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

**Alexandria**

## PETROTECH

**PETROLUME SUPPLY CHAIN SYSTEM**

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

by

**MOHAMED AHMED ELMADAWY**

**MOHAMED MANSOUR ELSHIK**

**ANDERW SAMIR ARMANYOS**

**ZYAD KHALED HASSAN ELSAKA**

College of Computing and Information Technology, AASTMT, 2023

Supervised By

**DR. EMAD RAOUF**

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

\* 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.

2. Phase 2: Design and develop the website 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.

The 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.

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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

The petroleum industry faces several challenges within its supply chain, including:

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

The primary objectives of the web-based system for the petroleum industry supply chain are as follows:

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 pose 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

The development and implementation of a web-based system for the petroleum industry supply chain must consider various constraints, including:

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 trails, 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.

By addressing these constraints, the web-based system can overcome challenges and provide an effective solution to improve the efficiency and accuracy of the petroleum industry supply chain.

1.6 Standards

List all standards used in your project, this may include Requirements specification standards, UMLs, design standards, software process models, implementation standards, testing standards, etc...

1.7 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.

**1.8 Thesis Organization**

Introduction:

Literature Review:

Theoretical Framework:

System Design and Architecture:

Implementation:

Evaluation and Results:

Discussion and Analysis:

Conclusion and Future Work:

References:

**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**

**Related Work and Similar Systems**

Discuss related work and similar systems. Here goes an introductory paragraph. Then, mention what your solution adds and what problem it solves.

3.1 Related Work

Explain all related work and literature in your topic.

3.2 Similar Systems

Summarize similar systems describing:

• Describe system.

• Main function

• Input and output

• Technologies used.

• Results

• Advantages and Disadvantages

Chapter 4

Analysis

Add introductory paragraph.

4.1 Functional Requirements

4.2 Non-functional Requirements

4.3 UML Diagrams

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 UML Diagrams

5.2 Technologies and Tools Used

5.3 Prototype

Chapter 6

Implementation

Add introductory paragraph.

6.1 Implementation Environment

6.2 Add sections as required.

6.3 Results and Discussion

Chapter 7

Testing

Add introductory paragraph.

7.1 Add sections as required

Chapter 8

Conclusion and Future Work

Add conclusion and future work, they can be separated in two sections or paragraphs.

**Senior Project Summary Report**

|  |  |  |
| --- | --- | --- |
| **Project Title** | ***PETROTECH*** | |
| **Supervisor(s)** | **DR.EMAD RAOUF** | |
| **Team members:** | **Names**  **MOHAMED AHMED ELMADAWY**  **MOHAMED MANSOUR ELSHIK**  **ANDERW SAMIR ARMANYOS**  **ZYAD KHALED HASSAN ELSAKA** | **Registration Numbers**  **19100123**  **19103175**  **19103377**  **19100742** |
| **Project Deliverables** | *Indicate the deliverables of the project.* | |
| **Team Organization** | *Describe the interdisciplinary/multidisciplinary team organization; list each member’s role and contributions. How each member evaluates a problem and performs duties within a team environment.* | |
| **Ethical Considerations** | *Describe any ethical and/or safety issues related to the project (if exits)* | |
| **Social Impact** | *Describe the social impact of the project.* | |
| **Professional Responsibility** | *Illustrate how professional responsibility was taken into consideration while working on your project.* | |

|  |  |
| --- | --- |
| **Supervisor Name** | **Signature** |
| **DR.EMAD RAOUF** |  |