



**Arab Academy for Science, Maritime
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College of Computing and Information Technology.
Alexandria**

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PETROLEUM SUPPLY CHAIN SYSTEM

*"A Thesis submitted in partial fulfillment of the requirements of
B.Sc. in Computer science."*

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College of Computing and Information Technology, AASTMT, 2023
Alexandria, 2023

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Abstract

The petrochemicals industry is a global and complex supply chain, with a wide range of stakeholders involved. This project proposes the development of a website that will provide a centralized platform for information sharing and collaboration among all stakeholders in the petrochemicals supply chain. The website will include a variety of features, such as:

- * A database of petrochemicals products and suppliers**
- * An ordering platform involving industry's supply chains**
- * A forum for discussion and networking among industry professionals**
- * A news and events section to keep users up to date on industry trends**
- * A tool for tracking and managing supply chain shipments**

The website will be designed to be user-friendly and accessible to a wide range of stakeholders, from producers and distributors to end users. It is expected that the website will improve communication and collaboration within the petrochemicals supply chain, leading to increased efficiency and profitability for all involved.

The project will be implemented in three phases:

1. Phase 1: Conduct a literature review and industry analysis to identify the key needs and requirements of petrochemicals supply chain stakeholders. Research and development for the industry's

current contributors

2. Phase 2: Design and develop the web application prototype.

3. Phase 3: Test and deploy the website.

The website will be hosted on a cloud-based platform and will be accessible to users around the world.

A website to connect the supply chain of the petroleum industry can indeed help streamline processes and improve efficiency. Here are some key considerations and functionalities you could incorporate into such a platform:

The petroleum industry relies on an intricate supply chain that involves multiple stages, including raw material transportation, storage, and payment processes. To improve the speed and accuracy of these operations, a web-based system is proposed. This system will provide a platform for seamless communication and collaboration among stakeholders, including suppliers, transporters, storage facilities, and financial entities.

The system will incorporate a robust login and registration mechanism to ensure secure access for authorized users. Upon registration, each user will have a personalized dashboard where they can manage their profile and access relevant features.

The raw material transportation module will allow suppliers to submit transportation requests, including details of the materials, quantity, and delivery timelines. Transporters will receive these requests, evaluate their capacity, and accept or decline the assignments. The system will enable real-time tracking of

transportation, ensuring transparency and timely updates.

For storage management, suppliers can submit requests for storage space based on their inventory needs. Storage facilities will have access to these requests and can allocate appropriate storage areas accordingly. The system will provide inventory tracking features, allowing suppliers to monitor stock levels and coordinate with storage facilities for timely replenishment.

The payment module will enable secure financial transactions between stakeholders. Suppliers can generate invoices based on delivered quantities, and distributors can process payments through integrated payment gateways. The system will maintain a record of payment history, ensuring transparency and accountability.

Overall, this web-based system aims to streamline the petroleum supply chain by facilitating seamless communication, efficient raw material transportation, optimized storage management, and secure payment processes. By connecting stakeholders remotely, the system will enhance the speed, accuracy, and overall effectiveness of the petroleum industry's supply chain operations.

Acknowledgment:

We would like to express our gratitude to all the

individuals and organizations who have contributed to the development and implementation of the web-based system for the petroleum industry supply chain. Without their support and collaboration, this project would not have been possible.

We extend our sincere appreciation to the petroleum industry professionals who shared their insights and expertise throughout the planning and development stages. Their valuable input and industry knowledge have been instrumental in shaping the functionalities and features of the system.

We would like to acknowledge the technical team for their tireless efforts in designing and building the platform. Their dedication and commitment to delivering a user-friendly and efficient system have been commendable.

We would also like to thank the stakeholders from the petroleum industry, including importers/extractors, factories, shipping companies, distributors, and selling points, for their active participation in testing and providing feedback on the system. Their engagement and constructive criticism have been vital in fine-tuning the system and ensuring its alignment with industry requirements.

Furthermore, we express our gratitude to the

management and decision-makers who supported and sponsored this project. Their vision and commitment to innovation have enabled the realization of this web-based system, which aims to revolutionize the petroleum industry's supply chain processes.

Finally, we would like to acknowledge the tireless efforts of the entire project team, including developers, testers, project managers, and support staff. Their collective expertise and teamwork have been instrumental in delivering a high-quality and impactful solution.

Once again, we extend our deepest appreciation to all those involved in making this system a reality. Their contributions and collaboration have paved the way for a faster, more accurate, and streamlined petroleum industry supply chain.

Chapter 1

Introduction

The petroleum industry plays a critical role in the global economy, supplying fuel and energy resources to various sectors. However, the complex nature of the petroleum supply chain often poses challenges, including delays, inefficiencies, and inaccuracies in communication and coordination among stakeholders.

To address these issues and enhance the speed and accuracy of the process, we present a web-based system designed to revolutionize the petroleum industry's supply chain.

Our system aims to connect and streamline the entire supply chain, from raw material transportation to storage and payment processes. By leveraging the power of the internet, the system enables remote communication and collaboration among key entities, including importers/extractors, factories, shipping companies, distributors, and selling points. Through a centralized web platform, these stakeholders can interact, exchange information, and make informed decisions in a seamless and efficient manner.

The core functionalities of the system encompass login and registration capabilities to ensure secure access for authorized users. Upon registration, each user gains access to a personalized dashboard where they can manage their profile and access relevant features tailored to their role within the petroleum supply chain.

The system incorporates modules for raw material transportation, storage management, and payment processes. Suppliers can submit transportation requests, providing detailed information on materials, quantities, and delivery timelines. Transporters can review and accept these assignments, while real-time

tracking capabilities ensure transparency and timely updates.

For storage management, suppliers can request storage space based on their inventory needs, which storage facilities can then allocate accordingly. Inventory tracking features enable suppliers to monitor stock levels and coordinate with storage facilities for efficient replenishment.

The payment module facilitates secure financial transactions, allowing suppliers to generate invoices based on delivered quantities and distributors to process payments through integrated payment gateways. A comprehensive payment history record ensures transparency and accountability.

Overall, our web-based system offers a transformative solution to the challenges faced by the petroleum industry supply chain. By providing a centralized platform for remote communication and collaboration, the system aims to improve the speed, accuracy, and overall effectiveness of petroleum supply chain operations. With this system, we envision a future where stakeholders can seamlessly connect and optimize their processes, leading to enhanced efficiency and improved outcomes for the entire petroleum industry.

1.1 Motivation

The motivation behind developing a web-based system for the petroleum industry supply chain stems from the need to overcome the inherent challenges and inefficiencies that currently exist in the industry's operational processes. The petroleum supply chain involves multiple entities and complex interactions, including importers/extractors, factories, shipping companies, distributors, and selling points. Manual and disjointed communication methods often lead to delays, errors, and a lack of transparency, resulting in decreased efficiency and increased costs. By leveraging technology and creating a centralized platform, the aim is to streamline operations, improve communication, and enhance the overall effectiveness of the petroleum supply chain.

1.2 Problem Statement

Communication Inefficiencies: The lack of a standardized and efficient communication system among stakeholders leads to delays, misunderstandings, and errors. Manual processes and disparate communication channels hinder collaboration and coordination.

Information Silos: Important information related to raw material transportation, storage, and payment processes is often siloed within individual entities. This lack of transparency makes it difficult to track and manage operations effectively, leading to inefficiencies and potential errors.

Inaccurate Inventory Management: Inadequate inventory tracking and management systems result in inaccurate stock levels, leading to overstocking or understocking issues. This can cause delays in production, excess storage costs, and missed sales opportunities.

Payment Challenges: Financial transactions within the petroleum supply chain are often manual and time-consuming. Inconsistent payment processes and delays in invoice generation and processing can strain business relationships and impact cash flow.

1.3 Objectives

Streamline Communication: Develop a centralized platform that facilitates seamless and efficient communication and collaboration among stakeholders involved in the petroleum supply chain.

Enhance Transparency and Information Sharing:

Establish a system that promotes transparency and enables real-time access to accurate information regarding raw material transportation, storage, and payment processes.

Improve Inventory Management: Implement robust inventory tracking and management features that enable stakeholders to monitor stock levels, optimize storage space, and minimize inventory-related issues.

Facilitate Secure and Efficient Payments: Integrate secure payment mechanisms within the system, allowing for timely and accurate financial transactions between entities in the supply chain.

1.4 Problem Complexity

The petroleum industry's supply chain is highly complex due to the involvement of multiple entities, diverse transportation modes, varying storage requirements, and intricate financial transactions. Coordinating and aligning these processes while ensuring accuracy and timeliness poses significant challenges. Additionally, compliance with industry regulations, dealing with fluctuating market demands, and managing potential disruptions further contribute to the problem complexity. Therefore, addressing these challenges requires a comprehensive and robust web-based

system that can handle the intricacies and interdependencies of the petroleum supply chain while improving efficiency and accuracy.

1.5 Constraints

Security and Privacy:

The system must prioritize the security and privacy of sensitive data exchanged among stakeholders. It should comply with industry standards and regulations to ensure the confidentiality and integrity of information.

Scalability:

The system should be designed to accommodate the growth and scalability needs of the petroleum industry. It should be able to handle increasing volumes of data, users, and transactions without compromising performance.

Compatibility and Integration:

The system should be compatible with existing software and systems used by stakeholders in the petroleum supply chain. Integration capabilities should be considered to enable seamless data exchange and interoperability.

User Experience:

The system should provide a user-friendly interface that is intuitive and easy to navigate. It should consider the diverse technical expertise of users and provide appropriate training and support resources.

Technical Infrastructure:

The system's implementation should consider the technical infrastructure available to stakeholders. It should be accessible from various devices and internet connectivity levels to ensure widespread usability.

Cost:

Development, implementation, and maintenance costs should be considered within reasonable limits. The system should aim to provide cost-effective solutions to the petroleum industry supply chain challenges.

Regulatory Compliance:

The system should comply with relevant industry regulations, data protection laws, and legal requirements governing the petroleum supply chain. It should ensure adherence to compliance standards and facilitate audit trials, if necessary.

Stakeholder Adoption:

Successful implementation relies on stakeholder adoption and engagement. Efforts should be made to ensure proper training, communication, and support to encourage stakeholders' active participation and acceptance of the system.

Industry Variability:

The petroleum industry encompasses a wide range of operations and business models. The system should be flexible enough to accommodate the diverse requirements and processes of different stakeholders.

Legacy Systems:

The presence of legacy systems within the industry may pose integration challenges. The system should consider the coexistence of older systems and provide solutions for seamless data migration or interoperability.

1.6 Feasibility Study and Business Canvas

Feasibility Study:

A feasibility study is an essential component of any project, including the development of a petroleum supply chain system. It assesses the practicality and viability of the project, considering various aspects such

as technical, economic, operational, and legal feasibility. Here are some key considerations for conducting a feasibility study for a petroleum supply chain system:

Technical Feasibility:

Assess the availability of required technologies and infrastructure to support the system's development and implementation.

Evaluate the compatibility and integration capabilities with existing systems used by stakeholders in the petroleum supply chain.

Determine the technical expertise and resources needed for system development and ongoing maintenance.

Economic Feasibility:

Analyze the project's financial viability, including the costs associated with development, implementation, and maintenance of the system.

Estimate potential cost savings and return on investment (ROI) resulting from improved efficiency and accuracy in the supply chain process.

Consider the scalability of the system and its ability to accommodate future growth and changing business needs.

Operational Feasibility:

Evaluate the system's impact on day-to-day operations of stakeholders in the petroleum supply chain.

Identify potential operational challenges and risks and develop mitigation strategies.

Assess the system's user-friendliness and ease of adoption for stakeholders, considering their technical expertise and training requirements.

Legal and Regulatory Feasibility:

Identify and comply with relevant industry regulations, data protection laws, and legal requirements governing the petroleum supply chain.

Assess any legal implications related to data privacy, security, and intellectual property rights.

Ensure adherence to compliance standards and requirements during system development and operation.

Business Canvas:

A business canvas is a strategic management tool that provides a visual representation of key elements of a business model. It helps to define the value proposition, target customers, revenue streams, and key activities of

the system. Here are some key components that can be included in a business canvas for a petroleum supply chain system:

Value Proposition:

Define the unique value proposition of the system, highlighting the benefits it brings to stakeholders in the petroleum supply chain.

Identify the specific problems or challenges the system addresses, such as improving communication, enhancing transparency, or optimizing inventory management.

Customer Segments:

Identify the target customer segments within the petroleum industry, such as importers/extractors, factories, shipping companies, distributors, and selling points.

Understand their specific needs, pain points, and expectations from a supply chain system.

Key Activities:

Outline the key activities required to develop, implement, and operate the petroleum supply chain system, such as system design, integration, data management, and ongoing maintenance and support.

Revenue Streams:

Identify potential revenue streams for the system, such as licensing fees, subscription models, transaction-based fees, or value-added services.

Determine the pricing strategy and revenue generation potential based on the value delivered to stakeholders.

Key Partnerships:

Identify potential strategic partnerships with stakeholders in the petroleum industry, such as technology providers, logistics companies, and industry associations.

Explore collaboration opportunities to enhance the system's capabilities and reach.

Channels:

Determine the distribution and communication channels to reach and engage with stakeholders, such as a web platform, mobile applications, or integration with existing industry platforms.

Cost Structure:

Identify the costs associated with system development, implementation, maintenance, and ongoing operations. Consider factors such as technology infrastructure, human resources, marketing, and support services. The feasibility study and business canvas provide valuable insights and guidance for the development and implementation of a petroleum supply chain system. They help assess the project's viability, define its strategic direction, and align stakeholders towards a common vision.

Chapter 2

Background

The petroleum industry plays a crucial role in global energy supply, encompassing activities such as extraction, refining, transportation, and distribution of petroleum products. Effective supply chain management is essential to ensure the smooth flow of petroleum products from the point of extraction to end consumers. However, the traditional supply chain processes in the petroleum industry often involve manual and time-consuming tasks, leading to inefficiencies, inaccuracies, and delays in the overall process.

Manual coordination and communication among various stakeholders, including importers/extractors, factories, shipping companies, distributors, and selling points, can result in information gaps, miscommunication, and errors. These challenges pose significant obstacles to achieving faster and more accurate supply chain processes in the petroleum industry.

To address these challenges, there is a growing need for a system that connects the supply chain of the petroleum industry over the internet, enabling remote communication and coordination among stakeholders. Such a system would streamline the supply chain process, enhance accuracy, improve operational efficiency, and ultimately contribute to cost savings and customer satisfaction.

By leveraging web-based technologies, this system aims to facilitate seamless communication, data exchange, and real-time tracking of petroleum products throughout the supply chain. It provides a centralized platform where stakeholders can interact, exchange information, monitor inventory levels, track shipments, and manage payments remotely. Through automation and integration, the system aims to eliminate manual errors, reduce paperwork, and improve overall supply chain visibility and efficiency.

Chapter 3

3. Related Work and Similar Systems

Supply Chain Management Systems:

Various supply chain management systems have been developed for different industries, including the petroleum sector. These systems aim to optimize supply chain processes, improve communication, and enhance efficiency. Examples include SAP Supply Chain Management, Oracle Supply Chain Management, and JDA Supply Chain Management.

Logistics and Transportation Management Systems:

Logistics and transportation management systems focus on optimizing the movement of goods and materials across the supply chain. They often include features such as shipment tracking, route optimization, and carrier management. Examples include Manhattan Associates' Transportation Management System (TMS) and Mercury Gate International's Transportation Management System.

E-Commerce Platforms:

E-commerce platforms provide online marketplaces and tools for businesses to conduct transactions and manage their supply chains. These platforms often include features for inventory management, order processing, and payment integration. Examples include Shopify, WooCommerce, and Magento.

Chapter 4

Analysis

To evaluate the effectiveness and impact of the petroleum supply chain system, it is essential to conduct a comprehensive analysis of its performance and outcomes. Here are some key aspects to consider during the analysis phase:

Efficiency Analysis:

Measure the system's impact on the efficiency of the petroleum supply chain. Assess whether the system has reduced process delays, improved communication, and streamlined operations.

Quantify the time and cost savings achieved through automation, optimized inventory management, and streamlined payment processes.

Compare key performance indicators (KPIs) before and after implementing the system to determine its overall

efficiency gains.

Accuracy and Error Reduction:

Analyze the system's impact on accuracy and error reduction in supply chain processes.

Evaluate the reduction in manual errors, such as data entry mistakes, payment discrepancies, or inventory discrepancies.

Assess the accuracy of information exchange and data synchronization between stakeholders and determine if the system has improved data integrity and consistency.

Cost Analysis:

Conduct a cost analysis to assess the financial implications of implementing the system.

Evaluate the initial investment required for system development, implementation, and training.

Measure the cost savings achieved through improved operational efficiency, reduced inventory carrying costs, and streamlined payment processes.

Stakeholder Satisfaction:

Gather feedback from stakeholders, including importers/extractors, factories, shipping companies, distributors, and selling points, regarding their

satisfaction with the system.

Conduct surveys or interviews to understand stakeholders' experiences, identify areas of improvement, and gather suggestions for further enhancements.

Analyze stakeholder feedback to identify patterns, common challenges, and opportunities for system optimization.

Performance Analysis:

Evaluate the system's performance against predefined performance metrics and KPIs.

Measure system response times, transaction processing speeds, and data processing capabilities to assess its scalability and ability to handle increased workload.

Analyze system logs and performance monitoring data to identify performance bottlenecks and areas for optimization.

Impact on Decision-Making:

Assess the system's impact on decision-making processes within the petroleum supply chain.

Evaluate the availability and quality of data and analytics provided by the system for informed decision-making.

Determine whether the system has enabled

stakeholders to make data-driven decisions, optimize processes, and respond quickly to market demands.

Sustainability and Environmental Impact:

Evaluate the system's impact on sustainability efforts within the petroleum supply chain.

Assess whether the system has contributed to waste reduction, energy efficiency improvements, or carbon footprint reduction through optimized transportation routes or inventory management.

Analyze the system's contribution to environmental sustainability goals and compliance with relevant regulations.

Scalability and Adaptability:

Assess the system's scalability and adaptability to handle future growth and changing business requirements.

Analyze whether the system can accommodate an increasing number of users, growing data volumes, and additional functionalities.

Evaluate the system's ability to integrate with new technologies, platforms, or industry standards.

Add introductory paragraph.

4.1 Functional Requirements

User Registration and Authentication:

The system should provide a user registration process for stakeholders to create and manage their accounts. Users should be able to authenticate themselves securely to access the system.

Communication and Collaboration:

The system should enable seamless communication and collaboration between stakeholders, allowing them to exchange messages, share documents, and track progress.

Users should be able to send notifications, alerts, and updates related to supply chain activities.

Raw Material Transportation Management:

The system should provide features to manage the transportation of raw materials, including tracking shipment status, documenting transportation routes, and monitoring delivery schedules.

Users should be able to assign and track transport vehicles, drivers, and associated logistics information.

Inventory Management:

The system should facilitate real-time tracking and management of inventory levels for petroleum products at various stages of the supply chain.

Users should be able to monitor stock levels, track inventory movement, and receive automated alerts for low stock or replenishment needs.

Payment Processing:

The system should support secure payment processing functionalities, allowing stakeholders to make and receive payments for petroleum products.

Users should be able to generate invoices, process payments, and maintain payment transaction records.

Reporting and Analytics:

The system should provide reporting and analytics capabilities to generate insights and key performance indicators (KPIs) related to supply chain activities.

Users should be able to access predefined reports, customize reports based on specific requirements, and perform data analysis to identify trends and make informed decisions.

Data Security and Privacy:

The system should ensure the security and privacy of sensitive data and comply with data protection regulations.

Users should have appropriate access controls and authorization levels based on their roles and responsibilities.

Non-functional Requirements

Performance:

The system should exhibit high performance and responsiveness, allowing for quick data processing and seamless user interactions.

Response times for queries, data retrieval, and system operations should meet acceptable benchmarks.

Scalability:

The system should be scalable to handle increasing user loads, growing data volumes, and expanding operations within the petroleum supply chain.

It should be able to accommodate additional users, locations, and transactions without compromising performance.

Reliability and Availability:

The system should be reliable, with minimal downtime or disruptions in service.

It should have measures in place for backup, disaster recovery, and fault tolerance to ensure continuous availability.

Usability and User Experience:

The system should have a user-friendly interface, providing intuitive navigation and ease of use.

It should be accessible to users with varying levels of technical expertise, offering clear instructions and assistance.

Security:

The system should have robust security measures to protect against unauthorized access, data breaches, and cyber threats.

It should use encryption, secure communication protocols, and access controls to ensure data confidentiality and integrity.

Integration:

The system should support integration with existing systems, platforms, and technologies used by

stakeholders in the petroleum supply chain.

It should provide APIs or data exchange mechanisms for seamless data sharing and interoperability.

Compliance:

The system should comply with industry regulations, data protection laws, and other relevant standards governing the petroleum supply chain.

It should adhere to security, privacy, and compliance requirements to protect sensitive information and avoid legal implications.

Chapter 5

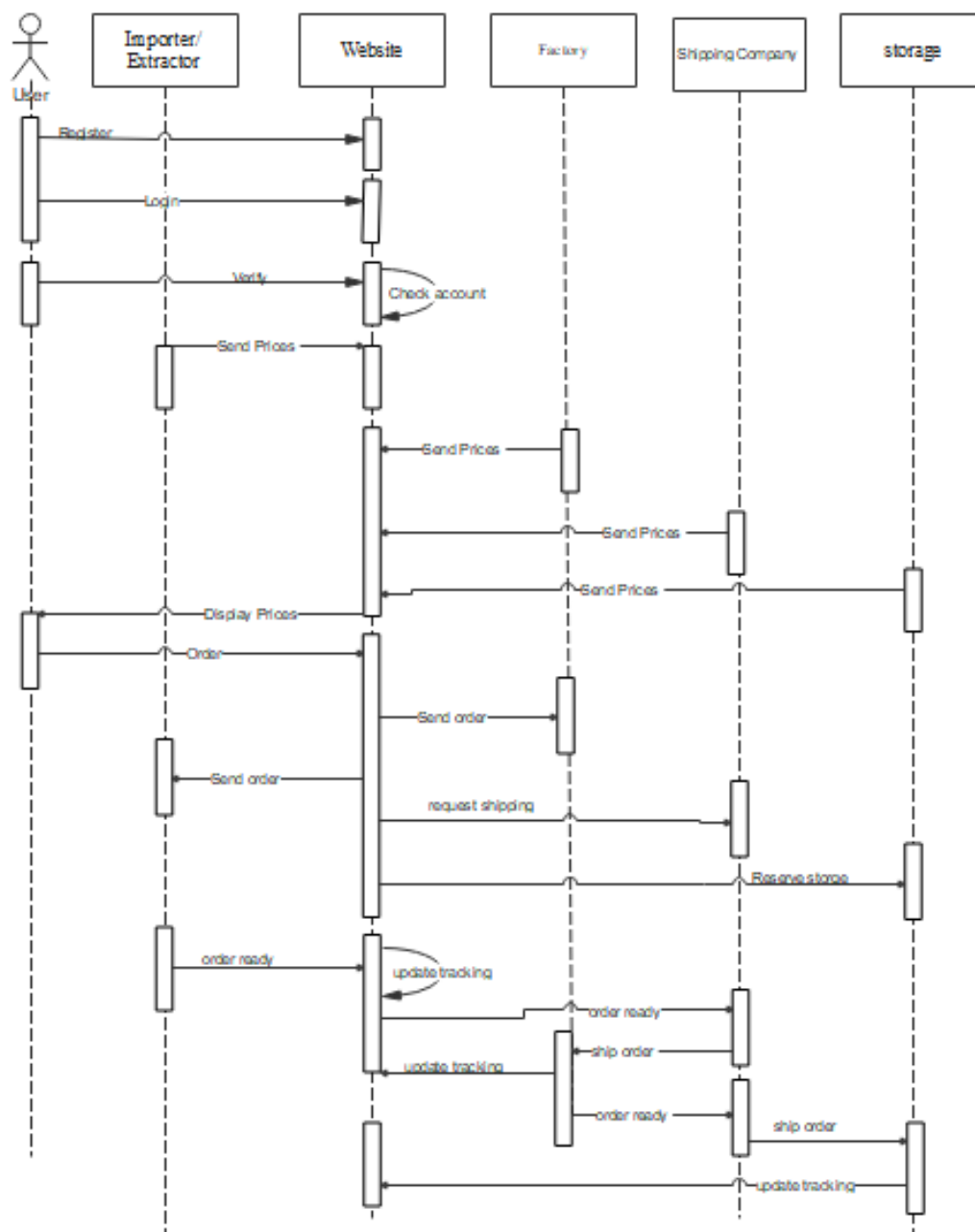
Design

Engineering design is a process of devising a system, component, or process to meet desired needs and specifications within constraints. It is an iterative, creative, decision- making process in which the basic sciences, mathematics, and engineering sciences are applied to convert resources into solutions. Engineering design involves identifying opportunities, developing requirements, performing analysis and synthesis, generating multiple solutions, evaluating solutions against requirements, considering risks, and making trade- offs, for the purpose of obtaining a high-quality solution under the given circum- stances. For illustrative purposes only, examples of possible constraints include

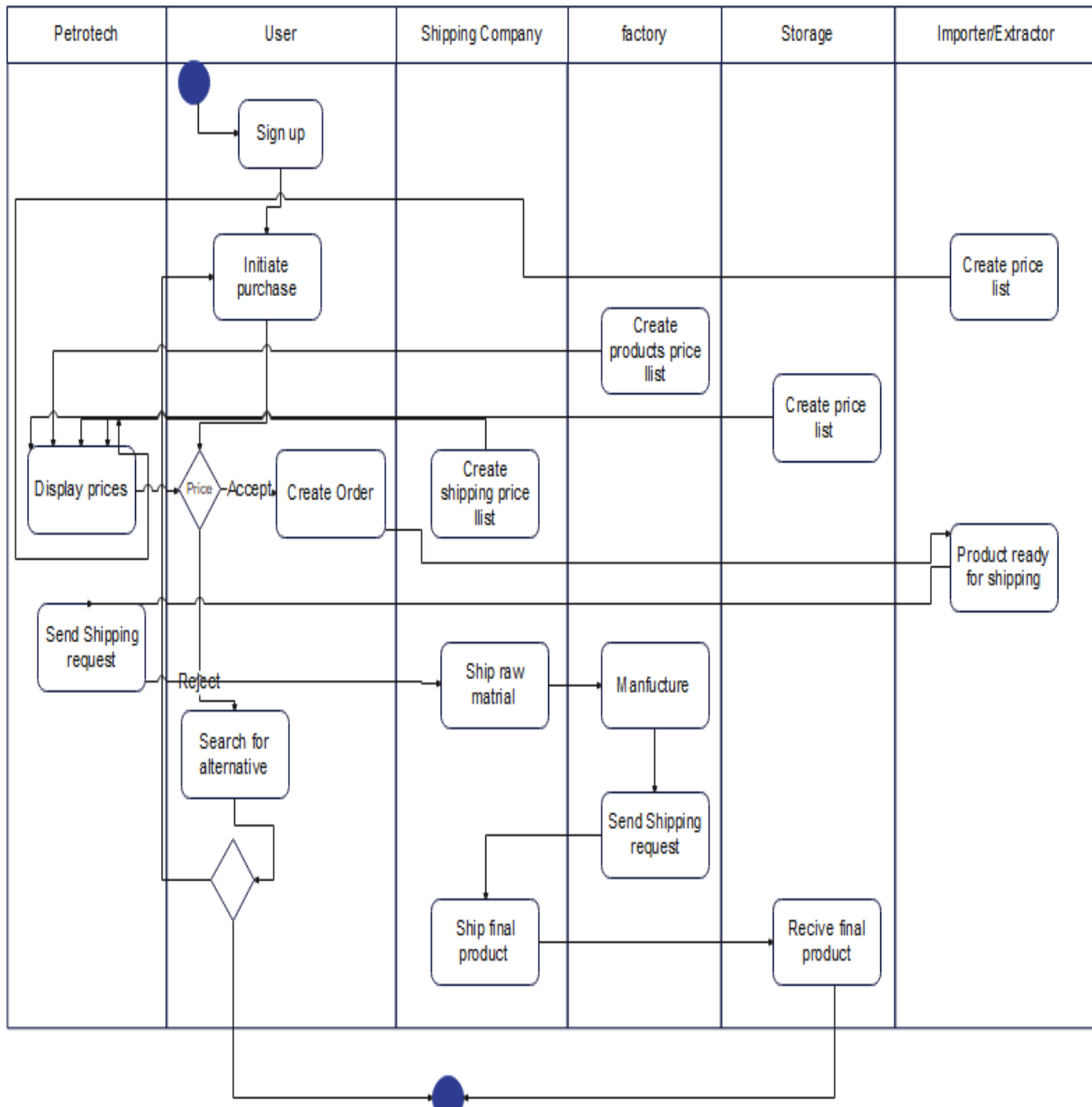
accessibility, aesthetics, codes, constructability, cost, ergonomics, extensibility, functionality, interoperability, legal considerations, maintainability, manufacturability, marketability, policy, regulations, schedule, standards, sustainability, or usability.

5.1 Diagrams

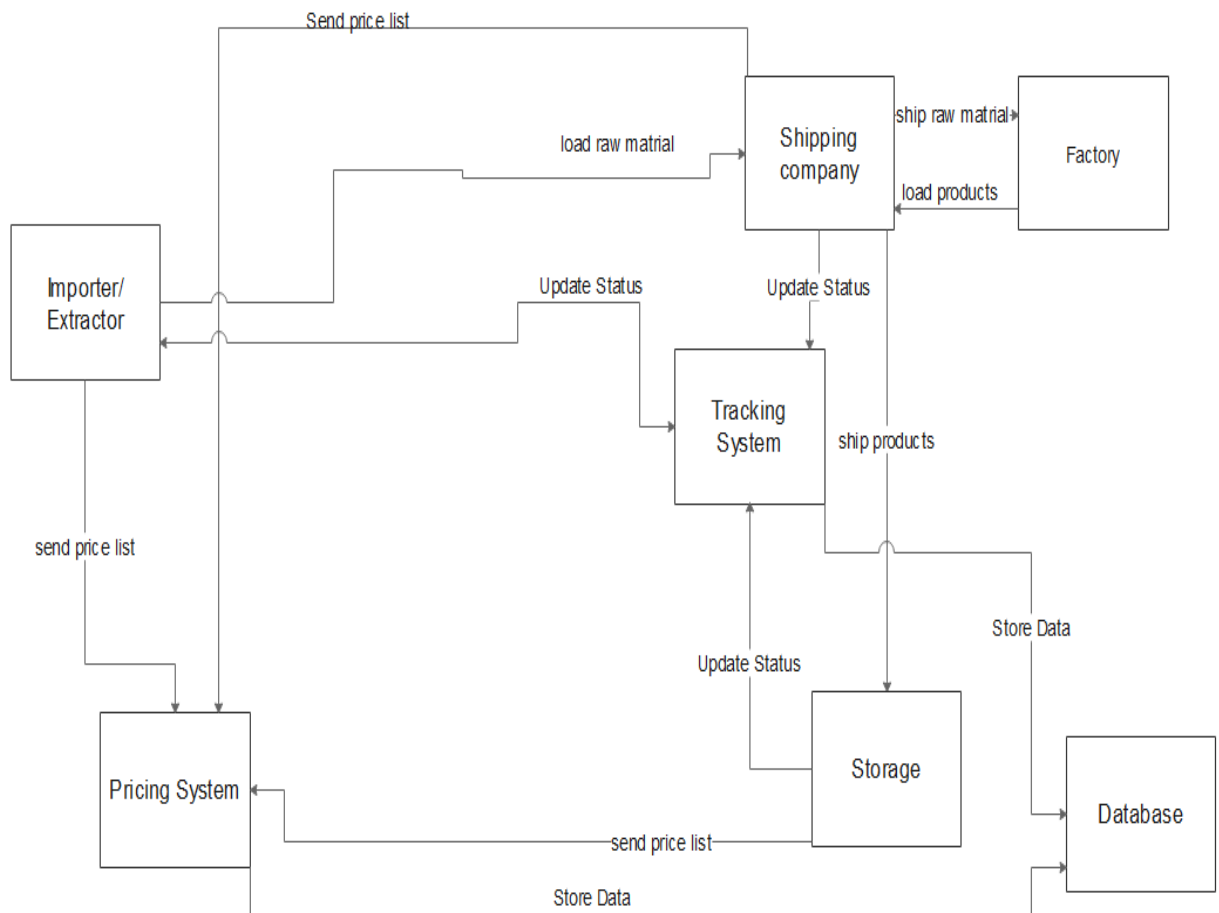
Sequence Diagram



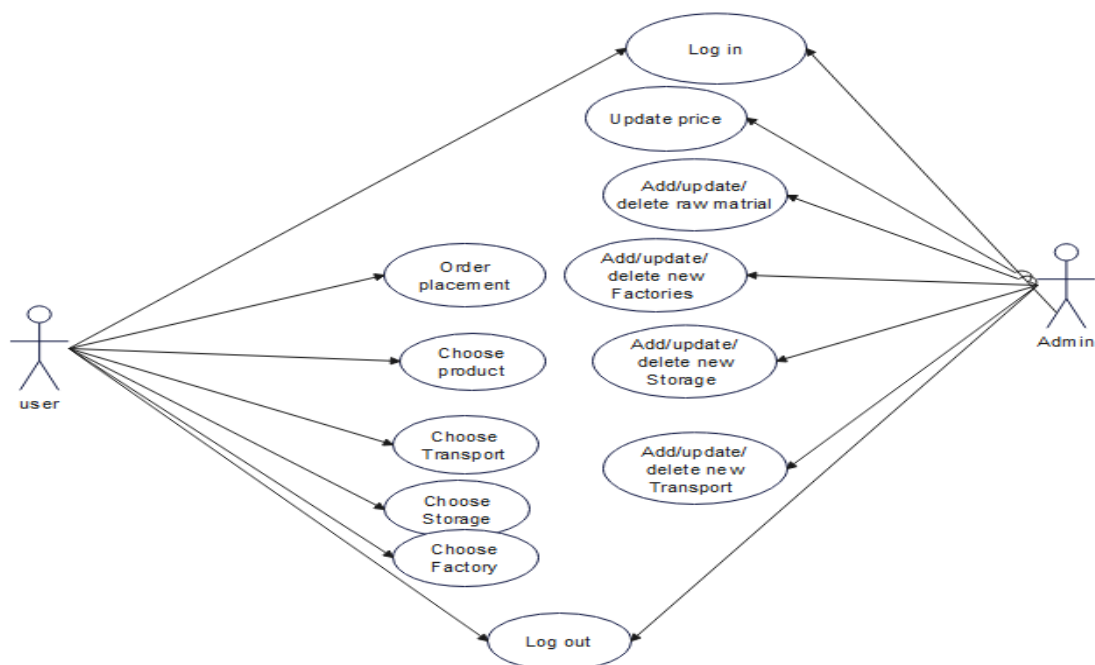
Activity Diagram



State Diagram



Use case Diagram.



5.2 Technologies and Tools Used

- **Programming languages: PHP (8.0.1) - JavaScript**
- **Frameworks: Laravel (9.5) – Nodejs – jQuery**
- **Version Control: Git – GitHub**
- **Database: MySQL (5.4) – MariaDB engine**
- **Development orientation: Trello**
- **Modules: Laravel Scaffolding – Laravel debugger**
- **Development Environment: Docker**



5.3 Prototype

- **Screens: Figma**
- **Logos and marks: Adobe Photoshop**



Raw Material

Production

Storage

Transportation

Kinds of Products

Price (EGP)	Types
10767 LE	بروبان
10.75 LE	بنزين 95
7.25 LE	سولار
7.25 LE	كبروسين
130.00 LE	بوتان

Choose a product line :

Oils production line

Additives production line

Fuel production line

Byproducts production line

Lubricants production line

Expected produced quantity :

66

/ barrel

Expected time to finish :

30/03/2023

Manufacturing cost (EGP) :

0.00 LE

Manufacture company :

الهيئة المصرية العامة للبترول (EGPC)

الأسفندرية للبترول (APC)

مصنع البترول (MISR)

التصنيع للبترول (NEC)

المصرية العامة للبترول ومداينول (EICHEM)

next >

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Storage

Raw Material

Production

Storage

Transportation

Petro.tech

Simplifying your fuel journey.

Units available for storage :

▼


Underground storage

Offshore storage

Ship storage

Tank storage

Store locations :



Storage price :

0.00\$

barrel (per day)

Longest storage period :

From: 31/03/2023

To: 30/04/2023

Storage total price :

0.00\$


next >

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Click To..

Purchase!



Shipping

Payment

Shipping details

Use saved address

123, Electric avenue

First line of address

123

Street name

Electric avenue

Postcode

ABC - 123

Select shipping

Free delivery

Payment Details

Use saved card

Mastercard ending 234

Name on card

Pomaline Moses Olannewaju

Card number


123 - 456 -

Expiration

03

24

123

CVC 

Cancel order

Payment

Cancel order

Complete order

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Chapter 6

Implementation

Laravel, a powerful PHP framework, provides a solid foundation for building feature-rich web applications. By combining it with jQuery, a popular JavaScript library, we can enhance the user experience with dynamic and interactive frontend elements. Additionally, Node.js, a JavaScript runtime, can be utilized for server-side tasks and real-time communication. MySQL, a robust relational database management system, serves as the foundation for storing and managing application data. Lastly, Docker offers a containerization platform that simplifies application deployment and scalability. Throughout this documentation, we will cover the setup, configuration, and integration of these technologies, enabling you to develop a Laravel application with a responsive frontend, efficient server-side processing, seamless data management, and streamlined deployment using Docker.

6.1 Implementation Environment

To create a successful implementation environment for your Laravel application with jQuery, Node.js, MySQL, and Docker, it is crucial to ensure that the necessary tools and configurations are in place. You will need a development machine with a compatible operating

system (such as Windows, macOS, or Linux) and a web server environment (e.g., Apache or Nginx) that supports PHP. Install PHP, MySQL, and Node.js on your system, ensuring that the versions meet the requirements of your Laravel application.

Next, set up Laravel by installing it via Composer, a dependency management tool for PHP. Create a new Laravel project and configure the database connection settings to integrate MySQL with your application. Laravel's built-in Artisan command-line tool simplifies various tasks, such as generating models, controllers, and migrations.

For front-end development, leverage the power of jQuery by including the library in your project. You can utilize jQuery's extensive features for DOM manipulation, event handling, AJAX requests, and animations to enhance the interactivity and responsiveness of your application.

To incorporate Node.js into your Laravel environment, you can use it for server-side scripting or as a build tool for front-end assets. Install Node.js on your machine and leverage package managers like npm or Yarn to manage dependencies and execute various scripts.

To ensure seamless deployment and scalability, Docker can be employed. Containerize your Laravel application

using Docker, which provides an isolated and portable environment. Create a Docker file that specifies the necessary configurations, dependencies, and commands required to build the Docker image. Use Docker Compose to define and manage multi-container setups, including the Laravel application, database, and any additional services.

By establishing an efficient implementation environment encompassing Laravel, jQuery, Node.js, MySQL, and Docker, you can streamline development, enhance collaboration, and facilitate smooth deployment and scalability. With the right tools and configurations in place, you'll be well-equipped to embark on the development journey of your Laravel application.

6.2 Architecture

The Laravel framework follows the Model-View-Controller (MVC) architectural pattern, which provides a structured approach to building web applications. The MVC architecture separates the application logic into three distinct components, each with its own responsibility.

The Model represents the data and business logic of the application. In Laravel, models are used to interact with the database, defining relationships, querying data, and performing validation. They encapsulate the application's data structure and provide methods for accessing and manipulating data.

The View component handles the presentation layer of the application. Views in Laravel are responsible for rendering the user interface and displaying data to the user. They are typically written using Blade, Laravel's templating engine, which provides a concise and expressive syntax for generating HTML and other dynamic content.

The Controller acts as an intermediary between the Model and the View. It handles user requests, processes input data, interacts with the Model to fetch or modify data, and passes the necessary data to the View for presentation. Controllers in Laravel are responsible for defining routes and actions that respond to specific HTTP requests.

The MVC architecture promotes separation of concerns and modularity, making it easier to manage and maintain the application codebase. It allows for reusability of components, as models can be reused across different controllers and views. Additionally, the separation of concerns enables developers to work

simultaneously on different parts of the application without conflicts.

Laravel's implementation of MVC provides a clear structure and organization to the application, making it easier to understand, extend, and test. It encourages best practices such as code reusability, loose coupling, and separation of concerns, leading to cleaner and more maintainable code. By embracing the MVC architecture, Laravel empowers developers to build scalable and robust web applications efficiently.

6.3 Development methodologies

The Agile methodology promotes close collaboration between developers, project managers, and clients throughout the development lifecycle. It encourages regular communication, frequent feedback, and open discussions to ensure that the application aligns with the client's expectations. By involving stakeholders in the development process, developers gain a deeper understanding of the requirements, allowing for better decision-making and a more refined end product.

One of the key principles of Agile is to prioritize working software over comprehensive documentation. In Laravel development, this means focusing on developing functional features that provide immediate value to the

client. Through iterative development cycles known as sprints, developers can rapidly deliver increments of the application, allowing stakeholders to provide feedback early on and steer the development in the right direction.

The Agile methodology also promotes flexibility and adaptability. As Laravel applications often evolve throughout the development process, Agile allows for changes and adjustments to be incorporated smoothly. Agile frameworks, such as Scrum or Kanban, provide tools and practices for managing project backlogs, sprint planning, and tracking progress, enabling developers to prioritize tasks, manage expectations, and respond to changes effectively.

Furthermore, Agile methodologies promote continuous integration and testing. By integrating Laravel's testing capabilities into the development workflow, developers can write unit tests, integration tests, and acceptance tests to ensure the application's quality and reliability. This helps identify and fix issues early, leading to a more stable and robust Laravel application.

6.4 Results and Discussion

The combination of Laravel, jQuery, Node.js, MySQL, and Docker yields powerful results in the development of web applications. Laravel provides a robust framework with features such as routing, ORM, caching, and authentication, allowing developers to build scalable and maintainable applications. By integrating jQuery, developers can enhance the frontend experience by adding dynamic and interactive elements, making the application more engaging and user-friendly.

Node.js complements Laravel by enabling server-side scripting and facilitating real-time communication through technologies like Web Sockets. It allows for efficient handling of concurrent requests, making the application responsive and capable of handling high traffic loads.

MySQL serves as the backend database management system, providing reliable and efficient storage for application data. Laravel's database ORM (Eloquent) simplifies database interactions, making it easier to create, retrieve, update, and delete records.

The integration of Docker streamlines the deployment process by encapsulating the application and its dependencies into containers. This allows for consistent

and reproducible deployments across different environments, making it easier to scale the application and manage infrastructure.

Overall, combining Laravel, jQuery, Node.js, MySQL, and Docker results in a powerful and efficient web application development stack. It enables developers to build feature-rich applications with responsive user interfaces, efficient server-side processing, robust data management, and streamlined deployment and scalability. This combination empowers developers to create high-quality applications that meet the demands of modern web development.

Chapter 7

Testing

Functional Testing:

Verify that the system functions as intended and meets the defined functional requirements.

Validate that user interactions, such as data entry and system responses, are accurate and consistent.

Usability Testing:

Evaluate the user-friendliness and ease of navigation of the system.

Test the system's interface, menu structures, and workflow to ensure they are intuitive and easy to

understand for stakeholders.

Performance Testing:

Measure the system's performance under various load conditions.

Test the system's response time, throughput, and scalability to ensure it can handle expected user traffic and data volume.

Identify any performance bottlenecks and optimize system performance accordingly.

Security Testing:

Evaluate the system's security measures to ensure the protection of sensitive data and prevent unauthorized access.

Test authentication and authorization mechanisms to ensure only authorized users can access and perform actions within the system.

Penetration testing

to identify potential vulnerabilities and strengthen the system's defenses against security threats.

Integration Testing:

Verify the seamless integration of the system with existing platforms and systems used by stakeholders. Test data exchange and interoperability between the system and external systems to ensure smooth information flow.

Validate that data synchronization, APIs, and interfaces function correctly and provide accurate results.

Acceptance Testing:

Engage stakeholders, including importers/extractors, factories, shipping companies, distributors, and selling points, in the testing process.

Allow users to test the system in their real-world scenarios and provide feedback on its usability, functionality, and alignment with their requirements.

Regression Testing:

Conduct regression testing after making system updates or implementing bug fixes to ensure that existing functionality has not been affected.

Re-test previously validated functionalities to ensure they continue to work as expected.

Identify any unintended consequences or defects resulting from system changes.

Data Accuracy and Validation Testing:

Validate the accuracy and integrity of data stored and processed by the system.

Verify that calculations, data transformations, and validations are performed correctly.

Test boundary conditions and error handling to ensure accurate data processing and prevent data inconsistencies.

Chapter 8

Conclusion and Future Work

In conclusion, the web-based system for the petroleum industry supply chain holds immense potential to revolutionize operations, enhance communication, and streamline processes. By improving accuracy, timeliness, and collaboration among stakeholders, the system drives efficiency, reduces errors, and ultimately enhances customer satisfaction. With its ability to optimize inventory management, facilitate secure payments, and provide valuable insights for decision-making, the system empowers the petroleum industry to achieve greater operational effectiveness and competitiveness in a rapidly evolving market.

Senior Project Summary Report

Project Title	<i>PETRO.TECH</i>	
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Team members:	Names <i>MOHAMED AHMED ELMADAWY</i> <i>MOHAMED MANSOUR ELSHIKH</i> <i>ANDREW SAMIR ARMANYOUS</i> <i>ZEYAD KHALED ELSAKA</i>	Registration Num. <i>19109957</i> <i>19103175</i> <i>19103377</i> <i>19100742</i>
Project Deliverables	<i>Presentation</i> <i>Website</i> <i>Project Description documentation</i>	
Team Organization	<i>Computer Science, Multimedia,</i> <i>And Software Engineering Students.</i>	
Ethical Considerations	<i>Compliance: Ensuring compliance with government regulations.</i> <i>Fair Trade: Encouraging fair trade practices.</i>	
Social Impact	<i>Job creation</i> <i>More Energy access:</i> <i>Infrastructure development</i>	
Professional Responsibility	<i>Avoiding plagiarism</i> <i>Meeting deadlines and deliverables</i>	

Supervisor Name	Signature
<i>DR. EMAD RAOUF</i>	

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