pandemic and the rise in Omicron cases have led to an increase in demand of oxygen supply. The residents of Delhi are stocking up on oxygen cylinders fearing that the city's worsening air quality will make the ones with pre-existing health conditions such as asthma more vulnerable. It is vitalto ensure that the medical oxygen supply system providesa safe and reliable supply of oxygen to healthcare facilitiesand patients as end user. To combat scarcity of oxygen cylinders, concentrators and other equipments, we propose a unique system of Oxygen Supply Management for users and hospitals which can effectively meet the crisis. By means of this system users and hospitals can connect with the oxygen suppliers and place an order as per their requirement basedon the availability of oxygen cylinders, concentrators, regulatorsand other equipments.

III. RELATED WORK

"Supply chain management in health care : state of the art and 4 potential" by Robbert Huijsman. With respect to the developments in the area of Supply Chain Management, this paper concentrates on whether any parallels can be found between the industrial sector and healthcare services. Methodology-An exploratory, qualitative approach based on an analysis of existing literature in the Supply Chain Managementdomain in health services. The various studies done regarding this issue is used to assess the current body of knowledge regarding Supply Chain Management in health services. Findings–Five main research areas with respect to Supply Chain Management in a health care setting are defined. Additionally, it is concluded that apart from a mono-disciplinary focus, an interdisciplinary focus on Supply Chain Management issue in health services is also necessary. Originality/value–This study contributes to both the supply chain management literature and literature in the area of healthcare management by identifying important research areas linked to both fields. Through this research both academicians and managers can gain a better understanding of the complexity of supply chain management in healthcare services[5].

"New Trends in Healthcare Supply chain". Joseph Mathew,Joshin John and Dr. Sushil Kumar.

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 prac- tices, use of RFID technologies, use of analytics, streamlining workflow etc. The application of these techniques can provideaffordable healthcare solutions in developing countries[6].

"Best Practices in Healthcare Supply Chain Managementto Improve the Performance of Healthcare Services".Megat Ridwan bin Megat Adnan.

Healthcare and pharmaceutical supply chain operation is complex to manage. Healthcare service is one of the primary areasin 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[7].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 health-care 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.

"The Role of Supply Chain Management in Healthcare Ser-vice Quality". Gutama Kusse Getele; Tieke Li; Jean Tsitaire Arrive.

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[8]. 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.

"Risk Management in the Service Supply Chain: Evidence From the Healthcare Sector".Gutama Kusse Getele; Tieke Li; Jean Tsitaire Arrive.

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 socialties, institutional support and inter-agency collaboration inmitigating service supply chain risk in the healthcare sectors. Qualitative and quantitative approaches were used to collect data from 171 respondents from Ethiopia. Partial least squaresstructural 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 ambiguityenvironment[9]. As for practical contributions, results may be helpful to policymakers, managers and organizations to do their jobs better or build competitive advantage by respond- ing the issues and problems related to healthcare individual managers, organizations and their partners.

"Covid Management: Managing the oxygen supply chains" by Saranga Ananth Krishnamurthy[2020].Based on national/international data trends to predict demand by regionin second wave. Create adequate CCCs and provide required training and preliminary care to reduce patients that reach a critical stage. Train volunteers and paramedics in order to manage the oxygen supply efficiently, limit wastage. Establish strict protocol for oxygen usage in hospitals and oxygen audit of per bed oxygen consumption. Forecast what is the oxygen requirement in various hospitals of the state during the third wave and beyond and identify resources to meet this demand.

IV. EXISTING SYSTEM

The second wave of coronavirus as well as the growing environmental and health calamity in Delhi due to rise inair pollution demands the requirement of oxygen supply de- vices .Experts have predicted that the rising air pollution level in Delhi could soon see inhabitants walking around with oxy- gen cylinders on their backs to counter it and a person would need at least five oxygen cylinders a day. During the pandemicdue to improper channel, the requirements of the patients couldnot be fulfilled which took a toll on human lives.

There wasno proper channel for connecting the oxygen suppliers and people. The lack of production of medical oxygen led to its shortage risking the life of the people during the pandemic. Existing systems were mostly dependent on communication through phone calls and social media platforms in orderto avail oxygen cylinders. The delay in communication ofavailability of oxygen cylinders led to loss of lives. The lackof resiliency across healthcare organizations had led to poor visibility and increase in the cost. Therefore, a lack of quick access to centralized and real time data from dispersed sourcesmade it difficult to determine what's needed, what's in stock and scope of future demand. During the pandemic as demand increased for medical oxygen, costs soared.

V. PROPOSED MODEL

During these volatile times, rapid supply of oxygen to hospitals is extremely important for smooth functioning of health systems. This platform will provide oxygen cylinders and other devices to the hospitals and users in the shortest possible time as per the demand and requirement.

The proposed system will be assigned to ensure an easy supply of oxygen to users and hospitals round the clock. This system will directly connect the needy to oxygen suppliers. With the help of this web application users and hospitals can place an order for oxygen cylinders, concentrators, regulators, nasal cannula and venturi masks. Through this system one can rent certain oxygen devices on monthly basis.

The oxygen suppliers can regularly update the details based on availability of oxygen cylinders and other oxygen related devices. The users and hospitals can make use of the 'message' feature to provide any specific detailregarding their requirement. The users and hospitals can track their order with the help of this web application. Thus, this system will provide hassle-free and timely supply of oxygen devices to users and hospitals.

VI. SYSTEM DESIGN

In the proposed system there will be four modules-

USER, HOSPITAL, OXYGEN SUPPLIER AND ADMIN.

Firstly there will be a registration page which needs tobe filled in order to proceed to login .The oxygen sup- plier can add products and its details such as company, price, material, pressure, material regarding the oxygencylinders and other devices based on its availability. Through this system one can also rent certain oxygen equipment's for a particular period of time. The user or the hospital will be able to view the oxygen devices and their necessary details. The user or hospital representative can add the productsto the cart and thereby place an order if their requirementsare fulfilled. There is an enquiry feature which lets the user or hospitals mention any specific detail or information that needs to be shared to the admin. The admin can view the enquiries sent by the user/hospital. The admin can add productsand brands. The oxygen supplier can view the order request made by user/hospital and can change the status of the order based on availability. The user and hospital representative can see the details and status of their orders in 'My Orders' tab. The payment status can be updated by the admin oncethe user/hospital receives their order.

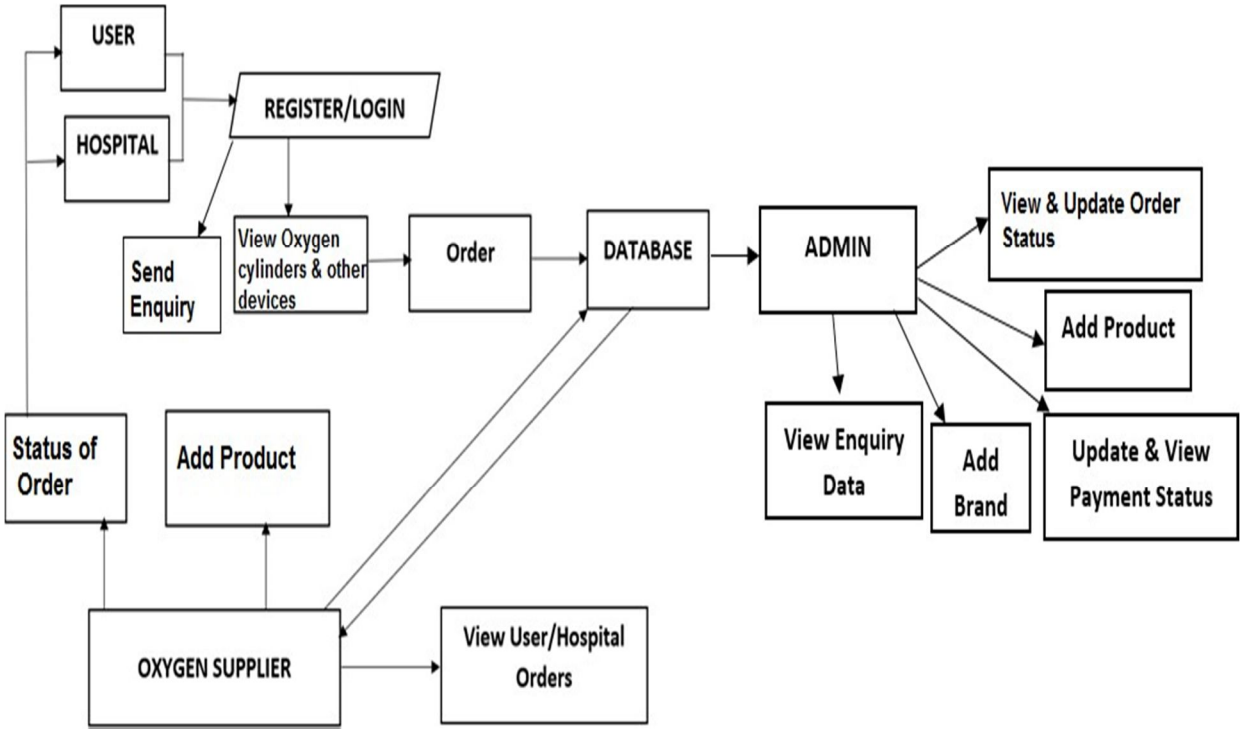

Fig. 1. System Architecture

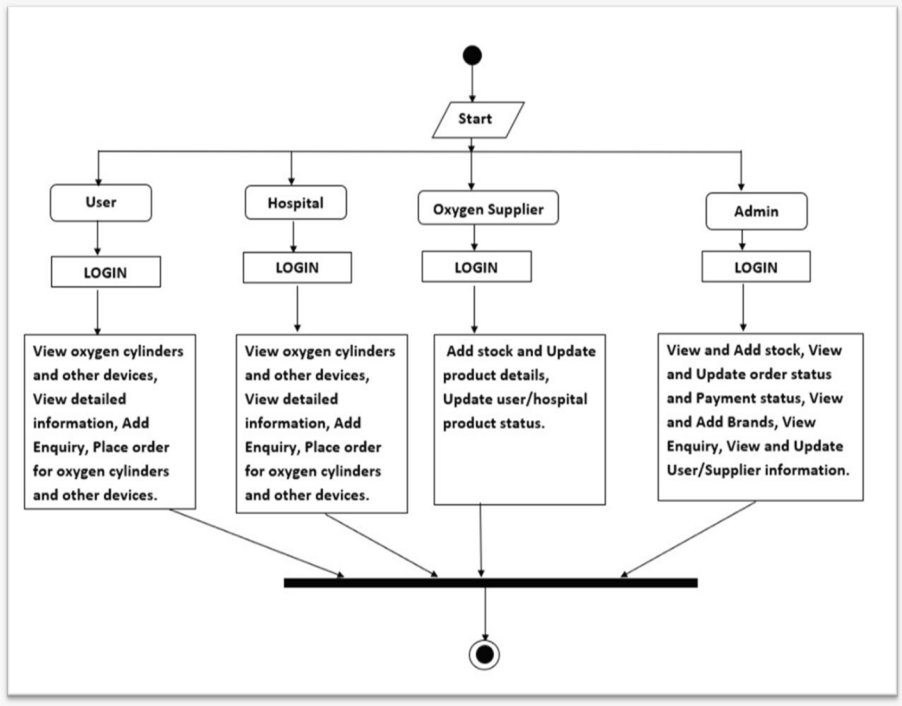

Fig. 2. Activity Diagram

Activity diagrams are graphical representations of work- flows of stepwise activities and actions with support for choice,iteration and concurrency. In the Unified Modeling Language, activity diagrams can be used to describe the business and operational step-by-step workflows of components in a system.An activity diagram shows the overall flow of control.

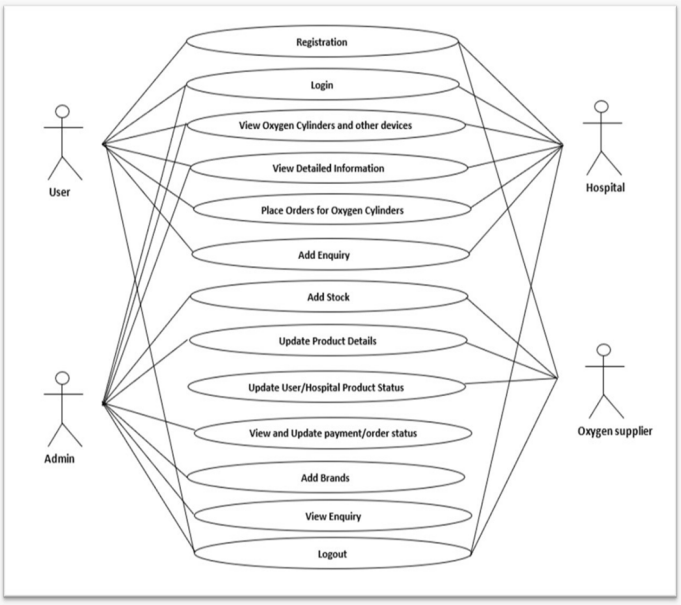

Fig. 3. Use Case Diagram

The purpose of this use case diagram is to present a graphical overview of the functionality provided by our systemin terms of actors (User, Hospital, Oxygen Supplier, Admin),their goals, and any dependencies between those use cases. The main purpose of a use case diagram is to show what system functions are performed for which actor. The roles of the actors in the system can be depicted.

VII. MODULES

A. User

1) *Login/Register:* The user has to register by providing the following information such as- name, email, phone no and password. The user will then be able to login using email and password.
2) *View Oxygen Devices:* The user can view various oxygen related devices and its available quantity.
3) *View Detailed Information:* The relevant details regardingthe products will be provided such as company, price, water capacity etc.
4) *Add Enquiry:* The user can enquire any details about the oxygen devices and other equipments by making use of message feature.
5) *Add to Cart:* The oxygen devices can be added to the cart based on their requirement.
6) *Place Order:* The user can place an order for oxygendevices after adding them to the cart.
7) *My Orders:* The user can see the details and status of theirorders.

B. Hospital

1) *Login/Register:* The hospital management in-charge can register by providing the following information such as- name, email, phone no and password. The hospital representative will then be able to login using email and password.
2) *View Oxygen Devices:* The hospital representative canview various oxygen related devices and its availablequantity.
3) *View Detailed Information:* The relevant details regardingthe products will be provided such as company, price, water capacity etc.
4) *Add Enquiry:* The hospital management can enquire any details about the oxygen cylinders and other equipments by making use of message feature.
5) *Add to Cart:* The oxygen devices can be added to the cart based on their requirement.
6) *Place Order:* The hospital representative can place anorder for oxygen related equipments after adding themto the cart.
7) *My Orders:* The details and status of the orders can be viewed.

C. Oxygen Supplier

1) *Add Product:* The oxygen supplier will provide the necessary details regarding the oxygen devices such as availability, price, water capacity, material etc.
2) *Update Product Details:* The oxygen supplier can update the product details based on their availability.
3) *View user/hospital Orders:* The oxygen supplier can view the orders requested by the users/hospitals for buying or renting.
4) *Update user/hospital Product Status:* The oxygen supplier can change the status of their product upon receiving any order.

D. Admin

1) *View and Add Product:* The admin can also view and add products whenever necessary.
2) *View and Update Order Status:* The order status can be changed by the admin based on order requirement.
3) *Add Brands:* The admin can add the names of any specific brand.
4) *View and Update Payment Status:* The payment status can be updated by the admin once the user/hospital receives the order.
5) *View Enquiry:* Any enquiries sent by the user/hospital regarding the products can be viewed by the admin.

VIII. IMPLEMENTATION

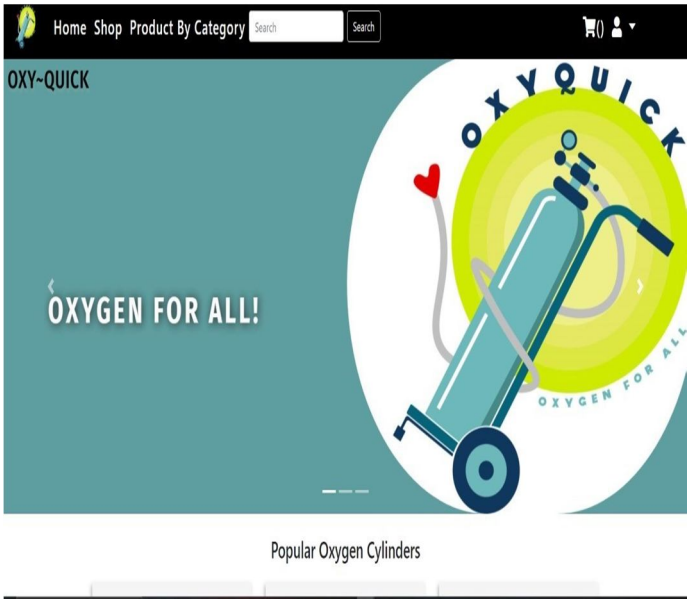

Fig. 4. HOME PAGE

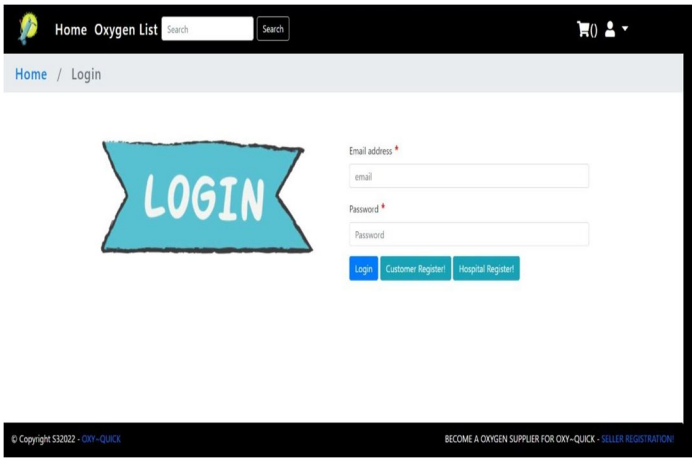

Fig. 5. USER/HOSPITAL LOGIN PAGE

Fig. 6. USER HOME PAGE

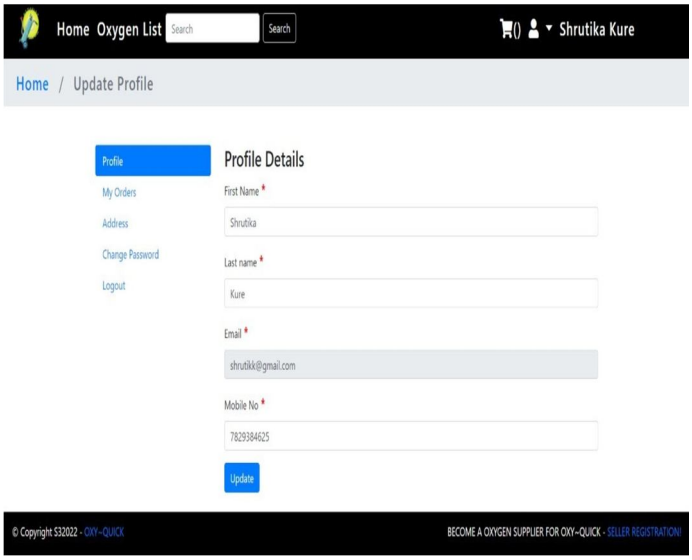

Fig. 7. USER/HOSPITAL PROFILE PAGE

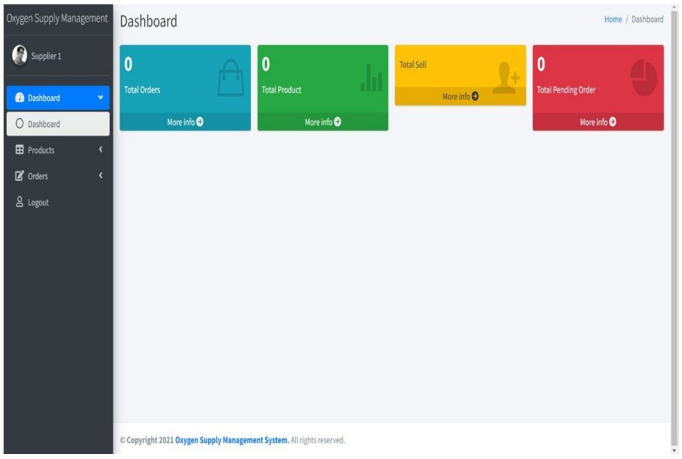

Fig. 8. OXYGEN SUPPLIER DASHBOARD

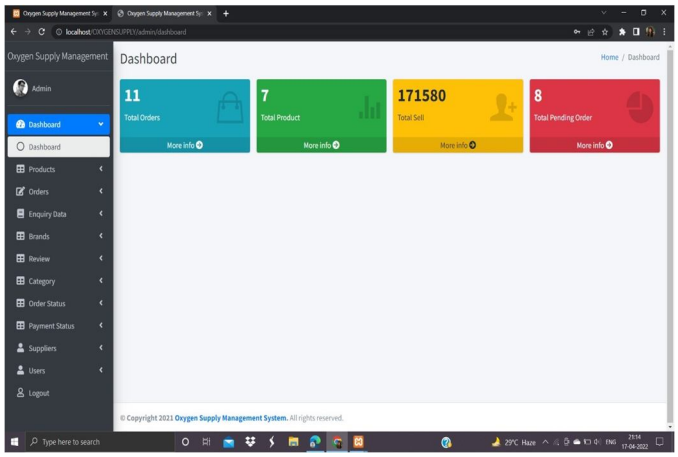

Fig. 9. ADMIN'S DASHBOARD

IX. SOFTWARE REQUIREMENTS

1) *Xampp:* It is the most popular PHP development en- vironment.XAMPP is a completely free, easy to install Apache distribution containing MariaDB, PHP, and Perl.The XAMPP open source package has been set up tobe incredibly easy to install and to use[10].
2) *PHP:* PHP is a server scripting language, and a powerfultool for making dynamic and interactive Web pages.
3) *MySQL:* MySQL is a relational database management system based on the Structured Query Language. MySQL is free and open-source software[11].
4) *HTML:* HyperText Markup Language is the most basic building block of the Web. It defines the meaning and structure of web content.
5) CSS: Cascading Style Sheets (CSS) is a stylesheet language used to describe the presentation of a documentwritten in HTML or XML.
6) *JavaScript:* JavaScript is an object-based scripting language which is lightweight and cross-platform[12].
7) *Bootstrap:* It is a free and open-source front-end frame- work used to create modern websites and web apps
8) Visual Studio Code: A code editor redefined and optimized for building and debugging modern web and cloud applications.

X. CONCLUSION

This system provides a friendly graphical user interface, provides reliability, system and data security and effectively overcomes the delay in communication which makes it effi- cient.This platform will provide oxygen cylinders and other devices to the hospitals and users in the shortest possible time as per the demand and requirement.This system will ensure aneasy supply of oxygen to users and hospitals round the clock. Therefore, the proposed system will provide hassle-free and timely supply of oxygen to the users and hospitals.

XI. ACKNOWLEDGEMENT

The ongoing project has helped us in acquiring tremendous knowledge in vari- ous aspects. We are highly indebted to our project guide Prof.Prakash Khelage for his guidance and constant supervision as well as for providing necessary information regarding the project. We would like to express our gratitude to our professor Mrs.Anita Morey for providing us with an opportunity to work on this project.Our sincere gratitude to Dr. Shikha Nema, Principal (Usha Mittal Institute of Technology) for her valuable encouragement and insightful comments. We would also like to thank to all the teaching andnon-teaching staff for their valuable support but not the least we would like to thank our parents and friends.

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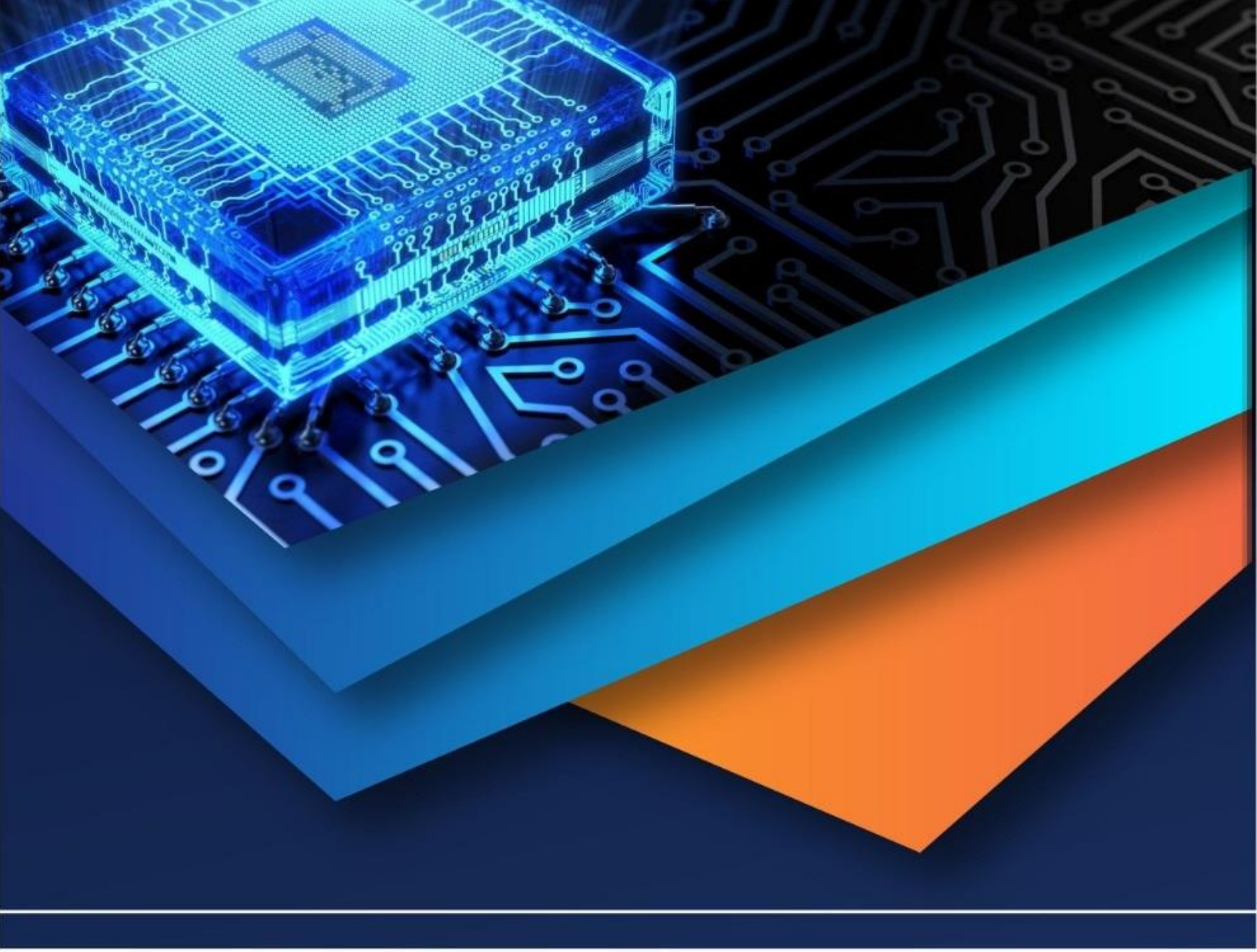

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