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# MASTER THESIS

(EXPLANATORY NOTES)  
OF GRADUATE OF ACADEMIC DEGREE  
«MASTER»

THEME: **«Management of supply chains involving maritime transport in the digital economy»**

Speciality 073 «Management»

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*I certify that in this master thesis  
there are no borrowings from the works of other authors  
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Kyiv 2023

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ТЕМА: «Управління ланцюгами постачання за участю морського транспорту в умовах цифрової економіки»

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Faculty of Transport, Management and Logistics  
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## TASK

### FOR COMPLETION THE MASTER THESIS OF GRADUATE

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1. Theme of the master thesis: «Management of supply chains involving maritime transport in the digital economy» was approved by the Rector Directive №1952/CT. of September 27, 2023.

2. Term performance of thesis: from October 02, 2023 to December 31, 2023.

3. Date of submission work to graduation department: December 11, 2023.

4. Initial data required for writing the thesis: general and statistical information about construction market in Ukraine, information of the company ««FTP», production and financial indicators of the company ««FTP», literary sources on logistics and customer service process, Internet source.

5. Content of the explanatory notes: introduction, the essence of the nowadays supply chain activities; the specifics of logistics in the digital economy; analysis the activity of the LLC «FTP»; identification of bottlenecks in the maritime service chain; analysis of business process of maritime in the logistics activity of the company; construction the SWOT-analysis of the LLC «FTP»; implementation of the blockchain system as part of the supply chain management in maritime transportation; calculation of the NVP of the proposed measures; conclusions and appendix.

6. List of obligatory graphic matters: tables, charts, graphs, diagrams illustrating the current state of problems and methods of their solution.

7. Calendar schedule:

№	Assignment	Deadline for completion	Mark on completion
1	2	3	4
1.	Study and analysis of scientific articles, literary sources, normative legal documents, preparation of the first version of the introduction and the theoretical chapter	02.10.23-18.10.23	Done
2.	Collection of statistical data, timing, detection of weaknesses, preparation of the first version of the analytical chapter	19.10.23-09.11.23	Done
3.	Development of project proposals and their organizational and economic substantiation, preparation of the first version of the project chapter and conclusions. Editing the first versions of master thesis	10.11.23-30.11.23	Done
4.	Preparing the final version of the master thesis, checking by standards inspector	01.12.23-08.12.23	Done
5.	Approval for a work with supervisor, getting of the report of the supervisor, getting internal and external reviews, transcript of academic record	05.12.23-09.12.23	Done
6.	Submission work to Logistics Department	11.12.23	Done

Graduate \_\_\_\_\_  
(signature)

Supervisor of the master thesis \_\_\_\_\_  
(signature)

8. Consultants of difference chapters of work:

Chapter	Consultant (position, surname and name)	Date, signature	
		The task was given	The task was accepted
Chapter 1	Associate Professor, Molchanova K.M.	02.10.23	02.10.23
Chapter 2	Associate Professor, Molchanova K.M.	19.10.23	19.10.23
Chapter 3	Associate Professor, Molchanova K.M.	10.11.23	10.11.23

9. Given date of the task October 02, 2023.

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Task accepted for completion: \_\_\_\_\_  
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## **ABSTRACT**

The explanatory notes to the master thesis «Management of supply chains involving maritime transport in the digital economy » comprises of 101 pages, 20 figures, 11 tables, 61 references.

**KEY WORDS: SUPPLY CHAIN MANAGEMENT , DIGITAL ECONOMY, SUPPLY CHAIN MANAGEMENT IN DIGITAL ECONOMY, MARITIME TRANSPORTATION IN DIGITAL ECONOMY, BLOCKCHAIN SYSTEM IN DIGITAL ECONOMY, BLOKCHAIN SYSTEM IN MARITIME TRANSPORTATION**

The purpose of the thesis is to develop theoretical foundations and practical recommendations for improving the management of maritime activities in supply chains.

The object of the thesis is the logistics activity of «FTP» company in the field of maritime transportation and its role in intersubjective interaction in the supply chain.

The subject of the thesis is management of the maritime activities in supply chain based on the application of blockchain systems and modern logistics approaches.

Research methods. Scientific works of classics of economics, publications of leading scientists and specialists on market development, transport economics, as well as regulations of Ukraine governing the activities of transport, logistics are the theoretical and methodological basis of research. To achieve this goal and the implementation of the tasks in the work used a set of general and special methods.

Materials of the thesis are recommended for use during scientific research, in the educational process and in the practical work of specialists of logistics departments.

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**NOTATION**

SCM	– Supply Chain Management
IoT	– Internet of Things
SCMS	– Supply Chain Management System
AI	– Artificial Intelligence
MNE	– Multinational enterprise
ICT	– Information and Communications Technology
GSCM	– Green Supply Chain Management
WCA	– The World Cargo Alliance
UAV	– Unmanned Aerial Vehicle
3PL	– Third Party Logistics
KPI	– Key Performance Indicators
BDTS	– Blockchain Document Transmission System
GCA	– Global Center on Adaptation
CEO	– Chief Executive Officer
NAFEZA	– The National Single Window for Trade
ACI	– Airports Council International
ACID	– Atomicity, Consistency, Isolation, Durability
PDF	– Portable Document Format
FMS	– Fleet Management Systems
NFT	– Non-fungible Tokens
NPV	– Net present value

## INTRODUCTION

In the digital economy, the optimization of the ocean freight sector holds immense significance and cannot be overstated. The logistics industry is currently navigating a challenging environment, necessitating the establishment of new methodological foundations and the development of practical recommendations to ensure the seamless and uninterrupted operation of enterprises. Efficient ocean freight transportation plays a pivotal role in enhancing the competitiveness of logistics businesses in today's dynamic market landscape.

By embracing and implementing effective practices within the digital economy, logistics companies can unlock a multitude of benefits. One of the primary advantages lies in the improvement of operational efficiency. Through the integration of digital technologies and platforms, such as IoT, AI, and data analytics, logistics companies can streamline their processes, optimize resource allocation, and enhance overall productivity. Real-time tracking and monitoring of vessels and cargo enable better visibility and control, leading to more accurate decision-making and proactive problem-solving.

Furthermore, the adoption of digital economy practices in the ocean freight sector enables logistics companies to reduce costs significantly. By automating documentation and customs procedures, eliminating manual errors, and optimizing route planning, companies can minimize unnecessary expenses and maximize cost-effectiveness. The utilization of data analytics allows for better demand forecasting, inventory management, and resource utilization, leading to improved cost control and resource optimization.

In addition to operational efficiency and cost reduction, the digital economy empowers logistics companies to meet customer expectations and achieve a high level of satisfaction more effectively. Through enhanced communication and collaboration platforms, companies can provide real-time updates to customers regarding the status and location of their shipments. This transparency and visibility



not only build trust but also enable customers to plan and manage their supply chains more efficiently. Additionally, digital solutions facilitate personalized and tailored services, allowing logistics companies to cater to individual customer needs and preferences.

The digital economy presents a transformative opportunity for the optimization of the ocean freight sector within the logistics industry. By embracing digital technologies and implementing effective practices, logistics companies can improve their operational efficiency, reduce costs, and meet customer expectations more effectively. The digital economy acts as a catalyst for innovation and growth, enabling logistics businesses to thrive in today's competitive market environment.

The purpose of this thesis is to conduct a comprehensive study aimed at improving transportation management and optimizing the overall cost of ocean/maritime transportation in the FTP company. The study encompasses various tasks that have been set to achieve this purpose.

Firstly, a thorough analysis of the FTP company will be provided, including the provision of general information about the company and a description of its main services. Additionally, the report will define FTP's main competitors in the Ukrainian market, shedding light on the competitive landscape within which the company operates. Furthermore, the organizational structure of the FTP company will be described, offering insights into its hierarchical setup and operational framework. Moreover, a SWOT analysis of the FTP company will be conducted, highlighting its strengths, weaknesses, opportunities, and threats.

Moving forward, the report will delve into the financial analysis of the FTP company over a three-year period. This analysis aims to identify the volumes of services performed by the company, as well as the structure of these volumes for the 2020-2022 period. Additionally, the main financial results of the logistics company "FTP" will be calculated, providing a comprehensive overview of its financial indicators.

Lastly, the report will focus on identifying bottlenecks within the company's logistics processes and proposing effective strategies to overcome these bottlenecks.

By addressing these challenges, the FTP company can enhance its operational efficiency and optimize its transportation management practices.

In summary, this report aims to provide a detailed examination of the FTP company's transportation management and cost optimization in the realm of ocean/maritime transportation. Through comprehensive analysis, financial evaluation, and strategic proposals, the report seeks to contribute to the improvement and growth of the FTP company in the logistics industry.

The object of the thesis is to analyze and evaluate the logistics activity of the "FTP" company in the field of maritime transportation and its significant role in facilitating intersubjective interaction within the broader supply chain network. The thesis aims to delve into the management aspects of maritime activities within the supply chain, focusing on the utilization of blockchain systems and modern logistics approaches as key drivers of efficiency and effectiveness.

In order to comprehensively understand the logistics activity of the "FTP" company, the thesis will explore various dimensions such as transportation planning and information flow. By examining these aspects, the thesis seeks to identify potential bottlenecks, inefficiencies, and areas for improvement within the company's maritime operations.

Furthermore, the thesis will investigate the role of the "FTP" company's logistics activity in fostering intersubjective interaction within the supply chain. This involves analyzing the company's relationships and collaborations with other stakeholders, including shipping partners, port authorities, customs agencies, and customers. By examining these interactions, the thesis aims to assess the impact of the company's logistics activity on the overall performance and competitiveness of the supply chain.

In addition to analyzing the current state of the "FTP" company's logistics activity, the thesis will also focus on proposing and evaluating the application of blockchain systems and modern logistics approaches in managing maritime activities within the supply chain. Blockchain technology, with its decentralized and transparent nature, has the potential to enhance data security, traceability, and trust

among supply chain participants. The thesis will explore how the implementation of blockchain systems can improve the efficiency and reliability of maritime transportation processes.

Overall, this thesis aims to provide a comprehensive analysis of the logistics activity of the "FTP" company in maritime transportation and its role in intersubjective interaction within the supply chain. It seeks to delve into the intricate details of the company's operations, examining its processes, systems, and strategies that contribute to the seamless movement of goods through sea routes.

In addition to analyzing the existing practices, this thesis also focuses on exploring the potential of blockchain systems in revolutionizing the maritime industry. By investigating the application of blockchain technology, the thesis aims to shed light on how these innovative solutions can enhance the efficiency and effectiveness of maritime operations within the broader context of supply chain management.

The object of the research is the processes of organization of supply chains with the participation of marine transport by the company "FTP"

The subject of the research is management of the maritime activities in supply chain based on the application of blockchain systems.

# CHAPTER 1

## STUDY OF THE THEORETICAL FOUNDATIONS OF SUPPLY CHAIN MANAGEMENT

### 1.1 The basics of the Supply Chain management

The development of cooperation and specialization among companies has led to the evolution of supply management methods. In the 1990s, factors such as globalization, market integration, increased market openness, advancements in information technologies, and the emergence of the Internet began to influence economic development. These factors contributed to the emergence of a new concept known as Supply Chain Management (SCM). Currently, SCM is the primary concept of supply management in the modern economy.

Supply chain management involves the integration of key business processes, primarily logistics, that start with the end user and encompass all suppliers of goods, services, and information that add value to the consumer and other stakeholders.

According to the "Standards for Logistics and Supply Chain Management" collection, supply chain management can be defined as:

- The organization, planning, control, and execution of the product flow, from design and procurement through production and distribution to the final consumer, in accordance with market requirements for cost efficiency.

- The active organization and ongoing mobilization of supply chains in the economy to enhance the success of the involved enterprises. Here, the supply chain refers to the chain of product value creation, encompassing all stages from raw material extraction to production and sales to the consumer.

- The organization, planning, control, and regulation of the product flow, starting from order receipt and raw material procurement to ensure efficient

production and distribution, ultimately reaching the end consumer in accordance with market requirements.

- The design, planning, implementation, control, and monitoring of activities within supply chains to create net value, establish a competitive infrastructure, leverage global logistics, synchronize supplies with demand, and measure overall supply chain performance.

- The planning and management of all types of activities within supply chains, including sourcing and procurement management, product transformation, and logistics management.

These definitions highlight the comprehensive nature of supply chain management and its focus on optimizing resource consumption, creating value, and achieving competitive advantages in the market.[7, 10, 16].

Supply chain management software offers several essential functions to streamline operations:

- Customer Requirement Processing: SCMS enhances the speed of processing customer requirements by checking raw material availability, managing product manufacturing, and coordinating with the logistics team. The software tracks the entire process to ensure timely delivery.

- Inventory Management: SCMS enables effective management of stocked goods in warehouses. It supports inventory concerns such as asset management, replenishment lead time, and future inventory and price forecasting.

- Purchase Order Processing: SCMS automates purchase order processes, reducing time and effort required to generate and manage purchase orders. Pre-defined parameters can be set up to replenish inventories, generate serial numbers for product shipments, and track inventory costs.

- Supplier Relationship Management: SCMS facilitates strategic planning and management of all supplier interactions. It assesses supplier assets and capabilities, comparing them with the organization's business strategy.

- Warehouse Management: SCMS supports a warehouse management system by efficiently handling the movement and storage of products. It enables quick processing of transactions such as picking, placing, receiving, and shipping. [21]

Overall, SCM software serves as a valuable tool in optimizing supply chain management processes. (Fig.1.1)

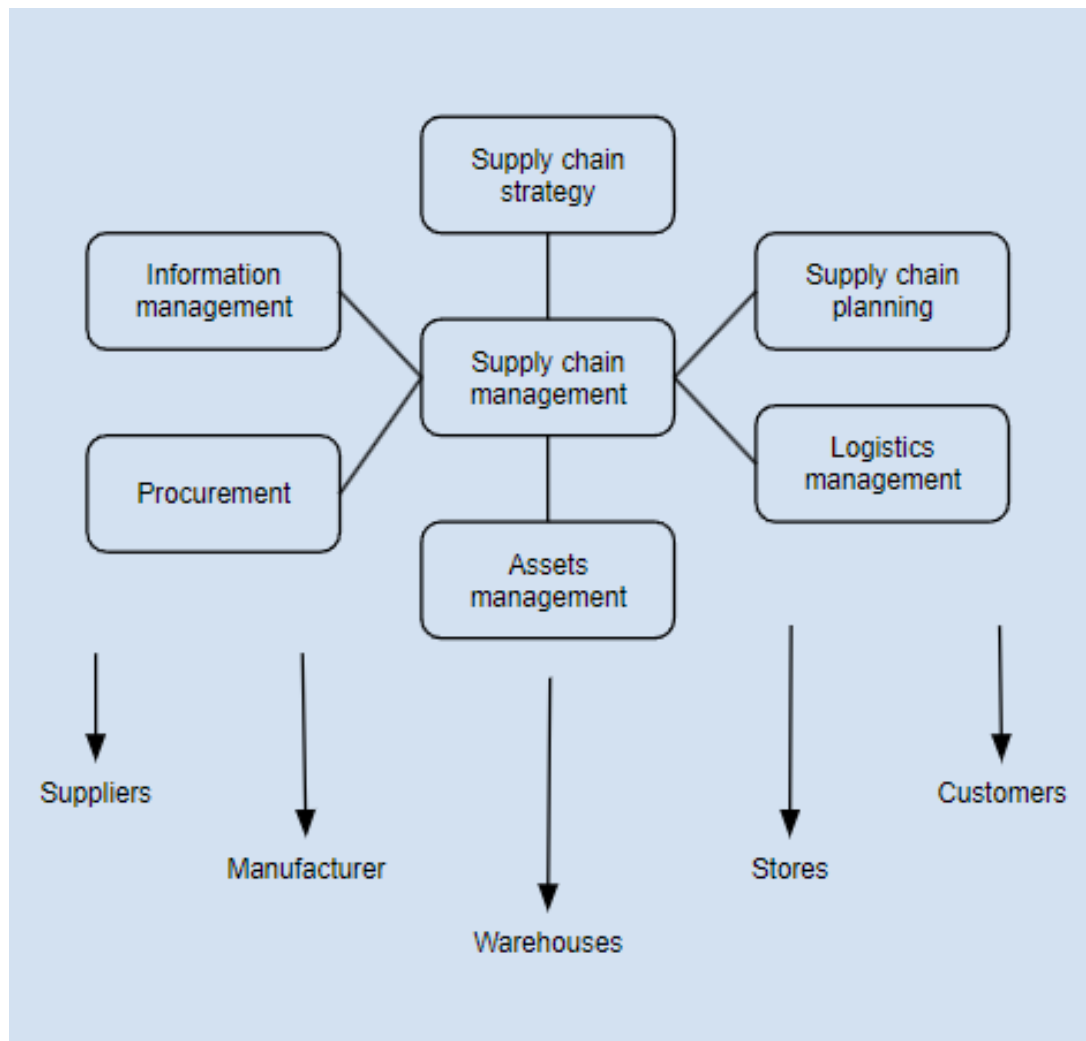


Figure 1.1 – Functions of Supply Chain Management

The set of fundamental functions in supply chain management includes:

- activity planning,
- organizing flow processes and interactions within the logistics system,
- making management decisions,
- coordinating inter-functional and inter-organizational activities,
- analyzing current operations,

- conducting internal and external audits,
- implementing controlling measures,
- pricing, particularly budgeting.

These functions encompass strategic, tactical, and operational decisions. While each company's logistics activities may have unique characteristics, there are essential stages that enterprises must undertake when developing a logistics system.

The evolution of supply chain management concepts can be attributed to objective factors such as the increasing importance of individualized approaches to customers, the development of tailored goods and products based on consumer preferences, and the accelerated response of manufacturers to market changes.

Additionally, the role of the internet and information technology in society has led to the utilization of online resources, the emergence of new business concepts, and the integration of information technologies in management practices. [7, 10, 38].

Supply Chain Efficiency refers to the internal standard used to measure a company's performance in effectively utilizing its available resources to achieve cost savings, process optimization, and other goals. It involves utilizing financial, human, and physical resources in the most efficient manner to meet customer demand at the lowest possible cost. This leads to reduced operational costs for materials and packaging, as well as minimized time wastage. Efficiency is crucial in ensuring that processes utilize resources optimally, resulting in fast and smooth system operations. [56]

In Supply Chain Management, there are challenges that can impact efficiency. One such challenge is the shortage of materials, which occurs when the quantity demanded exceeds the quantity supplied. This growing imbalance between supply and demand can negatively affect business performance, financial results, growth, and long-term competitive advantage. Upstream firms involved in extracting, refining, and processing raw materials are particularly affected by the availability of these materials. If acquiring raw materials becomes difficult, market forces may shift demand to other goods and supply chains.

Another challenge is the rising freight prices. The coronavirus pandemic has disrupted supply chains and trade channels, causing a significant increase in shipping container rates over the past years. This price surge extends to various sectors within the freight industry, including parcel delivery, trucking, ocean shipping, and warehousing. While most freight transportation contracts are negotiated annually, larger shippers may have multiyear agreements with different carriers.

Next challenge is demand forecasting. Demand forecasting refers to the process of using historical sales data to estimate and predict customer demand for goods and services in the future. It plays a crucial role in the supply chain process and influences various business decisions. By providing insights into expected customer demand, demand forecasting supports activities such as budgeting, financial planning, sales and marketing strategies, raw material and production planning, risk assessment, and mitigation planning.

The evolving needs of customers, driven by factors like faster delivery times, production-on-demand, and real-time order status updates, have been largely influenced by the internet. This increased consumer knowledge and access to information have had a significant impact on the manufacturing industry and other B2C sectors.

The COVID-19 pandemic has also brought about fundamental changes in consumer behavior.

Digitization of the supply chain is a critical aspect for the success of businesses across various industries. By transforming analogue supply chain processes into digital ones, companies can improve their bottom line. According to senior level executives, more than 85% anticipate that digitization efforts will enhance cash flow and reduce Days Sales Outstanding. Supply chain digitization involves establishing a dedicated master data system that consolidates information from internal sources such as historical sales data and point-of-sale consumer data, as well as external sources like socioeconomic data and competitor prices obtained from platforms such as Google Trends. [24]



## 1.2 Digitalization and digital economy

In the current stage of business development, innovative technologies play a crucial role, with almost everyone utilizing various computer and software tools. Digital business transformation has emerged as a popular and effective strategy for enterprises to compete in the market. The concept of 'digitalization' is highly relevant and requires additional attention.

Digitalization typically involves replacing paper-based document processes with electronic documents and communication methods. This process involves the integration of digital technologies to streamline and automate business operations, enhance communication with customers, and improve overall efficiency. [37]

The advancement of information technologies and electronic networks has significantly influenced the digitalization of economic relations, as most information is now in digital format. This trend has shaped the development of modern technology and business processes, with a strong emphasis on the electronic component. The adoption of digital communication channels elevates the level and effectiveness of interactions between buyers and sellers, creating new markets and opportunities for reorganizing economic processes. In essence, digitalization acts as a driving force that stimulates changes in the corporate world, primarily through the implementation of new technologies such as big data analysis, Internet of Things, cloud technologies, and 3D printing. By embracing digital technologies, enterprises can swiftly respond to evolving consumer needs and enhance their competitiveness. [5]

Digitization offers various tools to improve operational activities, including the replacement of paper-based document workflows with electronic documents, implementation of enterprise resource planning systems, digitization of warehouse management, logistics, financial systems, personnel management, and procurement processes. These measures enable enterprises to optimize and expedite their operations without compromising quality.[1]

The development of information technologies and the utilization of innovative solutions in the contemporary business environment have led to the emergence of a new type of economic relations known as the digital economy. The digital economy has been brought about by the advancement of effective commercial projects through electronic networks. It serves as a prominent manifestation of globalization processes, driven by the widespread accessibility of the Internet and the establishment of cross-border data flows. The primary aspects of the digital transformation of the economy include the digitization of global trade, the emergence of novel business models, and the enhancement of the information space[17].

Digitization of economic relations signifies a qualitative shift, characterized by the establishment of electronic communication methods among business participants within an information infrastructure based on global networks and their supporting means. In the digital economy, the size of a business holds no intrinsic value. Instead, the customer assumes the role of utmost importance, as their demands and loyalty stimulate the growth of sales volumes for goods and services[4]. The focus on the digitalization of the economy is occurring to varying degrees in all countries worldwide[8].

The digital economy is not a separate industry, but a virtual environment that complements our reality. Increasingly, the digital economy is intertwined with the traditional economy, making a clear distinction increasingly difficult. The main products of the digital economy are the same goods and services of the traditional economy, which are provided with the help of computer equipment and digital systems and the global Internet.[6]

Within the Ministry of Economic Development and Trade in Ukraine, there exists a department dedicated to the advancement of information and communication technologies, document management, and electronic services. This department's primary responsibilities include defining the state's information policy and formulating a strategy for its development. In January 2018, the Cabinet of Ministers of Ukraine endorsed the "Concept for the Development of the Digital Economy and Society of Ukraine for 2018-2020." This concept outlines various measures aimed at

promoting the digitization of the economy, fostering the growth of the domestic market and export of digital technologies, and encouraging citizen engagement in utilizing digital technologies. The concept establishes key provisions, principles, goals, and directions for the digitalization of Ukraine's economy, as well as the acquisition of digital competences by society. Notably, it emphasizes the implementation of digital workspaces, the execution of digital transformation projects, and the utilization of digital technologies in areas such as public safety, education, and healthcare. [3,9]

The emergence of the digital economy has paved the way for the development of Internet services, which offer time optimization and additional control benefits over the promotion of virtual services for users. In the era of globalization, Internet resources cater to the evolving demands of the "borderless economy," thereby expanding access to potential transactions through the rise of online purchases and the diversification of payment methods. The advent of new communication formats and information exchange has given rise to novel forms of organizing trade operations. [13,19]

The digital economy has experienced significant growth during the COVID-19 pandemic, with its position becoming even stronger. The pandemic has accelerated the shift towards the digital economy in various sectors, including remote work and electronic procurement.

Remote work has become a popular option for companies, allowing them to reduce office space costs and providing employees with the flexibility to work from home. Additionally, the adoption of electronic procurement has increased, with many people experiencing its benefits for the first time during the pandemic.

While these trends were already emerging prior to COVID-19, the pandemic has served as a catalyst, highlighting the importance of companies being prepared for the digital demands of the future. The digital economy relies on digital technologies, which are not only produced but also actively utilized by companies in their operations. It has a global nature and plays a crucial role in the formation and

development of the information society. To thrive in the modern business landscape, companies must embrace the key characteristics of the digital economy. [23, 32]

The use of modern devices that generate digital signals enables easy measurement, tracking, and analysis of data for effective decision-making. Leading companies in this field are continuously working on reducing costs and improving technologies to increase their use in business.

A robust system of wireless interconnections connects employees, assets, suppliers, and stakeholders, empowering better decision-making and promoting security, visibility, and efficiency in companies. Integration of supply, manufacturing, distribution, and predictive maintenance allows companies to anticipate disruptions, increase uptime, and enhance customer service.

The digital economy operates on the concept of sharing, where companies will soon only purchase what they need, reducing costs and enabling payment for goods or services received.

Customer personalization is a key feature of the digital economy, allowing customers to receive customized products from suppliers at their preferred time and location.

The digital economy enables companies to establish direct communication with buyers, eliminating unnecessary intermediaries or channels. Remote monitoring of supply chains is an example of more direct operations, using remote intelligence to track, manage, and solve problems without the need for local personnel at every point.

The digital economy brings convenience, value, and transformation to people's lives, society, and businesses. It enhances efficiency, economic development, and problem-solving capabilities. Decision-makers benefit from new insights that streamline processes and drive smarter decisions, positively impacting the company's bottom line. For example, logistics companies can increase customer loyalty through hyper-personalized services and drive innovation through technology platforms that enable information sharing. Data analytics and management help optimize limited resources through real-time resource allocation and the development of flexible

infrastructures. Additionally, the digital economy improves efficiency by automating processes like maintenance and workload schedules to prevent failures.

Thus, digital economy has numerous advantages as:

- Access to greater information and choice: The internet allows consumers to easily compare prices and access information, providing more options and convenience, especially for travelers seeking hotel prices and bus timetables.

- Time-saving: Online shopping eliminates the need to physically visit stores, saving time and reducing labor costs for businesses. Orders can be placed over the internet, with next-day delivery options available.

- Cost reduction: By conducting business primarily online, firms can save on expensive building rentals. Direct delivery from factories or warehouses to consumers bypasses traditional retail chains, resulting in lower costs and potentially lower prices.

- Personalization: The digital economy enables greater personalization compared to traditional economies. Consumers can choose specific preferences, leading to custom-built products like 3D-printed clothing with individualized sizes and colors.

- Lower barriers to entry: The digital economy provides opportunities for new firms to enter markets. Innovative ideas can challenge traditional firms, leading to the creation of new products and services such as online grocery deliveries and dating apps.

- Data insights: The digital economy generates significant data that can inform governments and charities about economic trends. For instance, mobile apps can track the spread of diseases like COVID-19, identifying local hotspots.

- Benefits for the developing world: The digital economy opens up opportunities for developing countries. For example, computer programmers in India can offer competitive rates, leading to job opportunities and increased income.

- Remote work capabilities: The digital economy has proven invaluable during the COVID-19 lockdown, allowing for remote work and flexible hours. This reduces

virus transmission, traffic congestion, and pollution while providing parents with childcare responsibilities greater flexibility.

Challenges in the digital economy include the concentration of market power among a few dominant firms, such as Amazon, Google, and Facebook, which can limit competition and result in higher prices for consumers. Additionally, the shift towards digital platforms has led to the decline of traditional businesses, like bookshops, which can negatively impact local communities and the personal interaction between buyers and sellers. The addictive nature of technology and the abundance of information available online can also lead to time wastage and difficulty in making decisions. Privacy concerns arise from the collection and use of user data by companies like Facebook, which can be exploited for targeted advertising or political purposes. The digital economy has also seen the rise of self-employed freelancers, who may lack the same labor protections as traditional employees. Social media platforms have facilitated the spread of graphic and harmful content, contributing to societal well-being concerns. The rapid pace of technological advancements, including the rise of AI, can disrupt industries and potentially lead to structural unemployment and increased inequality. Lastly, the environmental impact of the digital economy should not be overlooked, as data centers consume significant amounts of electricity and contribute to CO<sub>2</sub> emissions, while the constant release of new electronic devices promotes a throw-away culture and resource consumption (Fig. 1.2) [14].

Despite the fact that digital technologies are quite widespread today, there is a lack of research on their "security". The threat lies in the possible hacking of digital systems with unauthorized access to personal data. The amount of personal data collected by sensors of the Internet of Things is growing, and this raises fears of interference in private life. The main issue is the lack of full consent for the collection and processing of personal data, as well as what data should be collected and how it should be analyzed. This carries the risk of loss of privacy.

Virtually every business today depends on software for the development, production, distribution and after-sales support of products and services. Yes,

technical problems in the operation of the devices can cause a failure in the software, which can lead to the receipt of unreliable or out-of-date information.

<b>Advantages of Digital Economy</b>	<b>Disadvantages of Digital economy</b>
<ul style="list-style-type: none"> <li>-Greater information and choice</li> <li>-Saves time</li> <li>-Reduced costs for business</li> <li>-Greater personalization</li> <li>-Lower barriers to entry</li> <li>-Greater flexibility in work, enabling people to work from home</li> <li>-Benefits for developing world</li> </ul>	<ul style="list-style-type: none"> <li>-Monopoly power of tech giants</li> <li>-Less community</li> <li>-Addictive nature of technology</li> <li>-Privacy issues</li> <li>-Bypassing of labour laws</li> <li>-Disruption to traditional economy and jobs</li> <li>-Potential environmental costs</li> </ul>

Figure 1.2 – Advantages and Disadvantages of Digital economy

Technological progress cannot be stopped, but the impact of digital transformation today is ambiguous. Digitization contributes to the emergence of new challenges related to the uneven distribution of digital benefits, polarization of the labor market, cyber security, etc. Failure to resolve these issues can lead to economic inefficiency and slowing down the pace of development, the implementation of "reactionary" rather than strategic policy.

### **1.3 Management of supply chains involving maritime transport**

A maritime supply chain involves the movement of goods, as well as any related support, involving two destinations and using both sea (ocean) and land

transport. It is a whole network of interconnected systems involving freight forwarders, shipping lines, port terminal operators and ground logistics systems.

Freight forwarders are companies or individuals who arrange for the delivery of goods, while shipping lines own and operate the vessels that carry the goods by sea. Port terminal operators own or lease port facilities where goods are delivered and operate land-based logistics systems to deliver goods to their final destination.

All are integral touch points and must maintain constant communication to avoid delays or misdirection of supplies. Bad weather, overcrowded ports, and busy shipping lanes can disrupt any shipment if not carefully planned, monitored, and rerouted if necessary.

This system existed on a global scale for hundreds of years and led to research around the world as traders searched for better routes, different spices and precious materials. However, in today's world, the maritime supply chain has become highly dynamic and complex as it grows to meet ever-evolving technologies, consumer preferences and global trade patterns. [99]

There are several touch points in the maritime supply chain. These include external suppliers, internal divisions, external distributors and consumers. All these parts must act in harmony and, moreover, take into account important factors such as customer expectations, technological innovation, globalization, competition, government regulation and sustainable development. (Fig.1.3)

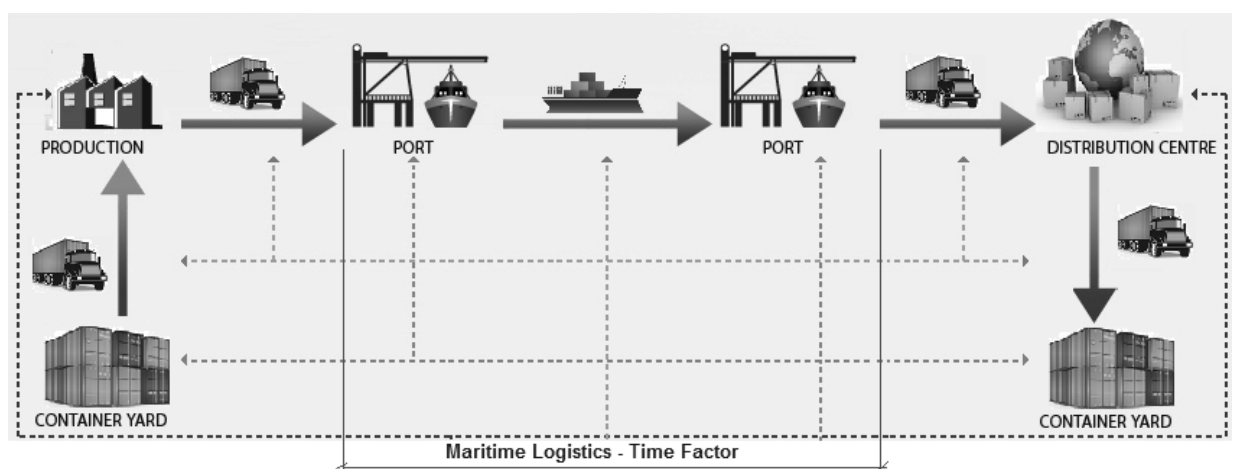


Figure 1.3 - A maritime supply chain



The maritime supply chain is more important than ever in our global economy. Approximately 80% of world trade by volume and more than 70% by value is transported by sea around the world. COVID 19 has demonstrated how disruptions in the global supply chain can create economic and governmental problems across the board. A sustainable supply chain is essential to the functioning of the global economic system.

Logistics companies are currently recruiting specialists with experience in the field of transport economics and are looking for vacancies in the field of logistics services in the maritime industry. The digitization of ports and the development of technology have created a need for different skills, and the growing shortage of transport logistics is a real possibility. [57]

The seamless operation of the maritime supply chain is what keeps the global economy running. Recruiting people in this field will help ensure price stability and product availability worldwide. [15]

Retailers and wholesalers depend on the reliable delivery of physical shipments to avoid production delays, as well as the delivery of manufactured products to stores and customers. Erratic delivery caused by poor logistics management can cost companies money or even lead to their complete collapse.

Over the past 20 (or even 10) years, customer expectations have changed dramatically. Customers are looking for increased flexibility, reliability and accuracy. And in many industries, innovation drives competition to be the first to offer new products. People want more, faster. Product life cycles are shorter than before - products such as clothing are almost constantly changing in line with changes in fashion.

Lot sizes have become smaller and delivery frequencies have increased. Supply chain excellence is essential to effectively serving customers.

Increased digitalization and improved artificial intelligence are creating a more competitive market. In the so-called Amazon effect, pressure has increased on other

shipping companies to duplicate the extremely efficient systems developed by the Amazon corporation.

More and more resources are being invested in route optimization to ensure results move quickly and efficiently throughout the supply chain. This includes collecting detailed data on marine and highway traffic, weather conditions, fuel economy, driver skill and any number of other indicators to help create the optimal route for freight transport.[18]

The question of sustainable development is causing concern in the global market. Environmental pressure comes from both government agencies and consumer preferences.

Corporations are beginning to adapt their business models to reflect an emphasis on green supply chains. Strategies to reduce environmental impact focus on these five ideas: reuse, recycle, reduce, recover, and reverse logistics (see Fig. 1.4).

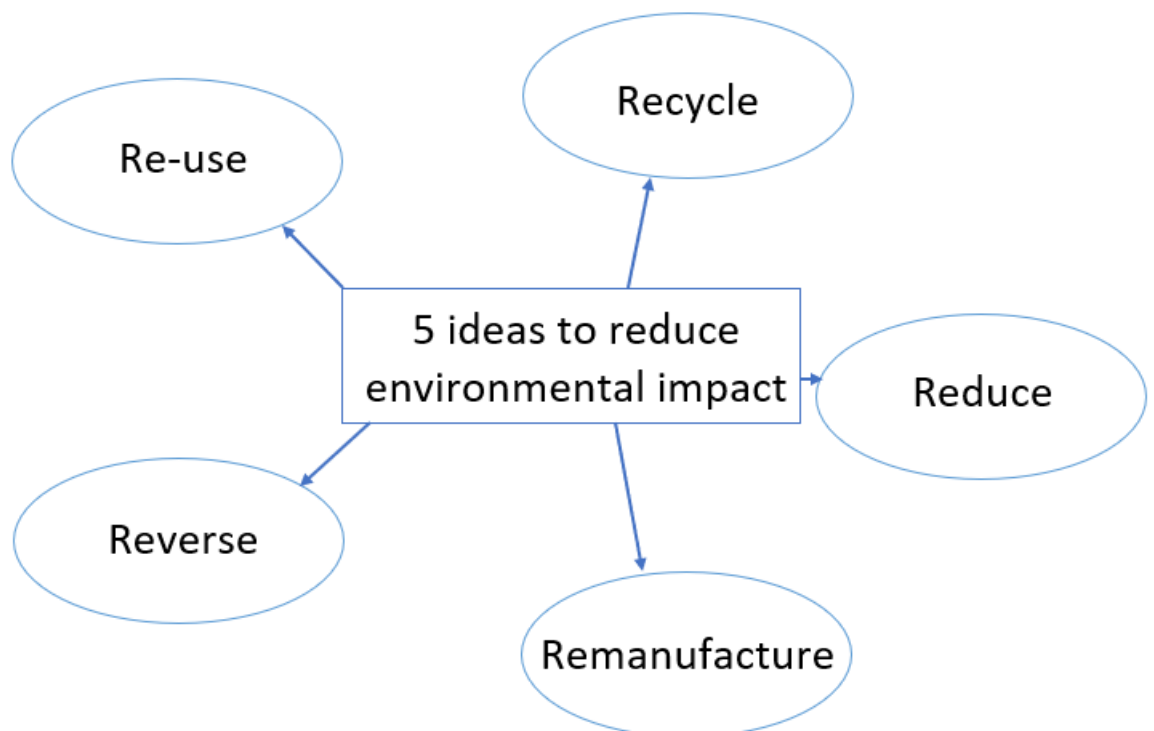


Figure 1.4 - 5 ideas to reduce environmental impact

In maritime shipping, the primary focus is on reducing fuel emissions and alternative fuels, as well as ship recycling, safe handling of hazardous materials and

reducing noise pollution. Port operators are paying attention to things like noise reduction, dredging and odor reduction.

Ports in supply chain management are the links of supply chains as they support interactions between global supply chains and regional production and consumption markets (Fig. 1.5). Global supply chains have become complex, forcing the logistics industry to simultaneously improve its costs, productivity and resilience to disruption. Logistics services that still offer value may suffer humiliation and become essential services, creating only small margins. This is especially true for physical added value. [59]

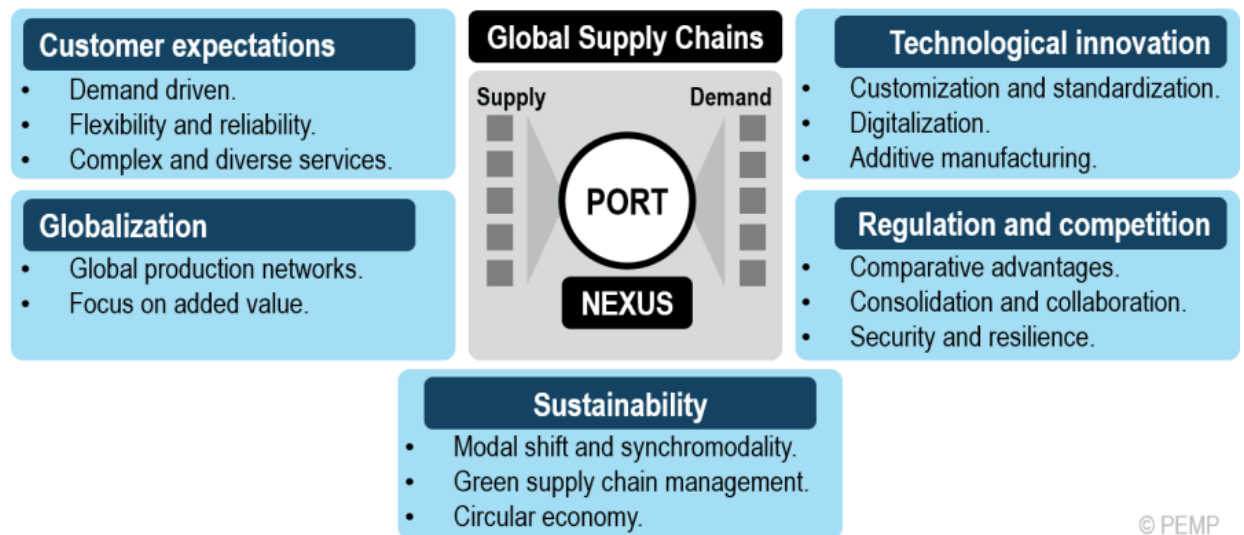


Figure 1.5 - The Port as a links in Global Supply Chains

Through supply chains, corporations interact with external suppliers, internal departments, external distributors and customers. Successful supply chain management is influenced by consumer expectations, globalization, technological innovation, government regulation, competition and sustainability issues.

Customer expectations: SCM models are constantly evolving under the influence of factors such as globalization and entry into new markets, mass customization in response to product and market segmentation, lean production methods, and related cost changes. Customer expectations in the service industry are moving toward greater flexibility, reliability, and accuracy. In many industries,

product innovation has become an important factor in competitiveness. This led to the fact that companies began to compete for the right to be the first to launch new products and technologies. As a result, the average product life cycle and supply chain cycles, such as order fulfillment times, have decreased. [39]

The number of items that need to be shipped and the frequency of shipment increases, while lot sizes become smaller. There is growing customer demand for fast-delivered, made-to-order or made-to-order products with high delivery reliability at the lowest possible price. While cost remains an important factor in customer satisfaction, factors related to reliability are becoming central. The focus is on supply chain excellence and efficient customer service. [12]

A growing skills shortage is a distinct possibility in logistics as the workforce is forced to provide an increasingly complex and varied range of services. Logistics companies struggle to attract enough talent to retain the workforce and provide ongoing training to improve productivity. Given the digitalization of all parts of society, including logistics, the need for new skill sets will further exacerbate this gap. In addition, the target workforce may be attracted to other more high-profile sectors. The port and logistics sectors are struggling to compete for talent.

**Globalization:** One of the main drivers of change in the port industry is emerging as a result of globalization and the structural transition from a supply-driven economy to a demand-driven economy. Sentence-based economics was based on economies of scale in production, standardization, and mass consumption of standardized products. This approach began to be scrutinized as productivity growth associated with economies of scale reached its structural limits and growing individualism began to affect consumption patterns. The result was a transition to a predominantly demand-driven economic system, with global production networks following market supply.

Multinational enterprises (MNEs) are key drivers of globalization. There has been a shift from capital-intensive activities, such as owning and operating large numbers of manufacturing sites, distribution centers and retail outlets, to other activities that are much less capital-intensive and more focused on developing a

strong brand. Branding is a key concept in the new MNE business model. This involves a strong focus on consumers and product innovation, while production is outsourced to a network of suppliers. MNEs are increasingly developing long-term relationships with a limited number of logistics suppliers on a co-production basis. Thus, a large number of MNEs have adopted flexible multi-firm organizational structures on a global scale.

Many of the world's largest MNCs manage extensive networks of globally dispersed resources. Global supplies, as such, are the main driver of world trade. However, at the customer end of the value chain, very few of the world's largest multinational companies operate globally, that is, have broad and deep penetration into foreign markets around the world. At the same time, they are regionally based on breadth and depth of market coverage, with the majority of their sales concentrated in the home part of the triad, namely North America, the European Union or Asia. The wide geographic distribution of suppliers and production (side end) versus the less wide geographic distribution of sales (customer end) is reflected in trading patterns, supply chain management needs, and delivery requirements.

Technological innovation: Optimizing supply chains through customization and standardization using advances in data analytics and transparency is leading to concepts like the plug-and-play supply chain. These are finely tuned, flexible supply chains consisting of core standardized, easily replicable solutions, complemented by standardized, proven processes tailored to the needs of a unique segment or market. These supply chains must be supported by digitization using intelligent, data-driven decision support systems for customers, markets and profitability.

The focus will be on more local and sustainable supply chains in which environmentally friendly modes of transport meet shippers' cost-effectiveness and efficiency expectations. Goods will need to be transported economically, with limited environmental impact and in a sustainable manner. In this sense, shippers will look to service providers for an orchestration function in which operational excellence is supported by greater convergence between physical and data processes.

Delayed and additive manufacturing will challenge existing business models. This trend will affect the demand for transport and logistics. More manufacturing is likely to be regional, whether in local factories, independent production farms, or even with the new role of logistics service providers offering manufacturing services and integrating them with their transportation, storage and distribution services.

Regulation and competition: Changing comparative advantages in economies such as China, where costs and inflation continue to rise, as well as the "China Plus One" scenario, in which China moves from an export-manufacturing economy to a consumption-led economy, have a major impact on the complexity and current challenges . supply chains Combined with manufacturing risks such as time to market or speed of response, import duties, skilled labor availability, ecosystem interactions, energy costs and automation, this means more nodes and production will be moved to other regions.

More horizontal collaboration between transport companies and logistics service providers will be required to cope with the need for shorter, more sustainable and cost-effective supply chains. This will bring its own challenges, mainly where mutual trust regarding data exchange protocols and competitiveness protection is concerned.

Consolidation in the logistics sector will result in fewer companies expanding supply chain capabilities to support increasingly efficient ICT systems. The data component will enable efficient and proactive service providers to transform into companies with a new perspective on logistics services. Along with a growing number of traditional activities such as transportation, warehousing and various types of value-added services, the availability of collaboration platforms will enable certain service providers to develop new types of logistics services.

Security of supply will become increasingly important. Supply chain resilience is becoming a key element in addressing increasing supply chain disruptions due to local political instability, natural disasters, terrorist attacks, etc. Supply chains must have built-in redundancy. Supply chains will be built for resilience. This will lead to increased supply chain visibility and data sharing across the supply chain.

Sustainability: Systematic use of more ecologically clean alternatives in logistics must be developed with increasing environmental pressure from society, in particular in the form of increased regulation and changes in consumer behavior. This is affecting how ports operate and how they are interconnected, which involves reorganizing supply chains in favor of changing modes of transport and synchro modality. This leads to the development of sustainable hubs and corridors along which new supply chain networks need to be developed. Corporations are adapting their business models by incorporating sustainability criteria into their procurement and operations, impacting their respective supply chains through the development of green supply chain management strategies. [41]

Green Supply Chain Management (GSCM) is a business model that integrates environmental concerns into inter-organizational SCM practices.

GSCM has attracted increased attention in the industry because there is a need to integrate environmentally sustainable choices into SCM practices. The growing importance of GSCM goes hand in hand with environmental issues such as climate change, lack of some new renewable material resources, waste disposal and increasing pollution in developing countries. Adding a green component to supply chain management involves considering the impact of SCM and the relationship with the environment. [40]

An important part of the success of the closed-loop economy depends on how logistics provide the transparency necessary to create efficient and integrated networks of a fully closed supply chain. Beyond the physical aspect of integrating supply chain flows to maximize circular economy opportunities, end-to-end integration of supply chain processes will be critical. The circular economy therefore opens up new opportunities for shipping and logistics service providers and requires them to collaborate with industry stakeholders.

## Chapter 1 summary

In this section, the supply chain management in digital economy involving maritime were studied, namely:

- It was defined that Supply Chain Management is the organization, planning, control, and execution of the product flow, from design and procurement through production and distribution to the final consumer, in accordance with market requirements for cost efficiency.

- Essential functions of SCM, which includes Supply chain planning, Logistics management, Assets management, Procurement and Information management were described.

- It was described what is digitalization and digital economy. It was defined what digitalization involves, how it helps improve and streamline processes in economy.

- Advantages and disadvantages of digital economy was defined and summarized.

- It was defined that maritime supply chain is a whole network of interconnected systems involving freight forwarders, shipping lines, port terminal operators and ground logistics systems.

- It was concluded that in maritime shipping, the primary focus is on reducing fuel emissions and alternative fuels, as well as ship recycling, safe handling of hazardous materials and reducing noise pollution.

- Also it was concluded that corporations are beginning to adapt their business models to reflect an emphasis on green supply chains. Strategies to reduce environmental impact focus on: reuse, recycle, reduce, recover, and reverse logistics.



## **CHAPTER 2**

### **STUDY OF THE ACTIVITIES OF THE "FTP" COMPANY IN THE MARKET OF TRANSPORT AND FORWARDING SERVICES**

#### **2.1 Analysis of the market of transport and forwarding services and the activities of the company "FTP" on it**

Since 2010, the logistics company "FTP" has been actively engaged in the international market, providing services in freight forwarding, transportation, and customs management. Throughout its operation, FTP has established itself as a trusted and dependable partner, sustaining growth and development in collaboration with its clients and partners.

The founders and, accordingly, top managers of the company are three ambitious individuals who invested their own efforts in the rapid development of the company and never stopped at the achieved results, which is confirmed by the received national certificate of the National Business Rating in 2014. in the nomination "Industry Leader 2014" among small enterprises according to the indicator of financial and economic activity "Investment attractiveness" according to the main type of activity. However, the company does not stop at the achieved results, the latest achievement was the acquisition of membership in the world's largest association of independent freight forwarders - WCA (The World Cargo Alliance) (registration number FTP 121010) already in July of this year. It should be noted that this alliance has more than 9,488 partners from 195 countries [53], which allows you to have exclusive access to the base of forwarders and maximum, unlimited opportunities in the field of international transportation, namely [60]:

- the most improved tariff for cargo delivery by any mode of transport;
- the maximum level of comfort and security within the framework of the selected service;

- the possibility of cargo selection in the most difficult and remote areas of the globe.

FTP provides several logistics services:

1. Customs logistics.

Customs logistics refers to the management and coordination of activities related to customs procedures and regulations in the context of international trade and logistics. It involves the movement of goods across borders while complying with customs requirements, documentation, and clearance processes.

FTP custom services encompass a comprehensive range of customs-related activities. Company guarantees the smooth completion of all customs formalities for exports, imports, and transit operations. Their expertise allows them to streamline the necessary control procedures during customs clearance, including rates, nomenclature, inspections, and payments. They prioritize maintaining customer's interests throughout the customs process and strive to minimize client's involvement. Additionally, FTP offers assistance with sample collection and obtaining data analysis. For products intended for sale in Ukraine, company acquires veterinary certificates. FTP also handles the getting of certificates. Furthermore, FTP provides price examination services and assist in the accreditation of client's enterprise with customs authorities.

2. Financial logistics

Financial logistics refers to the management and coordination of financial activities within the broader logistics and supply chain context. It involves the efficient and effective handling of financial transactions, information, and resources to support the movement and storage of goods and services.

Company's role in the logistics process involves overseeing the financial aspects of foreign economic activity, which plays a crucial role in determining the final financial outcome. FTP is involved in every step of the financial journey, ensuring its efficiency and accuracy. This includes managing payments to suppliers, handling expenses and income related to foreign economic transactions, and offering financial consulting services.

### 3. Contract logistics

Contract logistics refers to the outsourcing of resource management tasks by one company to a third-party company specializing in logistical matters, such as transportation, warehousing, and order fulfillment.

FTP offers comprehensive services for outsourcing the FEA department, including managing supplier relationships, handling foreign economic contracts, resolving any document or process-related disputes with suppliers, ensuring seamless delivery, and providing commission agent services.

### 4. Transport logistics

Transport logistics comprises the complete approach to all processes in logistics that are necessary to conduct all kind of transport.

FTP organizes from door-to-door cargo delivery with any type of transport or combination of different types of transport in the supply chain, obtaining all main logistics criteria. Company works out an optimal route and offer suitable terms and price based on the given conditions. They offer full truck load or less than truck load. Furthermore, company control the temperature regime during the transportation.

FTP handles shipment with various commodities in different categories, such as: Food; Electronics; Hygiene products; Fabrics, yarn, thread; Furniture and accessories; Helmets and body armours; Optical devices; UAV, drones; Medical goods; Radios; Repair parts for autos, bicycles and motorcycles; Agricultural machinery; Vehicles; Pharmaceuticals; Household cleaning products etc. [48]

Even though the FTP company is one of the leading Ukrainian freight forwarders that was founded in Ukraine, they have strong ukrainian and world-wide known competitors.

There are the following FTP competitors in Ukrainian logistics market:

- KÜEHNE + NAGEL

Country of origin: Switzerland

One of the largest logistics companies in the world, it has 1,400 offices in 109 countries.[49]

- DSV LOGISTICS

Country of origin: Denmark

The fifth largest transport and logistics company in the world, has offices in 80 countries, processes 30 million shipments annually. [45]

- FM LOGISTICS UKRAINE

Country of origin: France

The company started with 12 employees and seven vehicles. Now it has branches in 14 countries of the world and receives 60% of its income from abroad. [47]

- RABEN

Country of origin: Netherlands

Raben has branches in 12 European countries. The Ukrainian branch has been operating since 2003, has 500 employees, branches in seven cities, 70,000 square meters. m of warehouse space and 600 cars. [52]

- EKOL UKRAINE

Country of origin: Turkey

The company has 1 million square meters. m of closed warehouses in 12 European countries, two ferries, 52 railway routes per week and a fleet of 6,000 cars. [46]

- ZAMMLER

Country of origin: Ukraine

Zammler Ukraine is a Ukrainian logistics operator. On the market since 2007. Today Zammler works not only in Ukraine, it has representative offices in Poland, China and Kazakhstan. Provides services in the field of automobile, sea, railway, air transportation, customs brokerage and a full range of warehouse services. [55]

- PAKLINE LOGISTIC

Country of origin: Ukraine

Pakline Group is of Ukrainian origin, founded in Dnipro in 2004. Now the group of companies has 52,700 square meters. m of warehouse space and 114 units of own transport, represented in 12 Ukrainian cities, staff - 882 employees. [51]

- UVK

Country of origin: Ukraine

UVK is the first Ukrainian 3PL operator that entered the market in 2001. The operator provides customs brokerage services, international forwarding, fulfillment services, delivery and storage of goods. It offers its customers a direct regular service for the transportation of groupage cargo from China and other countries of Southeast Asia, North and South America, provides weekly shipment from the Chinese ports of Shanghai, Ningbo, and Hong Kong. Organizes import and export through European ports, warehouse in Warsaw and ports of Ukraine. [54]

- LOGISTICS-PLUS

Country of origin: Ukraine

Logistics-plus is a modern 3PL operator in the logistics services market. The logistics company was founded in 2008 and in this short period of time they have achieved great success. The reliability and quality of services of their logistics company as a 3PL operator is ensured by a team of professionals, the use of professional equipment, as well as innovative technologies that allow us to achieve the goals and objectives of our clients as much as possible. [50]

- DB SHENKER UKRAINE

Country of origin: Austria

The official freight forwarding agency of nine Olympic Games, the company is responsible for European logistics for the Mercedes AMG Petronas Formula 1 team. It has more than 8 million square meters. m of warehouse space and 24,500 employees in 750 offices. The representative office of the company was opened in Ukraine in 1998. DB Shenker offers transportation by road, rail, air, sea transport, contract logistics services.[43]

Also, it should be noted that, according to the classic classification of companies by size, the FTP logistics company belongs to small enterprises, and it has strong competition in the logistics services market not only from such global logistics players as Kühne+Nagel, DSV, Asstra, Ecole Logistics, Raben, as well as Ukrainian

Zammler , Formag Forwarding and Good Logistics, which has strong connections in various countries in the main directions of providing logistics services of the FTP.

It should be noted that global companies and Zammler also have their own warehouse complexes in Ukraine and other countries of the world, unlike FTP, which rents pallet spaces from its warehouse business partners, both in Ukraine and in China and EU countries. At the same time, in comparison with logistics companies of the same size Uni-Laman, Tvoya Logistika, FTP significantly benefits due to the organization of a full chain of services in the field of foreign exchange services in combination with full logistics support. In turn, such companies as Ukr-China Communication and China Trans, as well as the logistics company Fialan, also provide consulting services for foreign exchange, but from the moment of organizing the supply of goods to delivery to the customer's door [20]. The share of companies in the transport and forwarding services market is presented in Fig. 2.1.

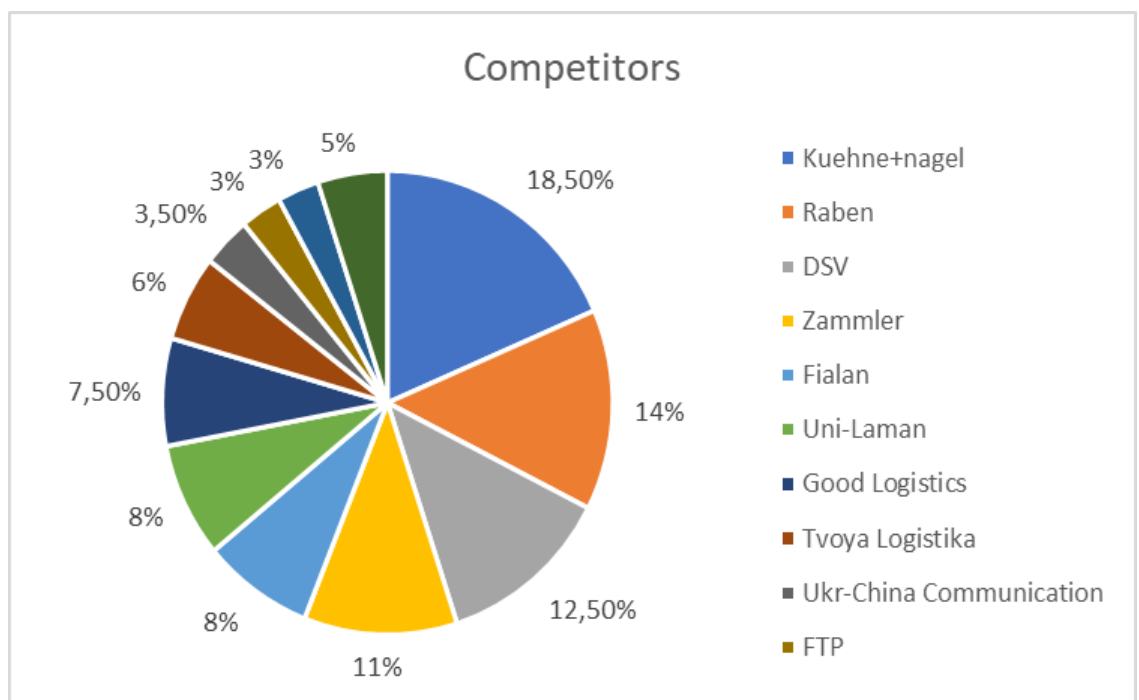


Figure 2.1 – Positions of FTP in comparison with competitors

An organizational structure is a system that outlines how certain activities are directed in order to achieve the goals of an organization. These activities can include

rules, roles, and responsibilities. The organizational structure also determines how information flows between levels within the company.

FTP has Linear-functional organizational structure (Fig.2.2). Each superior has clearly assigned subordinates and each subordinate has clearly assigned superior. Every employee has only one superior, the main bond between organizational levels is hierarchy. [35]

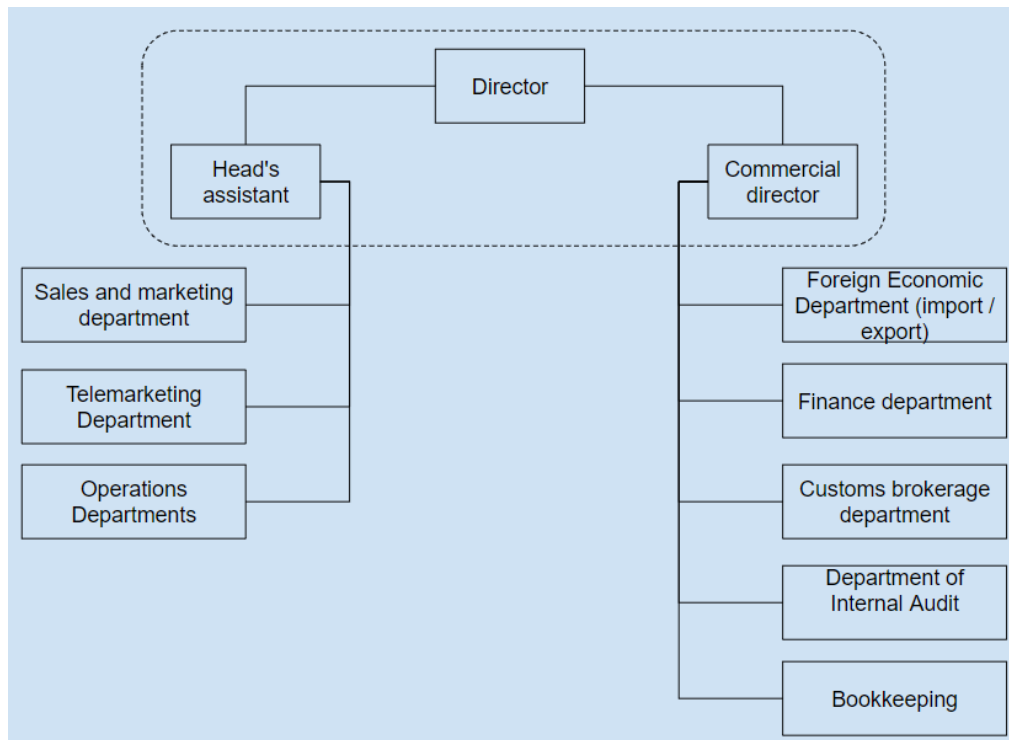


Figure 2.2 – Organizational structure of FTP company

The linear-functional management structure has the following advantages:

- There is an opportunity to attract more competent, qualified and erudite specialists in the field to the leadership;
- There is efficiency in making decisions in non-standard situations;
- Presence of rapid growth of professionalism of managers performing functional roles;
- The possibility of obtaining consistent orders, orders and tasks;
- Presence of full personal responsibility for the result of its activities.

The linear-functional control structure has the following drawbacks:

- The difficulty in coordinating the actions of all units that are part of the overall system of the enterprise;
- The presence of heavy workload of the head and his assistants on basic issues of management and production.[31]

SWOT (strengths, weaknesses, opportunities, and threats) analysis is a framework used to evaluate a company's competitive position and to develop strategic planning. SWOT analysis assesses internal and external factors, as well as current and future potential.[2]

SWOT analysis of FTP is shown in the Fig.2.3.

Strengths	Weaknesses
<ul style="list-style-type: none"> <li>- Fast services (fast process the transportation documentation, promptly informing clients about any changes, etc.)</li> <li>- Continuous expanding of the new ways of shipping (through airports (Warsaw, Frankfurt, Bratislava) and ports of Europe (Constanta, Gdynia, Gdansk, Hamburg, Koper))</li> <li>- Diversity of services (door to door services, customs clearance and etc.)</li> <li>- Multiple subcontractors (ocean freight carriers, trucking companies, air freight carriers)</li> <li>- High quality of services</li> </ul>	<ul style="list-style-type: none"> <li>- Absence of company's own vehicles</li> <li>- Outdated information support.</li> </ul>
Opportunities	Threats
<ul style="list-style-type: none"> <li>- Implementing new technologies</li> <li>- Improvement of information support</li> </ul>	<ul style="list-style-type: none"> <li>- Unstable economy</li> <li>- Employee shortage</li> <li>- Unstable political situation in Ukraine</li> </ul>

Figure 2.3 – SWOT analysis of FTP company



## 2.2 Analysis of the economic and financial state of the enterprise's activity

FTP company delivered strong result in recovering year after COVID – 19. However, due to full invasion of Russia to Ukraine, FTP's performing results significantly dropped compared to 2021 and 2020 years. [36]

According to company's financial report the total volume of performed services for the last three years is significantly changed (see Table 2.1 and Figure 2.4).

According to calculations, all services in 2021 increase compared to 2020. The biggest increase had air transportation. It increased by 20%. The total increase of performed services in 2021 increased by 4,3%.

Table 2.1 - Volumes of services performed for 2020 – 2022 by FTP company, number of contracts

№	Service groups of «FTP»	Years			Deviation 2020/2021	Deviation 2021/2022
		2020	2021	2022		
1	Road transport	265	286	240	7,9%	-16,1%
2	Air transportation	35	42	7	20,0%	-83,3%
3	Sea transportation	165	174	98	5,5%	-43,7%
4	Brokerage services	576	603	612	4,7%	1,5%
	Total	1059	1105	957	4,3%	-13,4%

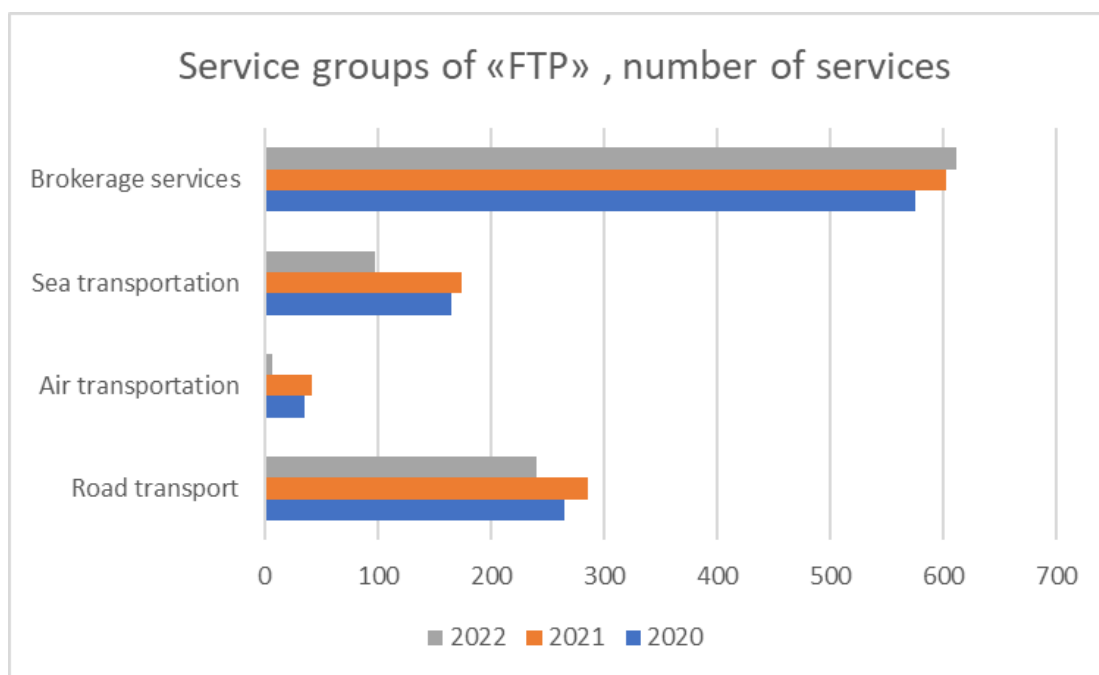


Figure 2.4 - Service groups of «FTP» , number of services provided in 2020, 2021 and 2022

In 2022, all services sharply decreased, except Brokerage service – it increased by 1,5%. The biggest drop was in Air transportation by 83,3%. The decrease was caused by prohibition of flights in Ukrainian. Moreover, Sea transportation decreased by 43,7% due to closed Ukrainian sea ports.

Table 2.2 – Structure of volumes of services performed for 2020 – 2022 by FTP company

№	Service groups of «FTP»	Years					
		2020	%	2021	%	2022	%
1	Road transport	265	25,0%	286	25,9%	240	25,1%
2	Air transportation	35	3,3%	42	3,8%	7	0,7%
3	Sea transportation	165	15,6%	174	15,7%	98	10,2%
4	Brokerage services	576	54,4%	603	54,6%	612	63,9%
	Total	1059	100,0%	1105	100,0%	957	100,0%

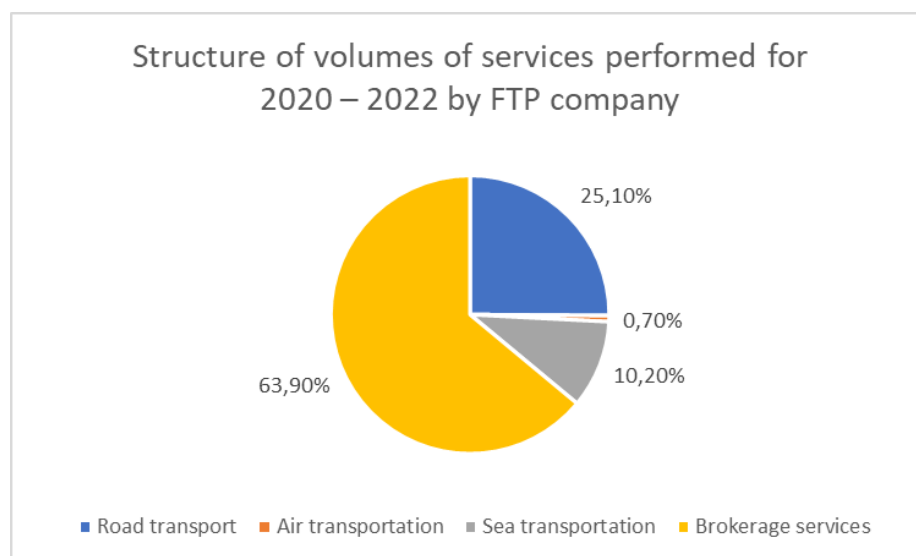


Figure 2.5 - Structure of volumes of services performed for 2020 – 2022 by FTP company

In accordance with Table 2.2, the biggest share of performed services is referred to Brokerage services. Within last three years it constantly increasing and has share more that 54%. The smallest share has Air transportation services that was more than 3% in 2020 and 2021 and is less than 1% in 2022.

Table 2.3 - The main financial results of the logistics company «FTP» for 2020-2022, thousand UAH

№	Type of service	Indicator	Years		
			2020	2021	2022
1	Freight forwarding services	Gross income	438,4	455,69	313,17
		Gross costs	393,3	408,78	280,94
		Net profit	45,1	46,905	32,236
2	Brokerage services	Gross income	1051,3	1100,5	1117
		Gross costs	519,5	543,85	551,97
		Net profit	531,8	556,7	565,01
3	Total	Gross income	1489,7	1556,2	1430,1
		Gross costs	912,8	952,63	832,9
		Net profit	576,9	603,6	597,24

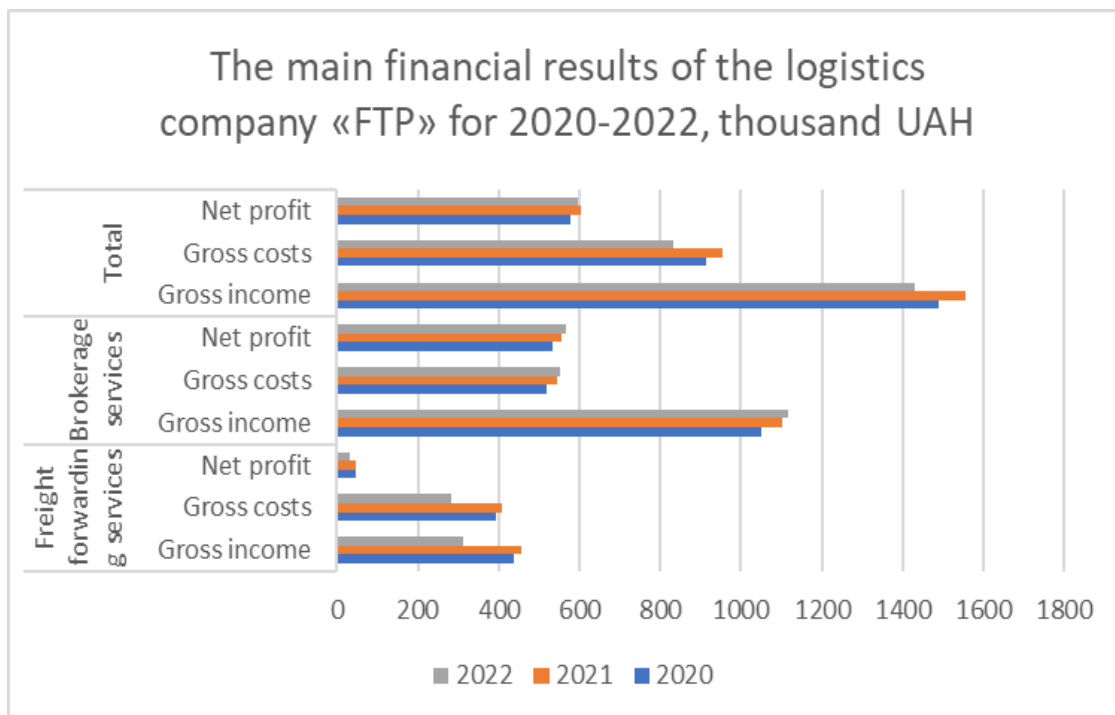


Figure 2.6 - The main financial results of the logistics company «FTP» for 2020-2022, thousand UAH

As shown in the Table 2.3 the biggest net profit is generated by Brokerage services. For the last three years net profit in this type of services constantly increasing.

Net income of freight forwarding services decreased up to 32,24 thousand UAH, which caused the drop of total net profit of FTP company in 2022. However, the net income of the company in 2022 was still higher than in 2020, which means that company faced strong economy crisis and remained efficient.

Table 2.4 show financial indicators of FTP company for the period from 2020 to 2022.

According to the Table 2.4, all financial indicators got worth in 2022 compared to 2021 and 2020.

The strongest deviation in 2022 was in Non-current assets (-26,3%), Operating profit (-25,6%), Cash and cash equivalent (-18,5%) and Current liabilities (10,5%).

Table 2.4 – Initial financial data of FTP company for period 2020 – 2022, thousand UAH

Indicator	2020	2021	2022	Deviation		Deviation	
				2020/2021	2021/2022	2020/2021	2021/2022
Current assets	21327,8	22415,4	20974,2	1087,6	5,1%	-1441,2	-6,4%
Non-current assets	665,9	817,3	602,4	151,4	22,7%	-214,9	-26,3%
Total assets	21993,7	23232,7	21576,6	1239	5,6%	-1656,1	-7,1%
Sales	13834,3	15348,3	14118,14	1514	10,9%	-1230,16	-8,0%
Operating profit	5864,6	7034,8	5237,1	1170,2	20,0%	-1797,7	-25,6%
Operating expenses	7228,2	7536,4	8109,2	308,2	4,3%	572,8	7,6%
Other expenses	38,1	42,3	45,7	4,2	11,0%	3,4	8,0%
Profit before taxes	703,4	734,8	726,14	31,4	4,5%	-8,66	-1,2%
Taxes	126,5	131,2	128,9	4,7	3,7%	-2,3	-1,8%
Net income	576,9	603,6	597,2	26,7	4,6%	-6,36	-1,1%
Cash and cash equivalent	4414,5	4875,1	3975,0	460,6	10,4%	-900,1	-18,5%
Current liabilities (short-term debt)	20288	23186,3	25624,1	2898,3	14,3%	2437,8	10,5%
Non-current liabilities	0	0	0	0	0,0%	0	0,0%
Equity	1705,7	1721,8	1846,3	16,1	0,9%	124,5	7,2%
Debt	11738,3	14582,5	15837,5	2844,2	24,2%	1255	8,6%

Non-current assets usually depreciate over time and their value reduces gradually on the balance sheet. There can be 3 reasons for a decrease in a non-current asset:

- it has been depreciated or amortized;
- the whole or part of the asset has been sold off;
- the whole or part of the asset has been written off. [25]

Two main reasons for a decline in operating profit are– either have decrease in sales or an increase in expenses. Based on the data, FTP company's decrease in operating profit in 2022 was caused due to both reasons. Sales decrease in 2022 by 8%, while Operating expenses increase by 7,6%.

Cash and cash equivalent statement shows how a company raised money (cash) and how it spent those funds during a given period. It's a tool that measures a company's ability to cover its expenses in the near term. [27]

In case of FTP company, the more cash available for business operations, the better. However, a low or negative cash flow in 2022 year is a result from unstable economy situation due to war in Ukraine. As with all financial analysis, it's important to determine the company's cash flow trend.

An increase in current liabilities means cash is not yet paid only expenses are recorded. Therefore, an increase in current liabilities causes an increased adjustment to the income.

An increase in the current liabilities from one period to the next means that FTP company is purchasing more goods or services on credit than it is paying off.

One of the best ways to evaluate business performance is to calculate financial ratios. There are the following indicators:

- Indicators of financial stability

The first ratio is Equity ratio. The equity ratio calculates the proportion of a company's total assets that were financed using capital provided by shareholders. The equity ratio, or "proprietary ratio", is used to determine the contribution from shareholders to fund a company's resources, i.e. the assets belonging to the company.

The formula for Equity ratio (2.1) is the following:

$$\text{Equity Ratio} = \frac{\text{Total Equity}}{\text{Total Assets}} \quad (2.1)$$

Equity ratio of FTP increased in 2022 (0,086). This is a high indicator for company and has a positive impact. A high equity ratio is a strong indication that the company is managing its assets effectively and will have an easier time paying off its debts promptly.

The next ratio is Debt to equity ratio. The debt-to-equity ratio shows how much of a company is owned by creditors (people it has borrowed money from) compared with how much shareholder equity is held by the company.

The formula for Debt to equity (2.2) ratio is the following:

$$\text{Debt to Equity Ratio} = \frac{\text{Total Liabilities}}{\text{Total Equity}} \quad (2.2)$$

Debt to equity ratio of FTP increased in 2022 (13,879). It is a negative trend. A high debt-to-equity ratio indicates that a company is borrowing more capital from the market to fund its operations.

The last ratio is Debt ratio. A debt ratio measures the amount of leverage used by a company in terms of total debt to total assets.

The formula for Debt ratio (2.3) is the following:

$$\text{Debt Ratio} = \frac{\text{Total Liabilities}}{\text{Total Assets}} \quad (2.3)$$

Debt ratio of FTP increased in 2022 (1,188). It is a negative trend. A high risk level, with a high debt ratio, means that the business has taken on a large amount of risk.

#### - Indicators of liquidity

The first ratio is Cash ratio. The cash ratio compares a company's most liquid assets to its current liabilities. The ratio is used to determine whether a business can meet its short-term obligations - in effect, whether it has sufficient liquidity to stay in business.

The formula for Cash ratio (2.4) is the following:

$$\text{Cash Ratio} = \frac{\text{Cash} + \text{Cash Equivalents}}{\text{Total Current Liabilities}} \quad (2.4)$$

Cash ratio of FTP decreased in 2022 (0,155). It is a negative trend. A cash ratio lower than 1 does sometimes indicate that a company is at risk of having financial difficulty.

The next ration is Accounts payable to receivable ratio. This ratio measures how quickly a business makes payments to creditors and suppliers that extend lines of credit.

The formula for Accounts payable to receivable ratio (2.5) is the following:

$$\text{Accounts payable to receivable Ratio} = \frac{\text{Credit Purchases}}{\text{Account Payable}} \quad (2.5)$$

Accounts payable to receivable ratio of FTP decreased in 2022 (1,395). It is a negative trend. A low ratio indicates slow payment to suppliers for purchases on credit. This may be due to favorable credit terms, or it may signal cash flow problems and hence, a worsening financial condition.

- Indicators of business activity

The first indicator is Total Asset Turnover. The asset turnover ratio, also known as the total asset turnover ratio, measures the efficiency with which a company uses its assets to produce sales.

The formula for Total Asset Turnover (2.6) is the following:

$$\text{Asset Turnover Ratio} = \frac{\text{Net Sales}}{\text{Total Assets}} \quad (2.6)$$

Total Asset Turnover of FTP decreased in 2022 (0,654). It is a negative trend. A low asset turnover ratio indicates that a company is not using its resources productively and may be experiencing internal struggles.

The next indicator is Receivable Turnover. The accounts receivable turnover ratio is a simple metric that is used to measure how effective a business is at collecting debt and extending credit.

The formula for Receivable Turnover (2.7) is the following:

$$\text{Receivable Turnover} = \frac{\text{Net credit sales}}{\text{Average Accounts Receivable}} \quad (2.7)$$



Receivable Turnover of FTP increased in 2022 (0,083). It is a positive trend. A high receivables turnover ratio can indicate that a company's collection of accounts receivable is efficient and that it has a high proportion of quality customers who pay their debts quickly.

- Indicators for assessing the balance sheet structure

The first indicator is Current ratio. The current ratio is a liquidity ratio that measures a company's ability to pay short-term obligations or those due within one year. It tells investors and analysts how a company can maximize the current assets on its balance sheet to satisfy its current debt and other payables.

The formula for Current ratio (2.8) is the following:

$$\text{Current Ratio} = \frac{\text{Current Assets}}{\text{Current Liabilities}} \quad (2.8)$$

Current ratio of FTP decreased in 2022 (0,819). It is a negative trend. It means company will have a difficult time paying their immediate debts and liabilities. In general, a current ratio of 2 or higher is considered good, and anything lower than 2 is a cause for concern.

The next indicator is The Equity to Total Debt ratio. The Equity to Total Debt ratio shows how much debt a company has compared to its assets. It is found by dividing a company's total debt by total shareholder equity. A higher The Equity to Total Debt ratio means the company may have a harder time covering its liabilities.

The formula for The Equity to Total Debt ratio (2.9) is the following:

$$\text{Debt to Equity Ratio} = \frac{\text{Total Debt}}{\text{Total Shareholders Equity}} \quad (2.9)$$

The Equity to Total Debt of FTP decreased in 2022 (0,072). It is a negative trend. A low The Equity to Total Debt ratio signifies a higher amount of debt financing through lenders as opposed to equity funding from shareholders.

- Indicators of profitability

The first indicator EBITDA Margin. EBITDA margin is a profitability ratio that measures how much in earnings a company is generating before interest, taxes, depreciation, and amortization, as a percentage of revenue.

EBITDA Margin formula (2.10) is the following:

$$EBITDA\ Margin = \frac{EBITDA}{Total\ sales} * 100 \quad (2.10)$$

EBITDA Margin of FTP decreased in 2022 (0,246). It is a negative trend. A low EBITDA margin indicates that a business has profitability problems as well as issues with cash flow.

The second indicator is Return on Equity. Return on equity (ROE) is a measure of financial performance calculated by dividing net income by shareholders' equity. ROE is considered a gauge of a corporation's profitability and how efficient it is in generating profits.

Return on Equity formula (2.11) is the following:

$$Return\ on\ Equity\ Ratio = \frac{Net\ Income}{Shareholder's\ Equity} \quad (2.11)$$

Return on Equity of FTP decreased in 2022 (0,323). It is a negative trend. It indicates that the company did not use the capital efficiently invested by the shareholders.

The last indicator is Return on Assets. Return on assets (ROA) measures how efficient a company's management is in generating profit from their total assets on their balance sheet. ROA is shown as a percentage, and the higher the number, the more efficient a company's management is at managing its balance sheet to generate profits.

Return on Assets formula (2.12) is the following:

$$Return\ on\ Assets\ Ratio = \frac{Net\ Income}{Average\ total\ assets} \quad (2.12)$$

Return on Assets of FTP decreased in 2022 (8,769). A low return on assets could mean that the company is not making good use of its assets. It may also indicate that the company is not profitable. This could be a sign that the company is in trouble and needs to make changes.

All results of calculations of financial ratios are shown in the Table 2.5.

Table 2.5 – Financial ratios of FTP company

					Value for 2020	Value s for 2021	Value s for 2022	Deviati on 2020/ 2021	Deviati on 2021/ 2022
	Risk zone	Dang er zone	Stabilit y zone	Well- being zone					
<b>1. Indicators of financial stability</b>									
Equity ratio	Less than 0,5	0,5- 0,65	0,65- 0,8	higher 0,8	0,078	0,074	0,086	-0,003	0,011
Debt to equity ratio	high er 2,0	2,0- 1,5	1,5-1,0	Less than 1,0	11,89 4	13,46 6	13,87 9	1,572	0,412
Debt ratio	high er 0,8	0,8- 0,7	0,7 -0,5	Less than 0,5	0,922	0,998	1,188	0,076	0,190
<b>2. Indicators of liquidity</b>									
Cash ratio	Less than 0,1	0,1- 0,15	0,15 - 0,2	higher 0,2	0,218	0,210	0,155	-0,007	-0,055
Accounts payable to receivable ratio	high er 2,0	2,-1,5	1,5-1,3	Less than 1,3	1,258	1,469	1,395	0,211	-0,074
<b>3. Indicators of business activity</b>									
Total Asset Turnover	Less than 0,4	0,4- 0,6	0,6-0,8	higher 0,8	0,629	0,661	0,654	0,032	-0,006

The end of the Table 2.5

Receivable Turnover	higher 0,15	0,15- 0,1	0,1- 0,05	Less than 0,05	0,052	0,046	0,083	-0,006	0,037
<b>4. Indicators for assessing the balance sheet structure</b>									
Current ratio	Less than 2,0	2,0- 2,2	2,2-2,4	higher 2,4	1,051	0,967	0,819	-0,085	-0,148
The Equity to Total Debt ratio	Less than 0,8	0,8- 1,0	1,0-1,5	higher 1,5	0,084	0,074	0,072	-0,010	-0,002
<b>5. Indicators of profitability.</b>									
EBITDA Margin	Less than 0,15	0,15- 0,2	0,2- 0,25	higher 0,25	0,271	0,307	0,246	0,036	-0,061
Return on Equity	Less than 0,07	0,07- 0,1	0,1- 0,15	higher 0,15	0,338	0,351	0,323	0,012	-0,027
Return on Assets	Less than 0,2	0,2- 0,4	0,4-0,8	higher 0,8	10,16 6	11,65 5	8,769	1,489	-2,886

### **2.3 Comprehensive analysis of the organization of logistics business processes**

The organization of logistics business processes involves the systematic management and coordination of various activities related to the movement of goods and services. This typically includes activities such as procurement, transportation, warehousing, inventory management, order fulfillment, and distribution. The

organization of these processes aims to optimize efficiency, minimize costs, and ensure timely delivery to customers. It often involves the use of technology, such as supply chain management systems, to streamline operations and improve overall performance.

To identify "problem" areas in logistics business processes, there are the following steps:

1. **Gather data:** Collect relevant information about logistics processes, including key performance indicators (KPIs), customer feedback, and operational metrics. This data will serve as a baseline for analysis.

2. **Analyze performance:** Evaluate the collected data to identify any patterns or trends that indicate areas of concern. Look for discrepancies, bottlenecks, delays, errors, or inefficiencies in the logistics processes.

3. **Conduct process mapping:** Create a visual representation of logistics processes, mapping out each step from start to finish. This will help identify potential areas where problems may arise.

4. **Engage stakeholders:** Involve key stakeholders, such as employees, managers, and customers, in the identification process. Seek their input and insights on areas that may need improvement or are causing issues.

5. **Perform root cause analysis:** Dig deeper into the identified problem areas to determine the underlying causes. Use techniques like the 5 Whys or fishbone diagrams to identify the root causes of the problems.

6. **Prioritize and set goals:** Prioritize the problem areas based on their impact on overall logistics performance and customer satisfaction. Set specific goals and targets for improvement in each identified area.

7. **Implement solutions:** Develop and implement action plans to address the identified problem areas. This may involve process redesign, technology implementation, training programs, or changes in supplier relationships.

8. **Monitor and measure:** Continuously monitor the performance of the logistics processes after implementing the solutions. Measure the impact of the changes made and track progress towards the set goals.

9. Continuous improvement: Foster a culture of continuous improvement within the logistics organization. Encourage feedback, regularly review and update processes, and seek innovative solutions to further enhance efficiency and effectiveness.

By following these steps, company can effectively identify and address problem areas in their logistics business processes, leading to improved performance and customer satisfaction. [28]

One of the main services provided by FTP company is ocean transportation. Company works with multiple biggest ocean carriers in the world.

As shown in the Fig. 2.7 the level of partnership interaction of the FTP with sea lines, the biggest share has Maersk (30%), Yang Ming (25%) and Hapag-Lloyd (20%)

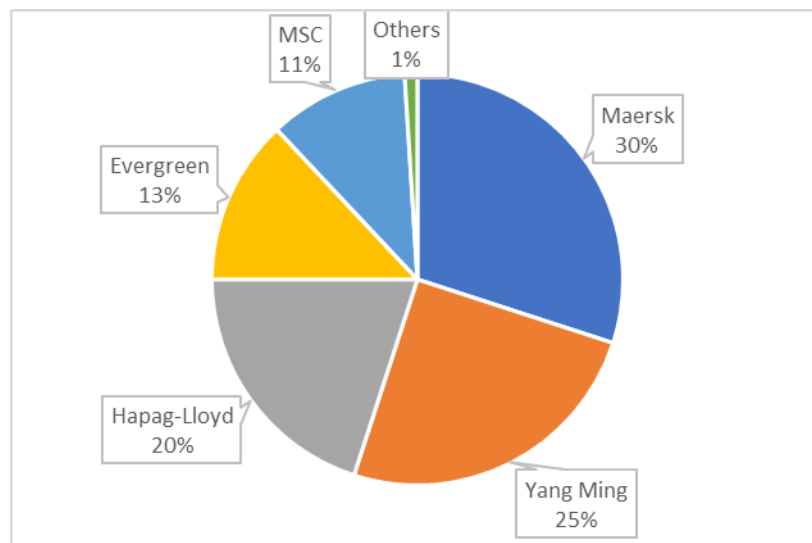


Figure 2.7 - Share of partnership interaction between FTP company and Ocean carriers in 2022

There are several potential problems that can arise in ocean transportation processes. Some common challenges include:

1. Delays: Delays in ocean transportation can occur due to various reasons such as adverse weather conditions, port congestion, labor strikes, or mechanical failures. These delays can disrupt supply chains and impact delivery schedules.

2. Container damage or loss: Containers used for ocean transportation can be subject to damage or loss during handling, loading, unloading, or due to accidents at sea. This can result in financial losses and delays in the delivery of goods.

3. Customs and regulatory issues: Compliance with customs regulations and documentation requirements can be complex and time-consuming. Errors or delays in customs clearance processes can lead to additional costs, fines, or even the seizure of goods.

4. Security risks: Ocean transportation is vulnerable to security threats such as piracy, smuggling, or terrorism. These risks can impact the safety of cargo and personnel, leading to potential losses or disruptions.

5. Inefficient logistics and coordination: Poor coordination among various stakeholders involved in ocean transportation, including shippers, carriers, freight forwarders, and customs authorities, can lead to inefficiencies, miscommunication, and delays in the overall process.

6. Cost fluctuations: Fluctuations in fuel prices, currency exchange rates, or regulatory fees can impact the overall cost of ocean transportation. These cost variations can affect budgeting and profitability for businesses.

Addressing these challenges requires effective planning, risk management strategies, clear communication, and collaboration among all parties involved in the ocean transportation process. [34]

Thanks to continuous digitalization in the world, FTP company has possibility to improve their ocean freight services.

The digital economy brings several positive impacts to ocean logistics.

Digital technologies enable automation, real-time tracking, and data analytics, leading to improved efficiency in ocean logistics operations. This includes optimized route planning, streamlined documentation processes, and better coordination among stakeholders, resulting in faster and more reliable shipments.

Digitalization reduces manual paperwork, eliminates redundant processes, and minimizes errors, leading to cost savings in ocean logistics. Automation and digitized documentation also reduce administrative expenses and improve resource allocation.

Digital platforms provide real-time visibility into the movement of goods, allowing stakeholders to track shipments, monitor inventory levels, and anticipate potential disruptions. This transparency enhances trust and collaboration among supply chain partners, leading to smoother operations and better customer service.

The digital economy generates vast amounts of data, which can be leveraged to gain valuable insights and make informed decisions in ocean logistics. Data analytics can optimize shipping routes, predict demand patterns, and identify areas for process improvement, ultimately enhancing overall performance and customer satisfaction.

Digital technologies enable the implementation of sustainable practices in ocean logistics. For example, smart container tracking systems can optimize container utilization, reducing empty container movements and minimizing carbon emissions. Additionally, digital platforms facilitate the sharing of data and resources, enabling collaborative initiatives for greener and more efficient supply chains.

Overall, the digital economy brings numerous benefits to ocean logistics, including increased efficiency, cost reduction, improved visibility, data-driven decision making, and the promotion of sustainable practices.

Bottlenecks in the management of supply chains involving ocean transport can occur at various stages and can impact the efficiency and effectiveness of the overall process. Some common bottlenecks include:

1. **Port Congestion:** Delays can occur due to congestion at ports, where a high volume of containers and vessels leads to limited berthing space and longer waiting times for loading and unloading.

2. **Customs Clearance:** Lengthy customs clearance procedures and documentation requirements can cause delays in the movement of goods through ports, leading to bottlenecks in the supply chain.

3. **Infrastructure Limitations:** Insufficient infrastructure, such as inadequate port facilities, road networks, or rail connections, can create bottlenecks and hinder the smooth flow of goods.



4. Container Availability: Shortages of containers or imbalances in container supply and demand can lead to delays in cargo shipments and disrupt the supply chain.

5. Weather and Natural Disasters: Adverse weather conditions, such as storms or hurricanes, can disrupt maritime operations, causing delays and bottlenecks in the supply chain.

6. Communication and Information Sharing: Inefficient communication and information sharing among stakeholders, including shipping lines, freight forwarders, and customs authorities, can lead to delays and coordination issues.

To mitigate these bottlenecks, proactive measures can be taken, such as improving port infrastructure, implementing efficient customs clearance processes, enhancing communication and collaboration among stakeholders, and utilizing technology solutions for real-time tracking and visibility of cargo movements.

For FTP company looking to improve ocean transportation, it would be recommend considering implementation of the blockchain systems.

Blockchain technology has the potential to significantly improve the management of supply chains involving maritime transport in the digital economy.

Blockchain provides a decentralized and immutable ledger that can record and verify transactions in real-time. This transparency helps to eliminate information asymmetry and enables all stakeholders in the supply chain, including shippers, carriers, and port authorities, to have access to the same trusted information. This can lead to improved visibility and traceability of goods throughout the supply chain.

Blockchain's cryptographic features ensure the integrity and security of data. By using blockchain, supply chain participants can securely share and store sensitive information, such as bills of lading, customs documents, and certificates of origin. This reduces the risk of fraud, tampering, and unauthorized access, enhancing the overall security of the supply chain.

Maritime supply chains involve a significant amount of paperwork and documentation. Blockchain can streamline these processes by digitizing and automating the creation, verification, and transfer of documents. Smart contracts,

built on blockchain, can automatically execute predefined actions when certain conditions are met, reducing manual intervention and improving efficiency.

Disputes and discrepancies often arise in maritime supply chains, leading to delays and additional costs. Blockchain's transparent and auditable nature can facilitate faster and more accurate dispute resolution. All relevant information and transaction history are recorded on the blockchain, making it easier to identify and resolve issues.

Blockchain enables secure and direct peer-to-peer interactions between supply chain participants, fostering trust and collaboration. Smart contracts can automate and enforce agreed-upon terms and conditions, reducing the need for intermediaries and improving overall efficiency.

Overall, blockchain technology has the potential to revolutionize the management of supply chains involving maritime transport in the digital economy by enhancing transparency, security, efficiency, and collaboration among stakeholders.

## **Chapter 2 summary**

The analytical section was devoted to a general diagnosis of the FTP logistics company, which consisted of researching the company's range of services and the history of the company's development, as well as an analysis of the company's market share in comparison with its leading competitors and identified products for which FTP managers provide logistics supply chains. This analysis proved that the company, which has been on the market for ten years, is developing rapidly, having started its activities only with an office in Kyiv and Odesa with a few people, already in 2016 it opened an office in Poland, today it has a significant network of reliable agents that provide services for consulting on issues of foreign trade, as well as in the future and the transport and forwarding service at the highest level. The company's latest achievement was membership in the Association of Independent Freight

Forwarders (WCA), which confirms the high quality of forwarding services and allows you to use the services of the best carriers at the best rates around the world.

In general, FTP services can be divided into four large blocks, which include customs, transport, contract and financial logistics, and which ensure the formation of a complete product supply chain from the selection of a supplier to the delivery of this product "to the customer's door".

FTP statistics show that the most demanded service for many years remains the provision of customs brokerage services, while at the same time, the direction of intermodal transportation is also developing, as well as client consulting services regarding customs clearance in certain markets. In most cases, the FTP is addressed by importer clients, while the largest serviced product flows come from China, Germany and Poland.

Regarding the financial condition, it should be noted that due to an aggressive marketing campaign to increase market share, as well as the expansion of the range of services, the company has a financial condition that is caused by some financial risks from the side of low profitability and low indicators of financial stability, but the overall picture allows us to say that the company is more or less financially stable.

Based on the analysis of partnership interaction of the FTP with sea lines, the biggest share has Maersk, Yang Ming and Hapag-Lloyd. It was defined, that during work with ocean carriers, multiple common problems appear: Delays, Container damage or loss, Customs and regulatory issues, Security risks, Inefficient logistics and coordination, Cost fluctuations.

In order to develop and minimize all bottlenecks that appears in maritime services, it is proposed to FTP company to implement blockchain system.

## **CHAPTER 3**

### **DEVELOPMENT OF PROJECT PROPOSALS FOR THE IMPLEMENTATION OF MODERN DIGITAL SOLUTIONS IN SUPPLY CHAINS INVOLVING MARINE TRANSPORT**

#### **3.1 Theoretical foundation of proposal project as way of solution of the bottlenecks in sea (maritime) transport supply chain**

Implementing blockchain systems into a logistics company can bring numerous benefits and enhance operational efficiency. Blockchain technology, known for its decentralized and transparent nature, can revolutionize the logistics industry by providing secure and immutable records of transactions and shipments.

By integrating blockchain into logistics processes, companies can streamline supply chain management, improve traceability, and enhance trust among stakeholders. Blockchain's distributed ledger allows for real-time tracking of goods, reducing the risk of fraud, theft, and counterfeit products. Additionally, smart contracts can automate and enforce agreements between different parties, ensuring timely payments and reducing administrative burdens.

Implementing blockchain systems in logistics requires careful planning and collaboration with industry partners. It involves identifying pain points within the existing logistics infrastructure and designing blockchain solutions to address them. Companies should also consider factors such as scalability, interoperability, and data privacy when selecting a blockchain platform.

Successful implementation of blockchain in logistics can lead to increased transparency, reduced costs, and improved customer satisfaction. However, it is important to note that blockchain technology is not a one-size-fits-all solution and should be evaluated based on the specific needs and requirements of the logistics company.

According to FTP data for 2022, company faced with the following bottle necks in ocean freight: Communication and Information Sharing, Container Availability, Customs Clearance, Delays occur due to congestion at ports.

Implementing of block chain systems can help FTP company in streamlining their transportation processes as well as reducing cost that occurs during delays.

As shown in the Table 3.1 and Fig. 3.1 the number of ocean freight services that was delayed is quite high. In 2020 the delayed services in ocean freight was 47% from total ocean services provided that year. In 2021 the delayed services in ocean freight was 52% from total ocean services provided that year. In 2022 the delayed services in ocean freight was 43% from total ocean services provided that year.

Table 3.1 – Numbers of delays in Ocean freight in FTP company in 2020 - 2022

Reasons of the delay	2020		2021		2022	
	Delayed ocean freight	%	Delayed ocean freight	%	Delayed ocean freight	%
Communication and Information Sharing	21	26,9%	34	37,4%	17	40,5%
Container Availability	11	14,1%	4	4,4%	2	4,8%
Customs Clearance	29	37,2%	34	37,4%	16	38,1%
Delays occur due to congestion at ports	17	21,8%	19	20,9%	7	16,7%
Total delayed services	78	47%	91	52%	42	43%
Total services provided by ocean freight carriers	165	100%	174	100%	98	100%

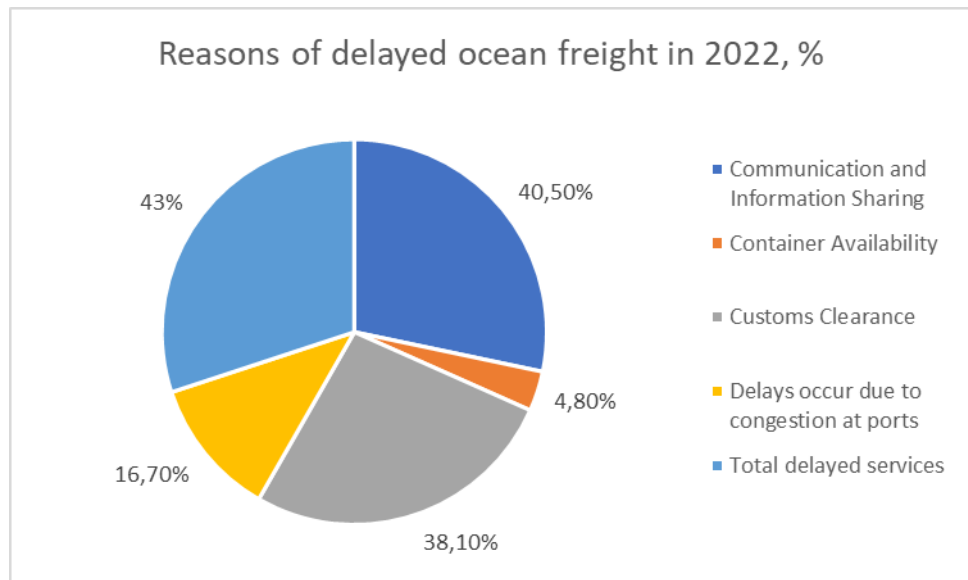


Figure 3.1 - Reasons of delayed ocean freight in 2022, %

In accordance with Table 3.1 the biggest share of the reasons that caused delays in ocean freight in FTP company is Communication and Information Sharing, which is constantly increase every year in the period of 2020 – 2022. Another main reason that caused delays was Customs clearance, the share of which remains in the same level – around 37-38% from total reasons of delays.

Inefficient communication and information sharing between ocean carriers and freight forwarders can lead to various challenges and disruptions in the logistics process.

Reliance on manual documentation and paper-based communication can result in delays, errors, and miscommunication. This can lead to inefficiencies in coordinating shipments, tracking cargo, and sharing critical information.

If ocean carriers and freight forwarders do not have access to real-time data and visibility into the status of shipments, it can lead to delays in decision-making, inefficient resource allocation, and difficulty in addressing issues promptly.

When different parties involved in the logistics process, using of separate systems or databases that do not seamlessly integrate, it can hinder effective communication and information sharing. This fragmentation can result in data inconsistencies, duplication of efforts, and delays in accessing and sharing relevant information.

Inefficient communication practices can hinder effective collaboration and coordination between ocean carriers and freight forwarders. Lack of timely updates, failure to share critical information, and inadequate coordination can lead to delays, errors, and increased costs.

In a global logistics environment, language and cultural differences can pose challenges to effective communication and information sharing. Misinterpretation of instructions, misunderstandings, and miscommunication can occur, leading to inefficiencies and errors.

Blockchain technology has the potential to significantly reduce inefficient communication and information sharing in ocean transportation. By leveraging its decentralized and transparent nature, blockchain can address several challenges faced by the industry, such as lack of trust, data silos, and manual processes.

One key benefit of blockchain in ocean transportation is the ability to create a single, shared source of truth for all stakeholders involved. Traditionally, information exchange in the industry involves multiple parties, including shipping lines, freight forwarders, customs authorities, and port operators. This fragmented communication often leads to delays, errors, and disputes.

With blockchain, all relevant information, such as shipping documents, customs declarations, and cargo tracking data, can be securely stored and shared on a distributed ledger. This eliminates the need for intermediaries and allows for real-time access to accurate and up-to-date information by all authorized participants. As a result, communication becomes more efficient, reducing delays and improving overall operational performance.

Furthermore, blockchain's immutability ensures that once information is recorded on the blockchain, it cannot be altered or tampered with. This enhances trust among stakeholders and reduces the risk of fraudulent activities. Smart contracts, a feature of blockchain technology, can automate and enforce contractual agreements, ensuring that all parties involved adhere to predefined rules and conditions.

By streamlining communication and information sharing, blockchain can also enable better coordination and collaboration among different entities in the ocean

transportation ecosystem. This can lead to improved visibility, optimized routing, and more effective resource allocation.

In summary, blockchain technology has the potential to revolutionize communication and information sharing in ocean transportation by providing a secure, transparent, and efficient platform for data exchange. By eliminating intermediaries, reducing delays, and enhancing trust, blockchain can significantly improve the overall efficiency and effectiveness of the industry.

There are several factors that can cause delays in customs clearance during ocean transportation.

Incorrect or incomplete paperwork, such as missing or incorrect information on shipping documents, can lead to delays in customs clearance. It is crucial to ensure that all required documents, including bills of lading, commercial invoices, packing lists, and customs declarations, are accurate and complete.

Customs authorities may conduct random or targeted inspections on shipments to ensure compliance with regulations and detect any prohibited or illegal goods. If a shipment is selected for inspection, it can result in delays as the goods undergo thorough examination.

Non-compliance with customs regulations, such as incorrect classification of goods, improper valuation, or failure to meet import/export requirements, can lead to delays in customs clearance. It is essential to adhere to all relevant customs rules and regulations to avoid such delays.

During peak seasons or periods of high shipping volumes, customs clearance processes can experience delays due to the increased workload. The customs authorities may face a backlog of shipments, leading to longer processing times.

Errors or discrepancies in customs documentation, such as incorrect tariff codes or missing information, can result in delays. It is crucial to ensure that all customs-related documents are accurately completed to avoid any unnecessary hold-ups.



In cases where there are security concerns or suspicions regarding the shipment, customs authorities may subject it to additional scrutiny or require additional documentation, leading to delays in clearance.

To minimize delays in customs clearance, it is important to work closely with customs brokers or freight forwarders who have expertise in navigating customs procedures. Ensuring accurate and complete documentation, maintaining compliance with customs regulations, and staying informed about any changes in customs requirements can help mitigate potential delays in ocean transportation customs clearance.

Blockchain technology can play a significant role in reducing delays in customs clearance for ocean transportation. By leveraging its inherent features, blockchain can enhance transparency, streamline documentation processes, and improve collaboration among stakeholders involved in customs clearance.

One of the key challenges in customs clearance is the extensive paperwork and documentation required for verifying the origin, contents, and compliance of goods. With blockchain, all relevant information can be securely stored in a decentralized and immutable ledger. This eliminates the need for manual document verification, reducing delays caused by errors, fraud, or missing paperwork.

Blockchain can also facilitate real-time tracking and visibility of shipments throughout the supply chain. By integrating IoT devices and sensors, data such as location, temperature, and condition of goods can be recorded on the blockchain. This enables customs authorities to have access to accurate and up-to-date information, allowing for faster and more efficient clearance processes.

Moreover, blockchain's smart contract functionality can automate and enforce compliance rules and regulations. Customs clearance requirements can be encoded into smart contracts, ensuring that all necessary documentation and procedures are met before goods are released. This reduces the need for manual intervention and speeds up the clearance process.

Additionally, blockchain enables secure and trusted sharing of data among different stakeholders, including shipping companies, customs authorities, and

importers/exporters. This promotes collaboration and information exchange, leading to faster decision-making and resolution of any issues that may arise during customs clearance.

There are several Block chain systems that can be implemented by FTP company:

1. CargoX is a blockchain-based courier service that enables individuals to send digital documents worldwide within seconds. In direct competition with established courier companies like DHL, Fedex, and UPS, CargoX positions itself as an independent player in the industry. Since its establishment in January 2018, CargoX has utilized the Ethereum blockchain to facilitate the secure transfer of digital original documents. Initially focusing on global cargo and supply documents, the company has expanded its Blockchain Document Transmission System (BDTS) solution to include other sectors such as air cargo. The primary objective of CargoX is to provide a comprehensive, fast, secure, reliable, and cost-effective solution for document transmission. By leveraging smart contracts within the BDTS, CargoX ensures an auditable trail of all transmitted documents, confirming their authenticity and integrity. [26]

2. VeChain provides a distinct identification and digital passport for every vehicle, encompassing its entire lifespan. By utilizing blockchain technology to store authentication data, brands can evaluate the quality and legitimacy of car components. Furthermore, vehicle owners have the ability to grant data access permissions to third-party service providers, including car insurance companies and platforms for used car trading. [30]

3. dexFreight is an open logistics network for cargo companies. It uses smart contracts to manage supply from booking to payment in one place. Smart contracts help you find and quickly load the right truck for your cargo, share information, and create a network for collaboration. It provides carriers, brokers and shippers with the necessary tools and technology to process cargo more efficiently, increasing visibility and profitability while reducing cargo processing time. [29]

### **3.2 Descriptions of proposed blockchain systems**

The first blockchain system that is suggested to FTP company is CargoX.

CargoX is an internationally operating company that focuses on providing document transfer solutions through blockchain transactions and a title verification platform. The team behind CargoX consists of experienced professionals with a combined expertise of over 100 years in logistics, banking, programming, IT, and blockchain. The CargoX platform is highly adaptable and versatile, accommodating over 60 different document formats across various industries.

CargoX has formed a partnership with the Global Cargo Alliance (GCA), a secure business platform that brings together trusted and qualified independent freight forwarders. This collaboration aims to foster mutually beneficial business relationships and enable members to offer their services within a secure environment. GCA members can take advantage of the network services provided by fellow members who specialize in various cargo movements.

In the near future, GCA members will also have access to integrated features of the CargoX platform, which is based on the Blockchain Document Transaction System (BDTS). This will allow them to create, process, and transfer shipping documentation, including Smart B/Ls, certificates of origin, and other relevant documents. GCA has accumulated over 20 years of experience in networking among independent freight forwarders and has utilized its extensive knowledge of digital marketing to establish the successful GCA Network.[33]

Through their continuous market research and analysis of existing networks, they have successfully identified shortcomings and developed specific tools and advantages to enhance communication among global freight forwarders. This initiative aims to drive business expansion and facilitate market growth for their members.

Biju K. Easaw, CEO of Global Cargo Alliance Ltd., highlighted the importance of streamlined documentation processes in today's world and emphasized that the

CargoX platform offers an innovative online Smart BL solution to overcome traditional methods.

GCA invites independent freight forwarders to explore their unique differentiators and benefits, assuring them of the dedicated support from the experienced GCA team to foster business growth. The GCA Network operates with utmost integrity, honesty, and transparency, and they have no conflicting or competitive interests with their members. It is worth noting that they do not receive any financial commissions, profits, rebates, etc. from vendors or member partners, and all rebates are directly passed on to their members in the form of discounted pricing.

CargoX has an easy guide for setting up company's profile on their platform. Setting up a company account is a quick and straightforward process that only requires a few minutes of your time. This step needs to be completed only once for each company. In the event that a company already possesses a registered CargoX account, authorized coworkers can easily create accounts for their colleagues. It is possible for a company to have multiple user accounts associated with a single company account.

To begin with registration, company needs to visit the CargoX website and select the option "I want to register a new company." This will initiate the registration process. (Fig.3.2)

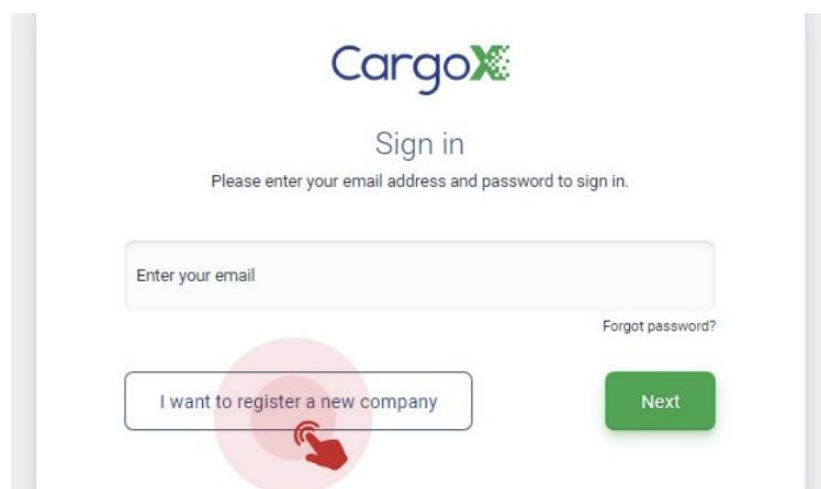


Figure 3.2 - 1<sup>st</sup> step of registration in CargoX platform

The next step is to input all the necessary and pertinent details related to company in the "Create a Company" window. Then, proceed to the next step by checking the designated checkbox to confirm your authorization to share company details. Once done, you need to click on the green "Next" button to proceed further. (Fig.3.3)

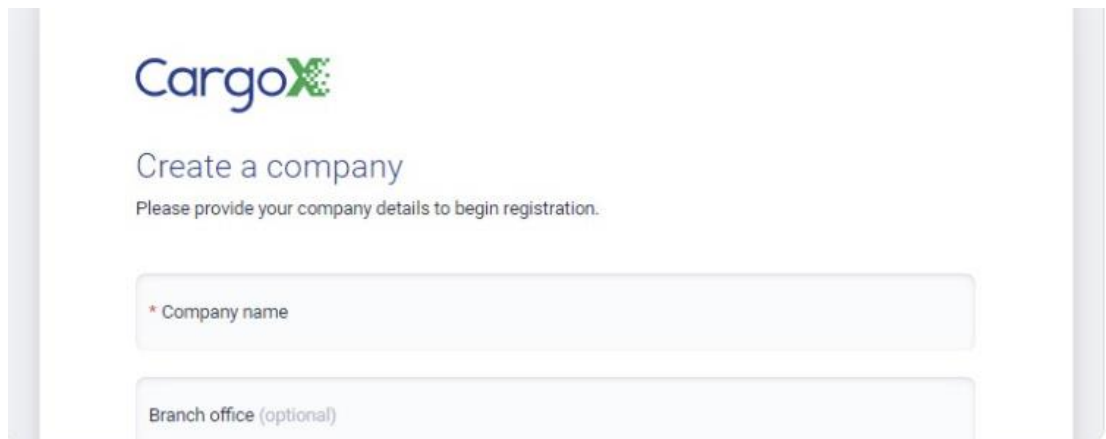
The screenshot shows the 'Create a company' registration form on the CargoX platform. At the top is the CargoX logo. Below it, the text reads 'Create a company' and 'Please provide your company details to begin registration.' There are two input fields: the first is labeled '\* Company name' and the second is labeled 'Branch office (optional)'. The form is presented within a light gray border.

Figure 3.3 - 2<sup>nd</sup> step of registration in CargoX platform

In the provided fields, you need to enter your personal details along with the user information that you will utilize to sign in to the CargoX Platform. To proceed, you need to select the checkbox to confirm your agreement with CargoX's conditions and pricing policy. Finally, click on the green "Verify email" button to proceed with the registration process. (Fig. 3.4)

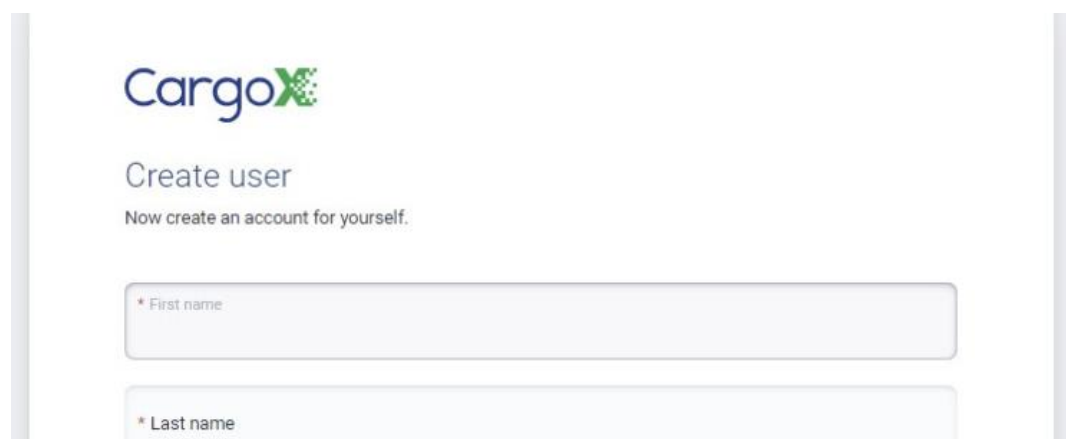
The screenshot shows the 'Create user' registration form on the CargoX platform. At the top is the CargoX logo. Below it, the text reads 'Create user' and 'Now create an account for yourself.' There are two input fields: the first is labeled '\* First name' and the second is labeled '\* Last name'. The form is presented within a light gray border.

Figure 3.4 – 3<sup>rd</sup> step of registration in CargoX platform

The last step is to check company's email inbox, copy/paste the verification code in the provided box on the CargoX registration site, and click on the green Complete registration button. (Fig.3.5)

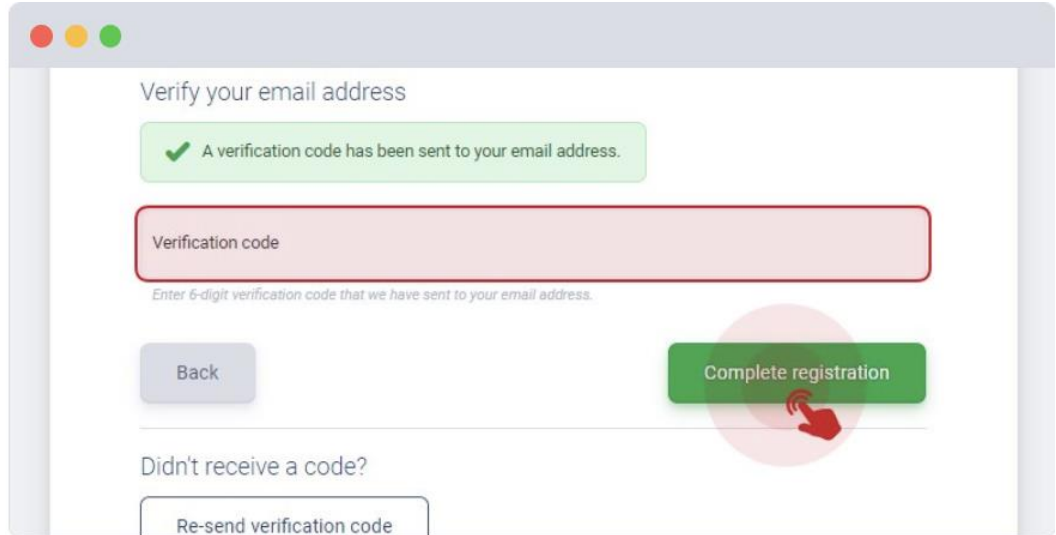


Figure 3.5 – 4<sup>th</sup> step of registration in CargoX platform

Also, company can get all information regarding CargoX Platform user interface. As shown in the Fig 3.6, it has the following sections:

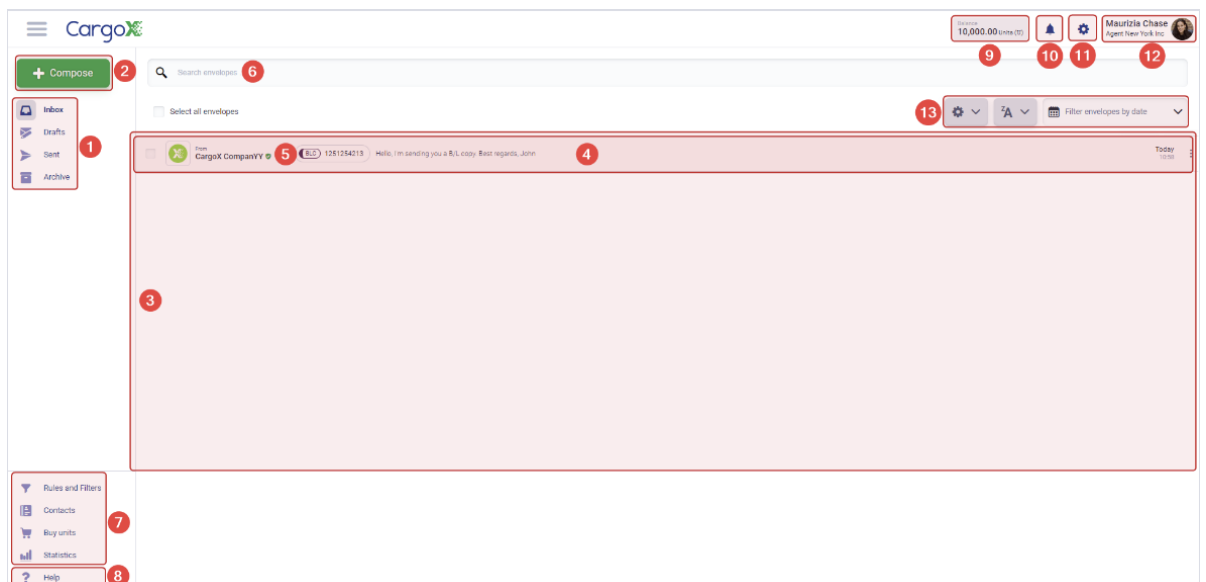


Figure 3.6 – Platform user interface

## 1. Menu list

Within the platform, you will find various folders that store your envelopes and their respective documents. Here is a breakdown of each folder:

- Inbox: This folder contains envelopes with documents that are currently in your possession. These documents are owned by you, and you have the ability to perform actions on them.

- Drafts: In the Drafts folder, you will find all the envelopes that you have initiated but have not yet completed. Whenever you are ready, you can resume working on these envelopes.

- Sent: The Sent folder stores envelopes that you have sent to companies you are connected with. Additionally, it includes envelopes sent to NAFEZA for Egypt ACI envelopes.

- Archive: Once you have finished working on envelopes and documents, you can move them to the Archive folder for storage and reference purposes.

- Incoming: The Incoming folder will appear when you have a pending incoming envelope. In such cases, you will need to manually confirm acceptance and cover any associated sending costs.

- Returned: Envelopes and documents that were not successfully delivered to the intended recipient are stored in the Returned folder.

These folders help you organize and manage your documents effectively within the platform.

## 2. Compose

By initiating this action, you will commence the process of creating a new envelope. This will enable you to send multiple documents to the intended recipient, accompanied by a personalized message. Additionally, you will have the ability to transfer ownership of the documents as needed.

## 3. Envelope list

The main section of the screen displays a list of envelopes within the currently selected folder. The selected folder is highlighted in blue. To view the specific details of an envelope, simply click on its corresponding entry.

#### 4. Envelope

Each item listed in the envelope list corresponds to an individual envelope. An envelope can be likened to an email message, as it comprises a message field and includes attached documents.

#### 5. Document

The circular icon within the envelope signifies the presence of attached documents. To view the specific details of a document, simply click on its corresponding entry.

#### 6. Search

You have the ability to swiftly locate any document by entering relevant search terms in the designated search field. To refine your search, you can utilize tags such as Sender, Document type, ACID number, and more. While the majority of documents are in unstructured PDF format, the search function also attempts to identify matching keywords within the content of these documents. For optimal results, it is recommended to utilize tags and manually enter metadata when uploading new documents.

#### 7. Shortcuts

In this section, you will find commonly used settings fields that are frequently utilized.

#### 8. Help

To access the Help page, simply click on the blue Help icon. This will provide you with access to our Help Center, release notes, support email, and live chat options.

#### 9. Account balance

The displayed number represents the available units (U) in your account. For a comprehensive summary of your units (U), click on the number to access detailed information.

#### 10. Notifications

The bell icon will show a red circle indicating the number of unread notifications. By clicking on the bell icon, you can access the notifications listing,



which displays various notifications such as received envelopes, new contacts, blockchain keys, and more. These notifications are interactive, allowing you to perform specific actions by clicking on them.

#### 11. Settings

You can find the general settings in this section. By opening it, you will be able to modify your personal information, blockchain keys, privacy and security settings, as well as notifications and preferences. These options are located under the personal section. Additionally, you can also manage company details, company verification, platform users, contacts, delegations, rules, and filters under the Company section. In the Billing section, you can handle all billing-related information, such as creating pro-formas, viewing invoices, configuring tax settings, and accessing company statistics. Furthermore, in the General tab, you can review the terms and conditions, finance and insurance details, and sign out of your CargoX profile.

#### 12. User and company details

This feature offers a convenient way to access your company profile and additional settings. By default, the image displayed will be your initials. However, once you upload a photo, it will be replaced with your actual face or another chosen avatar image.

#### 13. Workspace customization

You have the ability to personalize the appearance of the envelope and document view, as well as customize how the envelopes are sorted in the folder view.

All in all, CargoX has comfortable interface and it provides all details on how to use this system, in case if you have any issues. [42]

The next blockchain system that is considered as an option for FTP company is VeChain. VeChain is a blockchain platform that specializes in providing software solutions for businesses through smart contracts. Its notable offering is an enterprise supply chain product that enables the tracking and tracing of shipped goods. This functionality has found practical applications in various industries such as food and beverage, fashion, and automotive sectors. VeChain has successfully formed

partnerships with several prominent businesses, and its native cryptocurrency token, VET, ranks among the top 40 in terms of market capitalization.

VeChain has established partnerships with prominent businesses even before its mainnet launch, and it continues to foster relationships with various entities. Here are some notable collaborations involving VeChain:

- PricewaterhouseCoopers, a renowned accounting firm, has joined forces with VeChain to provide blockchain solutions to their clients.
- Walmart has been working with VeChain since 2019 to implement blockchain technology for tracking packaged meat, vegetables, and seafood.
- Several brands under LVMH Moët Hennessy Louis Vuitton have partnered with VeChain to leverage blockchain as a means to combat counterfeiting.
- BMW initiated a partnership with VeChain through the BMW Startup Garage Program, utilizing blockchain to store vehicle data securely.
- Groupe Renault, a French automaker, has collaborated with VeChain to develop a digital car maintenance book.

These partnerships highlight VeChain's growing presence and its application of blockchain technology across various industries.

VeChain operates on a blockchain platform, which is a decentralized and distributed ledger that securely records and stores transactions and data. While VeChain is based on Ethereum, it has been modified to incorporate unique features and functionalities specific to the VeChain platform. The VeChain blockchain utilizes a consensus algorithm called Proof of Authority (PoA), which is a variant of the Proof of Stake (PoS) algorithm. In the PoA algorithm, a group of trusted nodes known as Authority Masternodes are responsible for validating transactions and creating new blocks on the blockchain. These nodes are selected based on their reputation, expertise, and the amount of VET they hold, ensuring the network's security and integrity.

One notable feature of the VeChain blockchain is its support for smart contracts. Smart contracts are self-executing contracts that can automatically execute predefined actions when certain conditions are met. Within the VeChain ecosystem,

smart contracts enable the automation and streamlining of various business processes, including supply chain management, logistics, and product authentication.

VeChain offers a wide range of potential business applications, particularly in the areas of supply chain management and product authentication. Businesses can leverage VeChain's blockchain platform to effectively manage their supply chains by tracking and monitoring products in real time, from the sourcing of raw materials to the delivery of the final product. This enables improved transparency, reduced counterfeiting, and enhanced overall supply chain efficiency.

Additionally, VeChain's technology can be utilized to authenticate various products, including luxury goods, pharmaceuticals, and food items. By employing VeChain's blockchain for product tracking and authentication, businesses can mitigate the risk of counterfeiting and enhance consumer trust.

VeChain's blockchain platform offers secure and efficient data management capabilities for businesses. It enables the storage and management of various types of data, including supply chain information, customer data, and financial data. By utilizing VeChain's blockchain, businesses can ensure the integrity and security of their data, while also providing transparency and audibility.

In addition, VeChain's blockchain platform can be leveraged for quality control purposes. It allows businesses to track and monitor the quality of products throughout the supply chain, enabling early identification of any quality issues and facilitating timely actions to prevent them from impacting the final product.

Furthermore, VeChain can contribute to environmental sustainability efforts by tracking and monitoring the environmental impact of products throughout the supply chain. This empowers businesses to identify areas where they can reduce their environmental footprint and make more sustainable choices.

Overall, VeChain's blockchain platform presents a wide range of potential business applications, with a strong emphasis on supply chain management and product authentication. As the recognition of blockchain technology's benefits continues to grow, the potential uses of VeChain are expected to expand further.[22]

The last blockchain system that can be implemented by FTP company is dexFreight. dexFreight is a decentralized logistics platform that utilizes blockchain technology to enhance efficiency, transparency, and security in the supply chain industry. By integrating blockchain, smart contracts, IoT, and artificial intelligence with existing technologies and legacy systems, dexFreight offers a unique value proposition. The platform provides immutable identity and reputation, digitized transactions, tokenized payments, real-time peer-to-peer interaction, automated load and capacity matching, fraud prevention, and improved finance and insurance solutions.

dexFreight primarily serves third-party logistics providers, shippers, carriers, and other stakeholders in the supply chain. The technology behind dexFreight aims to reduce delivery times and costs, while unlocking capital from freight invoices, inventories, and underutilized assets like trucks and warehouses. The dexFreight marketplace will utilize this liquidity to provide affordable capital access to small and medium-sized businesses, particularly in emerging economies. The use of smart contracts ensures transparency and accountability, reducing counterparty disputes and associated costs. This digitization opens doors for innovative products and services that were previously unimaginable.

dexFreight caters to carriers (trucking companies), shippers, and freight brokers as its user base. Their primary objective in day-to-day operations is to expedite the shipment process. For brokers, this entails onboarding more carriers and negotiating with them to transport shipments. Shippers aim to swiftly deliver their products to customers, while carriers strive to keep their trucks active and avoid downtime.

In a typical spot market scenario, brokers and shippers engage in active negotiations to select carriers. They then proceed to onboard carriers by fulfilling necessary legal requirements, such as providing legal authority, insurance, W9 forms, and evaluating past performance information. Eventually, a "carrier-broker" or "shipper-carrier" agreement is executed, and a rate confirmation sheet is signed for each shipment. These documents outline the shipment's terms and conditions,

including origin, destination, equipment type, weight, pick-up and delivery times, agreed-upon rates, and more. Currently, these terms are primarily exchanged via email or fax, making enforcement challenging, especially considering the average transaction value of around \$1200.

dexFreight streamlines this process by reducing booking time for all parties involved while recording all terms and conditions in a smart contract. This smart contract is stored in Rootstock, a side chain of the Bitcoin network that utilizes hashing to secure and anchor transactions in the blockchain. Real-world events during the shipment lifecycle, such as proof of pick-up and delivery, are communicated to the smart contract through dexFreight's mobile app and other sources like electronic logging devices, GPS in trucks, telematics devices, and fleet management systems (FMS). These events trigger the execution of agreed-upon terms, such as payment immediately after delivery.

Invoice-less payments can significantly reduce costs and streamline processes for companies. According to the American Quality and Productivity Center, the median cost of processing invoices is 0.08% of revenue, amounting to \$5.83 per invoice across various industries. Other sources have even cited invoice processing costs as high as \$40. Traditionally, after a shipment is delivered, companies need to create and reconcile invoices with brokers or shippers, along with additional fees incurred during the shipment. However, with the implementation of smart contracts, the terms of the agreement and shipment information are stored, eliminating the need to wait for invoices from carriers. Instead, the smart contract can automatically trigger bank payments to the carrier. While the dexFreight platform generates electronic invoices for record-keeping purposes, the automated payment triggering saves significant time and resources for both parties involved.

To ensure the validity of contract components in a broker/shipper-carrier transaction, essential documents such as bill of lading and proof of deliveries are involved. dexFreight's mobile app enables drivers to gather this information, which is then hashed and added to Tierion. Tierion utilizes the Bitcoin infrastructure to securely anchor digital fingerprints of these documents. This process offers users a

guarantee that the contract is in existence and that the integrity of the documents remains intact, without any tampering.

dexFreight offers a cost-effective alternative to traditional freight invoice factoring, allowing carriers to swiftly convert their receivables into cash instead of waiting for payment from the broker/shipper. By simply requesting an advance against the invoice, carriers can benefit from significantly lower fees. In contrast, factoring companies typically charge an average of 3% for a 30-day invoice, along with additional fees for the advance.

In dexFreight, invoices are seamlessly transformed into non-fungible tokens (NFTs) with a single click. These NFTs serve as unique digital representations of the transaction, encompassing all relevant details. The NFT, which holds a defined value, is then utilized as collateral to access more affordable liquidity in the form of stable cryptocurrency from the decentralized finance ecosystem. This liquidity is seamlessly converted into the carrier's local currency to fulfill the requested amount.

The NFT's validity is fully supported by the dexFreight platform, as the shipment is processed within it and the smart contract captures cryptographic signatures from all involved parties, along with the milestones of the shipment lifecycle. This attests to the authenticity and integrity of the NFT. [44]

### **3.3 Development of a proposal to implement blockchain system to improve the process of maritime activity**

For the final evaluation and selection of the blockchain system, FTP company was asked to determine the importance of the indicators by which the final selection is made, namely, security, cost (USD) and easiness to use. Thus, the following ranks were given by the client for the selection criteria: for security - rank 1, cost (USD) - rank 2 and for easiness to use - rank 3, while the higher the rank, the less significant the indicator.

In the Table 3.2 summarize the initial data for blockchain system selection.

Table 3.2 - Initial data for blockchain system selection

Blockchain system	Security	Cost (USD)	Easiness to use
CargoX	1	450,00	3
VeChain	2	600,00	2
dexFreight	3	490,00	3

For analysis and selection, we use a comprehensive supplier assessment method, which consists of determining the best supplier taking into account the weight of each selected criterion and is carried out in five stages. [98,99]

So, at the first stage, the relay indicators are checked. In our case it is capability to use a blockchain system in Ukraine. All proposed blockchain system can be used in Ukraine.

The next stage is the calculation of weighting coefficients according to the formula (3.1)

$$W_i = \frac{2 \times (K - r + n)}{K \times (K + n)}, \quad (3.1)$$

Where:

$W_i$  - is the weight coefficient of the  $i$ -th indicator, and there is [1; K];

$K$  - is the total number of indicators taken into account when determining the integral evaluation (relay indicators are not taken into account), in our case, these are three indicators;

$r$  - is the rank value of the  $i$ -th indicator, and is [1; K];

$n$  - is the number of relay indicators, in our case one indicator is the presence of a certificate of the European model for conformity of products to European standards, which is submitted to such products.

The next step is to determine the desired extreme value for each indicator. In our case, minimization is the extreme value for all indicators. Therefore, for each indicator, the minimum value is chosen as a reference value and the quantitative criterion  $Z_j$  is calculated ( $j$  is  $[1; m]$ , where  $m$  is the number of suppliers) according to formula (3.2).

$$Z_j = \frac{K_{em}}{K_{\text{факт } j}}, \quad (3.2)$$

Where:

$K_{em}$  - is the reference value for this indicator;

$K_{\text{факт } j}$  - is the actual value for the  $j$ -th supplier

After that, the  $D_i$  score is calculated taking into account the  $W_i$  weighting factor according to the formula (3.3)

$$D_i = Z_j \times W_i. \quad (3.3)$$

Based on the obtained results, the integral estimate is found as the sum of the  $D_i$  estimates.[58]

All calculations are summarized in the table. 3.3 (calculations were made in MS Excel), where the integrated estimate is the largest for the CargoX blockchain system.

As shown in the previous table, Cargo X met two out three ideal values of analyzed indicators. It makes it the most suitable blockchain system that can be implemented by FTP company, to decrease appearance of any issues during maritime shipping processes.



Table 3.3 – Indicators for calculating the integrated assessment for blockchain systems

Blockchain system	Indicator	Security	Cost	Easiness to us	Integrated value
	<i>W<sub>i</sub></i>	0,5	0,333	0,167	
	<i>K<sub>em</sub></i>	1	450	2	
CargoX	<i>Z<sub>j</sub></i>	1	1	0,67	0,944
	<i>D<sub>i</sub></i>	0,5	0,333	0,111	
VeChain	<i>Z<sub>j</sub></i>	0,50	0,75	1,00	0,667
	<i>D<sub>i</sub></i>	0,250	0,250	0,167	
dexFreight	<i>Z<sub>j</sub></i>	0,33	0,92	0,67	0,584
	<i>D<sub>i</sub></i>	0,167	0,306	0,111	

To implement new blockchain system, FTP company will need to do investments: procurement of servers for databases, staff training, reconfiguration of the company's internal system, advisory services on implementation, system audit after 1 year of use. All expenses are shown in the Table 3.3 and Fig 3.7 below.

Table 3.4 – Annual cost of CargoX blockchain system implementation

№	Expenses	UAH
1	1 year subscription	16,500
2	Procurement of servers for databases	31,263
3	Staff training	5,000
4	Reconfiguration of the company's internal system	22,000
5	Advisory services on implementation	3,500
6	System audit after 1 year of use	5,500
7	Total expenses for 1 year	83,763

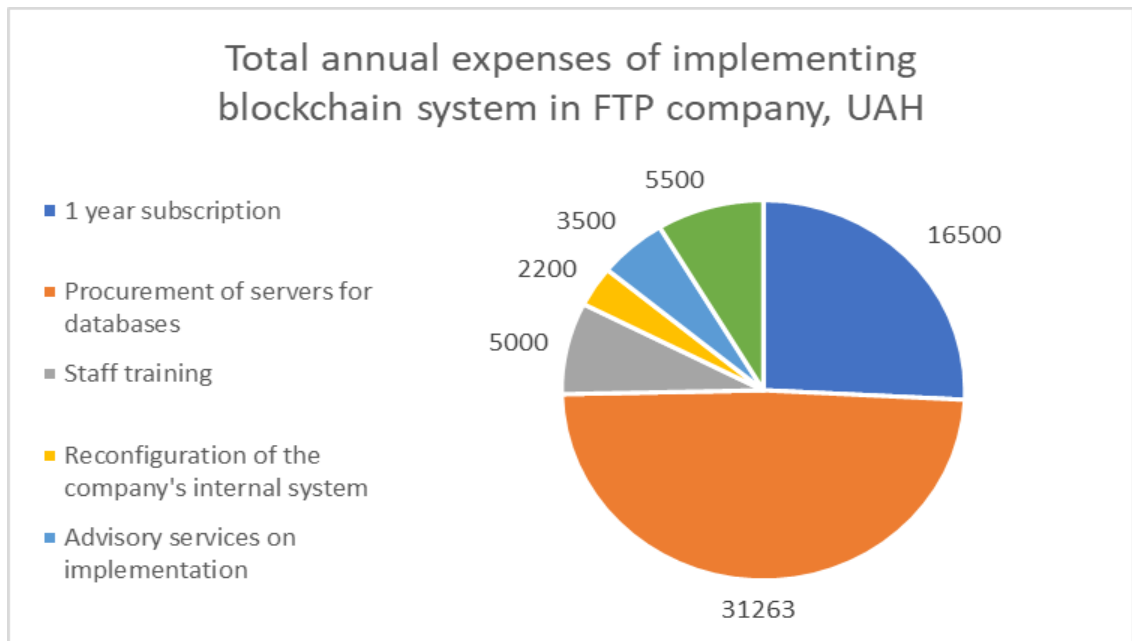


Figure 3.7 - Total annual expenses of implementing blockchain system in FTP company, UAH

On the basis of the above costs and benefits, we will conduct a justification of this project on the implementation of knowledge management in a logistics company, for this we will calculate the net present value (NPV), the internal rate of return (IRR) and the discounted payback period (DPP) according to formulas (3.4) - (3.6) ) [66-68]

$$NPV = \sum_{t=1}^n \frac{D_t - B_t}{(1+i)^t}, \quad (3.4)$$

Where:

$D_t$  – project benefits in period  $t$ ;

$B_t$  – costs for the project in period  $t$ ;

$i$  – discount rate;

$n$  - is the duration of the project.

$$IRR = A + \frac{a(B - A)}{(a - b)}, \quad (3.5)$$

Where:

A - is the value of the discount rate at which the NPV is positive;

B - is the value of the discount rate at which the NPV is negative;

a – value of positive NPV, at the value of the discount rate A;

b - is the value of the negative NPV, at the value of the discount rate B.

$$DPP = \sum_{t=1}^n \frac{I_t - B_t}{(1+i)^t} \geq I_0, \quad (3.6)$$

Where:

$I_0$  - is the initial investment in period zero

In order to implement a blockchain system, the company intends to invest a total of \$83,763. It is projected that the company will achieve 100% production capacity by the 5th year, with corresponding cash flows of \$18,000, \$22,900, \$26,100, \$37,100, and \$39,000. The discount rate for evaluating the investment project is 17%. To assess the project's viability, key financial metrics such as NPV (Net Present Value), PI (Profitability Index), DPP (Discounted Payback Period), and IRR (Internal Rate of Return) need to be calculated.

All calculations regarding the determination of the net present value are presented in the table. 3.5.

To determine the internal rate of return, it is necessary to determine the negative value of the net present value and the discount rate at the same time (Table 3.6).

Table 3.5 – Determination of the net present value of the knowledge management project at a discount rate of 17%, UAH.

Years	Cash Flow, UAH	Discount Factor: $1/(1+r)^n$	Present Value, UAH
1	18000	0,8547	15384,62
2	22900	0,7305	16728,76
3	26100	0,6244	16296,07
4	37100	0,5337	19798,42
5	39000	0,4561	17788,33
Present Value of Future Cash Flows, UAH			85996,20
Initial Investment, UAH			83763
NPV, UAH			2233,20

Table 3.6 – Determination of the net present value of the knowledge management project at a discount rate of 50%, UAH.

Years	Cash Flow, UAH	Discount Factor: $1/(1+r)^n$	Present Value, UAH
1	18000	0,6667	12000,00
2	22900	0,4444	10177,78
3	26100	0,2963	7733,33
4	37100	0,1975	7328,40
5	39000	0,1317	5135,80
Present Value of Future Cash Flows, UAH			42375,31
Initial Investment, UAH			50000
NPV, UAH			-41387,69

So, using the formula (3.5), we determine based on the data given in the table. 3.4 and 3.5, the internal rate of return, which will be 18%, respectively, this indicator indicates there is no possibility of increasing the discount rate if necessary, because under these conditions, the project is self-sustaining only with a discount rate of 18% (Fig. 3.8)



Figure 3.8 – Dependence of the net present value on the discount rate

The profitability index (PI) is a metric used to assess the attractiveness of a project or investment. It is determined by dividing the present value of anticipated future cash flows by the initial investment amount in the project.

$$PI = 85996,20/83763=1,03.$$

The discounted payback period is a financial evaluation method employed to assess the profitability of a project. It calculates the duration, in years, required to recover the initial investment by considering the time value of money through discounting future cash flows. This approach takes into account the fact that the value of money decreases over time and provides a more accurate measure of the project's break-even point.

$$DPP = 4+(83763-(15384,62+ 16728,76+16296,07+19798,42)) /$$

$$/ 17788,33 = 4,87 \text{ years} \approx 4 \text{ years } 10 \text{ months } 22 \text{ days}$$

The internal rate of return (IRR) is a financial metric utilized to assess the profitability of prospective investments. It represents the discount rate at which the net present value (NPV) of all cash flows becomes zero in a discounted cash flow analysis.

$$IRR=10,61\%$$

The acceptance of the CargoX implementation project is recommended based on the positive net present value (NPV) and a profitability index (PI) greater than 1.

The PI of 1.03 indicates that for every \$1 of initial investment, the FTP company can generate an additional \$0.03 in value. Additionally, the discounted payback period is determined to be 4 years and 10 months, which signifies the time it takes for the project's cumulative present value of cash flows to equal the initial investment cost.

### **Chapter 3 summary**

The integration of blockchain systems into a logistics company can yield a multitude of advantages, ultimately enhancing operational efficiency. By leveraging the decentralized and transparent nature of blockchain technology, the logistics industry can undergo a transformative shift. Implementing blockchain enables the creation of secure and immutable records, revolutionizing transaction and shipment tracking within the industry. This integration streamlines supply chain management, improves traceability, and fosters trust among stakeholders.

The distributed ledger functionality of blockchain facilitates real-time tracking of goods, significantly reducing the risks associated with fraud, theft, and counterfeit products. Furthermore, the utilization of smart contracts automates and enforces agreements between different parties, ensuring timely payments and alleviating administrative burdens. Overall, the implementation of blockchain systems in logistics empowers companies to optimize their operations, enhance security, and foster greater efficiency throughout the supply chain.

Based on the FTP data for 2022, the company has identified several bottlenecks in ocean freight, including communication and information sharing, container availability, customs clearance, and delays caused by port congestion. To address these challenges, implementing blockchain systems can be beneficial for the FTP company. By streamlining transportation processes and reducing costs associated with delays, blockchain technology can help optimize the company's operations in the freight industry.

Based on the calculations, there has been a significant number of delayed ocean freight services. In 2020, approximately 47% of the total ocean services provided that year experienced delays. In 2021, this percentage increased to 52%, and in 2022, it decreased to 43%. These figures indicate the proportion of delayed ocean freight services compared to the total services provided in each respective year.

Based on the calculations, the primary factor contributing to delays in ocean freight for the FTP company is Communication and Information Sharing. This factor has consistently increased each year from 2020 to 2022. Another significant reason for delays is Customs clearance, which has remained relatively stable, accounting for approximately 37-38% of the total reasons for delays. These findings highlight the importance of addressing communication and information sharing challenges to reduce delays in ocean freight for the FTP company.

Inadequate communication and information sharing between ocean carriers and freight forwarders can give rise to a range of challenges and disruptions in the logistics process. Relying on manual documentation and paper-based communication methods can result in delays, errors, and misunderstandings. Consequently, this can lead to inefficiencies in coordinating shipments, tracking cargo, and exchanging crucial information. Without access to real-time data and visibility into the status of shipments, ocean carriers and freight forwarders may experience delays in making informed decisions, allocating resources effectively, and promptly addressing any issues that arise.

After conducting thorough research, it has been determined that three blockchain systems can greatly assist with maritime processes in the FTP company. These recommended blockchain systems are CargoX, VeChain, and dexFreight. Each of these blockchain systems offers unique features and benefits that can streamline and enhance the efficiency of maritime operations.

CargoX is a blockchain platform that focuses on digitizing and securing the documentation process in the shipping industry. It utilizes smart contracts to automate and authenticate the transfer of ownership and other important documents, reducing the risk of fraud and improving transparency.

VeChain, on the other hand, is a blockchain platform that specializes in supply chain management. It provides real-time tracking and verification of goods throughout the entire supply chain, ensuring transparency and traceability. This can be particularly useful in the maritime industry, where the movement of goods across different stages is crucial.

Lastly, dexFreight is a blockchain-based logistics platform that aims to optimize freight transportation. It leverages blockchain technology to create a decentralized marketplace where shippers, carriers, and other stakeholders can connect and transact directly, eliminating intermediaries and reducing costs.

It was defined that implementing one of these blockchain systems, the FTP company can benefit from enhanced security, improved transparency, streamlined documentation processes, and optimized freight transportation. These detailed descriptions provide an overview of the capabilities and potential advantages of each blockchain system for the maritime processes of the FTP company.

The FTP company was tasked with assessing the significance of various indicators used in the final selection process. These indicators include security, cost (in USD), and easiness to use. It is important to note that the higher the rank assigned to an indicator, the less significant it is considered to be in the selection process. This ranking system allows the company to prioritize the most crucial factors while considering the overall importance of each indicator. By carefully evaluating and assigning ranks to these indicators, the FTP company can make informed decisions that align with their specific needs and objectives.

Cargo X has successfully met two out of three ideal values of the analyzed indicators, making it the most suitable blockchain system for the FTP company to implement in order to reduce issues during maritime shipping processes. However, implementing this new blockchain system will require investments from the FTP company. These investments may include procuring servers for databases, providing staff training, reconfiguring the company's internal system, seeking advisory services for implementation, and conducting a system audit after one year of use. These steps



are necessary to ensure a smooth and successful integration of the new blockchain system within the FTP company's operations.

Based on the aforementioned costs and benefits, a justification for the project implementation of knowledge management in a logistics company was conducted. The net present value (NPV), internal rate of return (IRR), and discounted payback period (DPP) were calculated to assess the feasibility of the project.

In order to implement a blockchain system, the company intended to invest a total of \$83,763. It was projected that the company would achieve 100% production capacity by the 5th year, with corresponding cash flows of \$18,000, \$22,900, \$26,100, \$37,100, and \$39,000. The discount rate for evaluating the investment project was 17%. To assess the project's viability, key financial metrics such as NPV (Net Present Value), PI (Profitability Index), DPP (Discounted Payback Period), and IRR (Internal Rate of Return) needed to be calculated.

Based on a thorough analysis, it is highly recommended to proceed with the implementation of the CargoX project for the FTP company. This recommendation is supported by a positive net present value (NPV) and a profitability index (PI) exceeding 1. The PI value of 1.03 indicates that for every \$1 invested initially, the company can generate an additional \$0.03 in value. Furthermore, the discounted payback period is estimated to be 4 years and 10 months, which signifies the duration required for the cumulative present value of cash flows from the project to equal the initial investment cost. These financial indicators demonstrate the potential profitability and viability of the CargoX implementation project for the FTP company.

## CONCLUSIONS AND RECOMMENDATIONS

In this section, the supply chain management in digital economy involving maritime were studied, namely:

- It was defined that Supply Chain Management is the organization, planning, control, and execution of the product flow, from design and procurement through production and distribution to the final consumer, in accordance with market requirements for cost efficiency.

- Essential functions of SCM, which includes Supply chain planning, Logistics management, Assets management, Procurement and Information management were described.

- It was described what is digitalization and digital economy. It was defined what digitalization involves, how it helps improve and streamline processes in economy.

- Advantages and disadvantages of digital economy was defined and summarized.

- It was defined that maritime supply chain is a whole network of interconnected systems involving freight forwarders, shipping lines, port terminal operators and ground logistics systems.

- It was concluded that in maritime shipping, the primary focus is on reducing fuel emissions and alternative fuels, as well as ship recycling, safe handling of hazardous materials and reducing noise pollution.

- Also it was concluded that corporations are beginning to adapt their business models to reflect an emphasis on green supply chains. Strategies to reduce environmental impact focus on: reuse, recycle, reduce, recover, and reverse logistics.

The analytical section was devoted to a general diagnosis of the FTP logistics company, which consisted of researching the company's range of services and the history of the company's development, as well as an analysis of the company's market share in comparison with its leading competitors and identified products for which

FTP managers provide logistics supply chains. This analysis proved that the company, which has been on the market for ten years, is developing rapidly, having started its activities only with an office in Kyiv and Odesa with a few people, already in 2016 it opened an office in Poland, today it has a significant network of reliable agents that provide services for consulting on issues of foreign trade, as well as in the future and the transport and forwarding service at the highest level. The company's latest achievement was membership in the Association of Independent Freight Forwarders (WCA), which confirms the high quality of forwarding services and allows you to use the services of the best carriers at the best rates around the world.

In general, FTP services can be divided into four large blocks, which include customs, transport, contract and financial logistics, and which ensure the formation of a complete product supply chain from the selection of a supplier to the delivery of this product "to the customer's door".

FTP statistics show that the most demanded service for many years remains the provision of customs brokerage services, while at the same time, the direction of intermodal transportation is also developing, as well as client consulting services regarding customs clearance in certain markets. In most cases, the FTP is addressed by importer clients, while the largest serviced product flows come from China, Germany and Poland.

Regarding the financial condition, it should be noted that due to an aggressive marketing campaign to increase market share, as well as the expansion of the range of services, the company has a financial condition that is caused by some financial risks from the side of low profitability and low indicators of financial stability, but the overall picture allows us to say that the company is more or less financially stable.

Based on the analysis of partnership interaction of the FTP with sea lines, the biggest share has Maersk, Yang Ming and Hapag-Lloyd. It was defined, that during work with ocean carriers, multiple common problems appear: Delays, Container damage or loss, Customs and regulatory issues, Security risks, Inefficient logistics and coordination, Cost fluctuations.

In order to develop and minimize all bottlenecks that appears in maritime services, it is proposed to FTP company to implement blockchain system.

The integration of blockchain systems into a logistics company can yield a multitude of advantages, ultimately enhancing operational efficiency. By leveraging the decentralized and transparent nature of blockchain technology, the logistics industry can undergo a transformative shift. Implementing blockchain enables the creation of secure and immutable records, revolutionizing transaction and shipment tracking within the industry. This integration streamlines supply chain management, improves traceability, and fosters trust among stakeholders.

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