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QUALIFICATION PAPER

(EXPLANATORY NOTES)

OF GRADUATE OF ACADEMIC DEGREE

«BACHELOR»

THEME: «Organization of international cargo transportation by air»

Speciality 073 «Management»

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*I certify that in this qualification paper
there are no borrowings from the works of other authors
without appropriate references*

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Kyiv 2024

МІНІСТЕРСТВО ОСВІТИ І НАУКИ УКРАЇНИ
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Факультет транспорту, менеджменту і логістики
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Київ 2024

NATIONAL AVIATION UNIVERSITY
Faculty of Transport, Management and Logistics
Logistics Department

Academic Degree Bachelor

Speciality 073 «Management»

Educational Professional Program «Aviation Logistics »

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«13» May 2024

TASK

FOR COMPLETION THE QUALIFICATION PAPER OF GRADUATE

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1. Theme of the qualification paper: «Organization of international cargo transportation by air» was approved by the Rector Directive №624/CT. of April 24, 2024.
2. Term performance of the paper: from May 13, 2024 to June 16, 2024.
3. Date of submission paper to graduation department: June 01, 2024.
4. Initial data required for writing the paper: general and statistical information of the Pulsar Expo company, production and financial performance indicators of the Pulsar Expo company, literary sources on cargo transportation management, specifics of perishable cargo transportation, Internet sources.
5. Content of the explanatory notes: theoretical approaches to the management organization of transportation on international routs; general characteristics of the Pulsar Expo company; analysis of the production and financial performance of Pulsar Expo; analysis of the organization of transportation of various cargoes Pulsar Expo; identification of directions for improvement of the company's activities; development of recommendations for improving the management of transportation with participation of air transport; calculation of the effect of project proposals.
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	13.05.24-16.05.24	Done
2.	Collection of statistical data, timing, detection of weaknesses, preparation of the first version of the analytical chapter	17.05.24-20.05.24	Done
3.	Development of project proposals and their organizational and economic substantiation, preparation of the first version of the project chapter and conclusions	21.05.24-26.05.24	Done
4.	Editing the first versions and preparing the final version of the qualification work, checking by standards inspector	27.05.24-29.05.24	Done
5.	Approval for a work with supervisor, getting of the report of the supervisor, getting internal and external reviews, transcript of academic record	30.05.24-31.05.24	Done
6.	Submission paper to Logistics Department	01.06.24	Done

Graduate _____
(signature)

Supervisor of the qualification work _____
(signature)

8. Consultants of difference chapters of paper:

Chapter	Consultant (position, surname and name)	Date, signature	
		The task was given	The task was accepted
Chapter 1	Associate Professor, Molchanova K.M.	13.05.24	13.05.24
Chapter 2	Associate Professor, Molchanova K.M.	17.05.24	17.05.24
Chapter 3	Associate Professor, Molchanova K.M.	21.05.24	21.05.24

9. Given date of the task May 13, 2024.

Supervisor of the qualification paper: _____ Kateryna MOLCHANOVA
(signature of supervisor) (surname and name)

Task accepted for completion: _____ Oleksandra SUSLOVA
(signature of graduate) (surname and name)

ABSTRACT

The explanatory notes to the qualification paper «Organization of international cargo transportation by air» comprises of 87 pages, 20 figures, 17 tables, 50 references.

KEY WORDS: AIR TRANSPORT, MULTIMODAL TRANSPORTATION, INTERNATIONAL ROUTS, INFORMATION SUPPORT, ECONOMY EFFICIENCY

The theoretical basis of managing the transportation on international routs by air transport was studied in the qualification work. The activities of the Pulsar Expo company on the cargo transportation market, its production and financial indicators, and existing approaches to the organization of transportation of various cargoes are analyzed.

As a result of the study, possible directions for improving the company's activities were identified and recommendations were developed for improving the management of transportation processes. The main goal of this project is the development of practical recommendations for the use of the latest technologies, which will contribute to the improvement of control over the process of delivery of products.

It is recommended to use the materials of this qualification paper during scientific research, in the training process and in the practical activities of specialists of logistics departments.

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NOTATION

- CMR – Convention relative au contrat de transport international de marchandises par route;
- IATA – International Air Transport Association;
- CTKs – cargo tonne-kilometers;
- ACTKs – available cargo tonne-kilometers;
- CEO – general director;
- ETA – Estimated Time of Arrival;
- TMS – Transport Management System.

INTRODUCTION

Transport is one of the most important components of the production infrastructure of Ukraine. Its effective functioning is a necessary condition for stabilization, promotion of structural transformations of the economy, development of foreign economic spheres of activity, raising the standard of living of the population, ensuring the national security of the country.

Transport belongs to the sphere of material production, is its fourth branch (after mining, processing industry and agriculture) and continues the production process, delivering products from the place of production to the place of consumption. The product of transport is the process of movement itself, which is carried out with the help of vehicles both in the sphere of production and in the sphere of circulation.

It affects the development of the economy and as a consumer of metal, energy, wood, rubber, and other products. It accounts for a significant part of the main production assets and industrial production personnel.

The specificity of transport, as a branch of the economy, is that it does not produce products itself, but takes lessons in its creation, provides production with raw materials, materials, equipment and transports finished products to the consumer. Transportation costs are included in the cost of products.

Transport is an important component of the market infrastructure, because it creates conditions for the formation of national and local markets.

The importance of transport for any country occupying a large territory is very great. It plays an important economic and defense role in the state.

The economic role of transport is manifested, first of all, in the fact that it is an organic link of every production, carries out continuous and mass supply of all types of raw materials, fuel and products from production points to the consumer, and also carries out division of labor, specialization and cooperation of production. Without transport, it is impossible to rationally place production, develop new territories and

natural resources. Transport is an important factor in the economic integration of countries and the development of international trade.

The socio-political functions of transport are manifested in its ability to exchange material and spiritual values between districts, cities, and territories, thereby contributing to their unification into a single state. Transport provides freight, domestic and tourist trips, as well as medical care for people, facilitates physical labor.

The diverse and important cultural significance of transport is, first of all, that it provides communication between continents, countries, cities and people, and contributes to the satisfaction of their aesthetic needs and cultural exchange.

The defensive role of transport has always been highlighted and emphasized. At all times, it was considered as one of the important factors of ensuring the defense capability of the state. Its functions are the transfer of troops and weapons, provision of rear facilities and military production. It is also an important part of many types of military weapons.

The goal of the thesis was the organization of effective transport connections on international routes with the participation of air transport, since the company actively cooperates with importers and the quality of international routes plays an important role in the company's activities.

In accordance with the purpose of the work, the following tasks were defined and formulated:

1. Investigate theoretical aspects of the formation of a cargo delivery chain with the participation of several types of transport.
2. Research specifics of transportation chain planning involving air transport.
3. Carry out analysis of the transport market of Ukraine.
4. Describe activity of "Pulsar Expo Ukraine" LLC.
6. Analyze the production indicators of the company.
7. Investigate the financial condition of the enterprise.
8. Develop recommendations for the development of an optimal route in a mixed connection with the participation of air transport.

9. Carry out calculations of the economic efficiency of the proposed project solutions.

The object of research in the thesis was the processes related to the organization of cargo transportation with the participation of air transport in international traffic.

The subject of the study was the optimization of information provision of the processes of organization of international transportation.

During the completion of the thesis, general scientific methods were used: system analysis, induction and deduction, analysis and synthesis, expertise.

Sources of information during the diploma research were:

- regulatory acts related to multimodal cargo transportation;
- scientific and methodological developments of domestic and foreign specialists in logistics and transportation organization;
- statistical and accounting reporting of the business entity "Pulsar Expo" LLC. (accounting balances, financial statements);
- Internet sources on the relevant subject.

Microsoft Office software products: Word, Excel and Visio were used during the calculations and design of the thesis.

CHAPTER 1

THEORETICAL FOUNDATIONS OF THE ORGANIZATION OF INTERNATIONAL FREIGHT TRANSPORTATION WITH THE PARTICIPATION OF SEVERAL TYPES OF TRANSPORT

1.1 Theoretical aspects of the formation of a cargo delivery chain with the participation of several types of transport

As international practice shows, the effective functioning of the transport system depends on national legislation, its stability, the optimal tariff-price and tax policy in this area, developed transport infrastructure, the use of progressive technologies of transportation and cargo processing built on logistic principles.

The modern practice of cargo transportation in global logistics systems is associated with the ever-increasing expansion of transportation carried out by one operator from one dispatch center and according to a single transport document (mixed, multimodal, intermodal, combined, A-modal, unimodal, segmental, etc.).

That is why many works of foreign and domestic scientists have been devoted to the implementation of these types of cargo transportation, the study of which has shown that there is no established terminology for various methods of mixed cargo transportation. Therefore, it is necessary to analyze in more detail the specialized domestic and foreign literature on the terminology of mixed cargo transportation (multimodal, intermodal, combined).

Thus, in most works [4, p.128] it is determined that mixed transportation is the transportation of a cargo lot from the point of departure to the destination, when more than one type of transport is used for the process of movement.

And in the work [14, p.122-123], it was noted that mixed transportation of goods (mixed separate transportation) is usually carried out by two types of transport, for example: rail-road, road-river, rail-sea, etc., and the following signs of mixed

separate transportation are distinguished : the presence of several transport documents, the absence of a single tariff rate of freight, a consistent scheme of interaction of the participants in the transport process.

In most works, the main feature of mixed transportation is the participation of several types of transport. In general, there is no single approach to the classification of mixed types of transportation. It is appropriate to analyze the legal documents regulating the conceptual apparatus.

Thus, the Civil Code of Ukraine [3] in Article 913 it's regulated the concept of "Multimodal transportation". According to this document, multimodal transportation is considered to be the transportation of goods, baggage and mail by several modes of transport using a multimodal transportation document.

The Law of Ukraine "On Multimodal Transportation" [2] also defines combined transportation. According to this document, the combined transportation of goods involves multimodal transportation of goods by truck, trailer, semi-trailer, with or without tractor, removable body or container, which has appropriate marking in accordance with international standards, by road on the initial and final segments of the multimodal transportation route and by railway , inland waterways, sea routes, provided that the sea distance is more than 100 kilometers in a straight line, on another segment of the multimodal transportation route.

In 1980, the UN Convention "UN Convention on International Multimodal Transport of Goods" [48] was developed and signed within the framework of the UN under the auspices of UNCTAD, aimed at international legal regulation of multimodal transport. The convention became one of the first sources of the international level, which defined the very term "multimodal transport".

According to it: "International Multimodal Transport means the transportation of goods by at least two different modes of transport on the basis of a Multimodal transport document from a place in one country, where the goods are delivered to the operator of the Multimodal Transport, to the specified place of delivery in another country. Operations for the removal and delivery of goods, which are carried out in fulfillment of the contract of carriage by only one mode of transport, as defined in

such contract, are not considered an international contract of carriage". The Convention, signed in Geneva on May 24, 1980, has not yet entered into force due to an insufficient number of countries that have expressed their intention to ratify, accept, approve or accede to it.

In general, the multimodal transport system is represented as a branched network (Fig. 1.1).

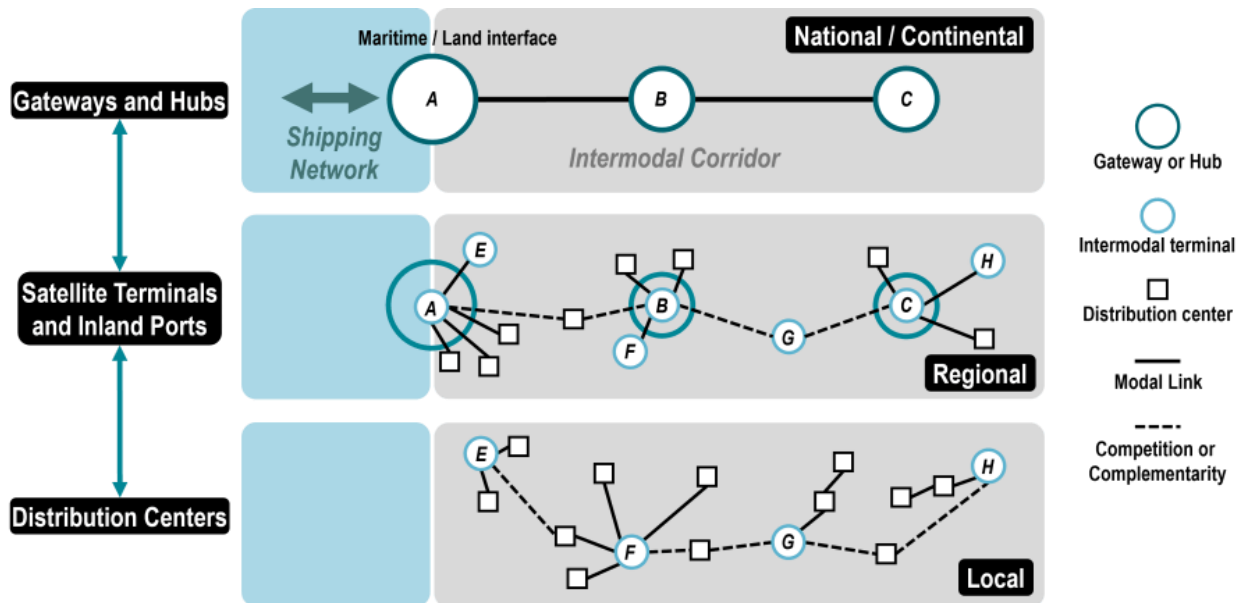


Figure 1.1 – Multimodal transport system

Source: [40]

The above figure represents a corridor within a multimodal transportation system composed of a set of gateways and hubs (A, B, and C) where regional and local transportation networks converge. Depending on the geographical scale being considered, the regulation of flows is coordinated at the local level by distribution centers (the first or the last link between production and consumption), at the regional level by intermodal terminals, or the global level by gateways, which are composed of major transport terminals and related activities.

Promotion of the material flow along the multimodal transport chain requires reliable and high-quality information support (see Fig. 1.2).

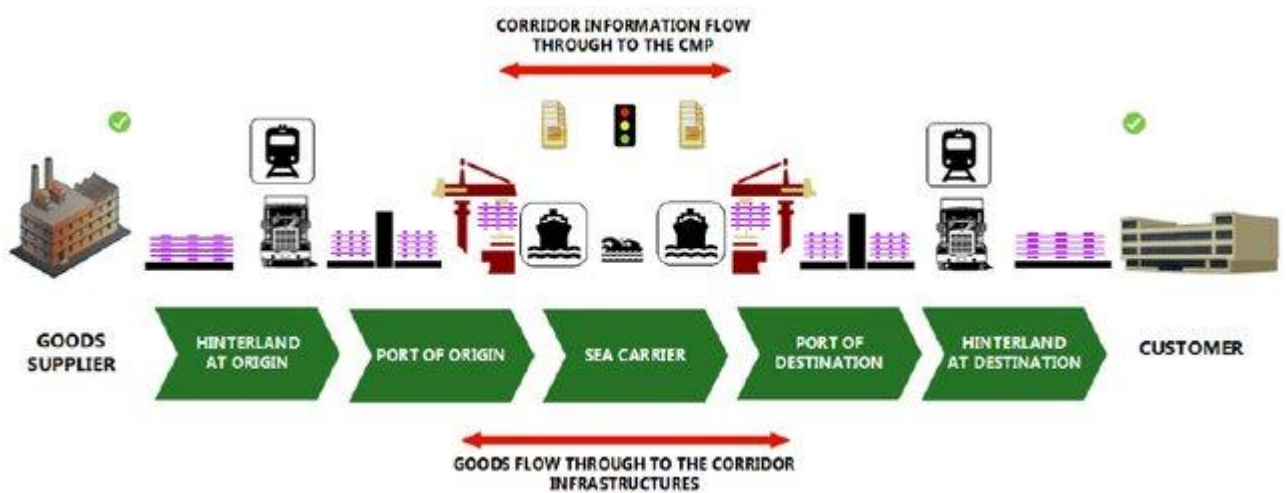


Figure 1.2 - The Information and Freight Flows within the Multimodal Transport Chain

Source: [33]

The competitiveness of freight forwarding enterprises directly depends on their ability to provide a reliable, efficient, high-quality chain of cargo transportation.

Relations in the field of transport and forwarding activities are regulated by the Civil Code of Ukraine, the Economic Code of Ukraine [5], the laws of Ukraine "On Transport" [6], "On Foreign Economic Activity" [7], "On Cargo Transit" [8], "On Transport and Forwarding Activities" [1], other laws, transport codes and statutes, as well as other normative legal acts issued in accordance with them.

To date, Law № 1955-IV dated July 1, 2004 "On transport and forwarding activities" is in force in Ukraine, which defines the legal and organizational principles of transport and forwarding activities in Ukraine and is aimed at creating conditions for its development and improvement [1].

This Law defines the concept of transport and forwarding activity, which is a business activity of providing transport and forwarding services for the organization and provision of transportation of export, import, transit or other goods.

Transport forwarding service is work directly related to the organization and provision of transportation of export, import, transit or other cargo under a transport forwarding contract.

A forwarder (transport forwarder) is a business entity that, on behalf of the client and at his expense, performs or organizes the performance of transport forwarding services specified in the transport forwarding contract.

The client is understood as the consumer of the forwarder's services (a legal entity or an individual) who, under the contract of transport forwarding, independently or through a representative acting on his behalf, instructs the forwarder to perform or organize or ensure the performance of the services defined by the contract of transport forwarding and pays them, including the fee to the forwarder.

A carrier is a legal entity or a individual who has assumed the obligation and responsibility under the cargo transportation contract for the delivery to the destination of the cargo entrusted to it, the transportation of cargo and their delivery (handover) to the consignee or another person specified in the document regulating the relationship between forwarder and carrier.

Participants in transport and forwarding activities are clients, carriers, forwarders, transport agents, ports, railway stations, associations and specialized enterprises of railway, aviation, road, river and sea transport, customs brokers and other persons performing work (providing services) when transporting goods.

The effect of this Law extends to relations that arise during transport forwarding of goods by all types of transport, except pipeline. The provisions of this Law also apply to cases where the forwarder's duties are performed by the carrier.

The main task of the state regulation of transport and forwarding activities is the protection of the economic interests of Ukraine, the further formation, development and formation of the market of transport and forwarding services.

The Cabinet of Ministers of Ukraine organizes and ensures the implementation of state policy and state control in the field of transport and forwarding activities, directs and coordinates the work of executive authorities that carry out state regulation in this field of activity.

Forwarders on behalf of clients carry out the following types of transport and forwarding activities:

- provide optimal transport service, as well as organize the transportation of goods by various modes of transport through the territory of Ukraine and foreign countries in accordance with agreements (contracts), according to which the parties have the right to use known international customs, recommendations, rules of international bodies and organizations, unless it is expressly prohibited or exclusively by the laws of Ukraine;

- charter national and foreign ships and engage other means of transport and ensure their delivery to ports, railway stations, warehouses, terminals or other facilities for timely shipment of cargo;

- carry out work related to the reception, accumulation, crushing, finishing, sorting, storage, storage, transportation of goods;

- keep records of the arrival and departure of cargo from ports, railway stations, warehouses, terminals or other facilities;

- organize cargo security during their transportation, transshipment and storage;

- organize cargo examination;

- carry out the registration of goods and transport documentation and its distribution as appropriate;

- submit cargo shipment applications and shipment orders to participants in transport and forwarding activities in accordance with the procedure established by law;

- ensure the implementation of a set of measures for the shipment of goods that arrived in substandard condition, with defects, in damaged, weak, non-standard packaging or such that does not meet the requirements of the carriers;

- carry out cargo and liability insurance;

- ensure the preparation and additional equipment of vehicles and cargo in accordance with the requirements of normative legal acts regarding the activity of the corresponding type of transport;

- ensure the optimization of the movement of material flows from the consignor to the consignee in order to achieve the minimum level of costs;

- carry out settlements with ports, transport organizations for transportation, transshipment, storage of goods;
- draw up documents and organize work in accordance with customs, quarantine and sanitary requirements;
- provide a prepared transport that has additional equipment in accordance with the requirements stipulated by the legislation;
- provide other auxiliary and accompanying transport forwarding services provided by the transport forwarding contract and which do not contradict the legislation.

Fees to the forwarder are the funds paid by the client to the forwarder for the proper execution of the transport forwarding contract. The forwarder's fee does not include the forwarder's expenses for the payment of services (works) of other persons involved in the execution of the transport forwarding contract, for the payment of fees (mandatory payments) paid during the execution of the transport forwarding contract. Documents (invoices, invoices, etc.) issued by economic entities involved in the execution of the transport forwarding contract or by authorities are proof of the forwarder's expenses.

Cargo transportation is accompanied by cargo and transport documents drawn up in the language of international communication, depending on the chosen mode of transport, or in the national language, if the cargo is transported in Ukraine. Such documents can be: Air Waybill; International Waybill (CMR - Convention relative au contrat de transport international de marchandises par route); SMGS invoice; Bill of Lading; waybill CIM; Cargo Manifest; other documents defined by the laws of Ukraine.

The fact of providing freight forwarder services during transportation is confirmed by a single transport document or a set of documents (railway, road, air waybills, bills of lading, etc.) that reflect the route of the cargo from the point of departure to the point of destination.

1.2 Specifics of transportation chain planning involving air transport

The logistic principle of the interaction of transportation participants: consists in choosing such a chain of transportation that will ensure optimal costs along the entire path of the cargo: consignor - intermediary - carrier - intermediary - consignee.

The generalized algorithm for the organization of cargo transportation is presented in Fig. 1.3.

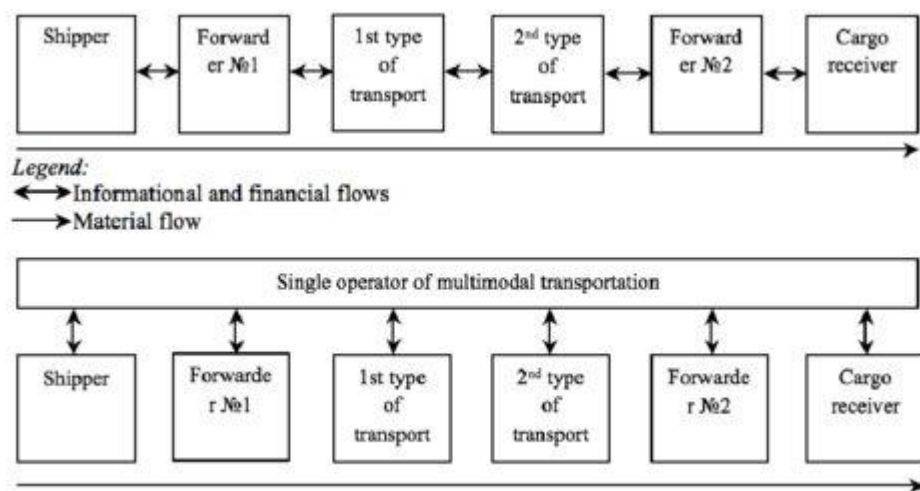


Figure 1.3 - Scheme of the transportation organization

Source: [47]

The essence of a single transport process is a rational organization of the transport process, namely a set of operations with cargo and vehicles, the common goal of which is the efficient movement of cargo, possible only on the basis of a single technology.

Principles of formation of a single transport process:

- unification: connecting the target function of transportation with the corporate strategies of all participants in the logistics chain;
- sequence: the technological sequence of various management decisions made by the participants of the flow process;

- capacity optimization: reducing the depth of production of the focal enterprise (the main enterprise – producer) in the logistics chain in order to increase the efficiency of its main activity and, as a result, the cooperation of other participants;
- optimal location: maximum proximity to the consumer allows to increase traditional quality indicators, concentration of cargo flows and stability of physical distribution (density of transportation, compliance with time standards);
- systematicity: it is impractical to apply an element-by-element approach to the organization, planning, management and regulation of flow processes as information functions - they assume consideration of these processes from the standpoint of mutual relationships as a single whole.

The structure of a single transport process:

- technological (controlled) component: processes performed with cargo/passengers (movement, disembarkation/boarding, unloading/loading), vehicles, etc.
- informational (controlling) component: as a subject, it has information about the elements of the technological part. Weakly adjusted functioning of this component causes sudden arrival of cargo, downtime of rolling stock waiting for any technological operations, reduction of rhythm, violation of plans and schedules caused by inaccuracies and errors, etc.

The analysis of the efficiency of the transport process is carried out on the basis of an integrated assessment of the quality of the cargo delivery system, which is based on assessments obtained by quality parameters (cost, reliability, timeliness, preservation, insurance, compatibility, traffic safety, environmental safety, image, flexibility of the system during service and payment , convenience of service, informativeness, comprehensiveness).

Transportation planning is done at different levels. At the first stage, perspective and current plans are developed. At these levels of planning, the issues of forming a fleet of vehicles, allocation and location of enterprises, and others are resolved. On their basis, operational plans are developed, which consist in drawing up variable tasks for the use of rolling stock in the process of transportation. These plans must be

coordinated with the average daily volume of transportation and with data on the release of rolling stock by types and models received from the technical service of the motor vehicle enterprise.

Solving the task of operational planning can be carried out both manually and with the use of computer equipment. Operational planning of transportation includes: determination of the volume of transportation and selection of rolling stock; development of transportation routes; drawing up a work schedule for each driver (Fig. 1.4).

Transportation volumes are determined on the basis of processing requests for cargo transportation from customers. The predictability of the flow of requirements for transportation is determined by the degree of influence of random factors on the process of production and consumption of material resources. Data on transportation needs are collected in an operational mode. This allows you to constantly control the volume of transport services. An important task of the transportation organization is the selection of efficient means of transport that most fully meet specific conditions. At the same time, two tasks are solved: the specialization of the rolling stock is determined and the carrying capacity is selected. The selection of the most efficient rolling stock is performed by comparing the results of operational and economic calculations.

The efficiency of freight transportation largely depends on their reasonable planning in time and space. In order for all types of transport to be used in the economy in the most efficient way, it is necessary to study the volumes of cargo transportation and cargo circulation by periods of the year to ensure a more uniform loading of vehicles throughout the year, taking into account the urgency of transportation. It is possible to reduce the seasonality of the use of cars and the need for involved transport by correctly distributing the time of transportation of fodder, organic fertilizers, construction materials and increasing the volume of car fleet services to the population and other enterprises.

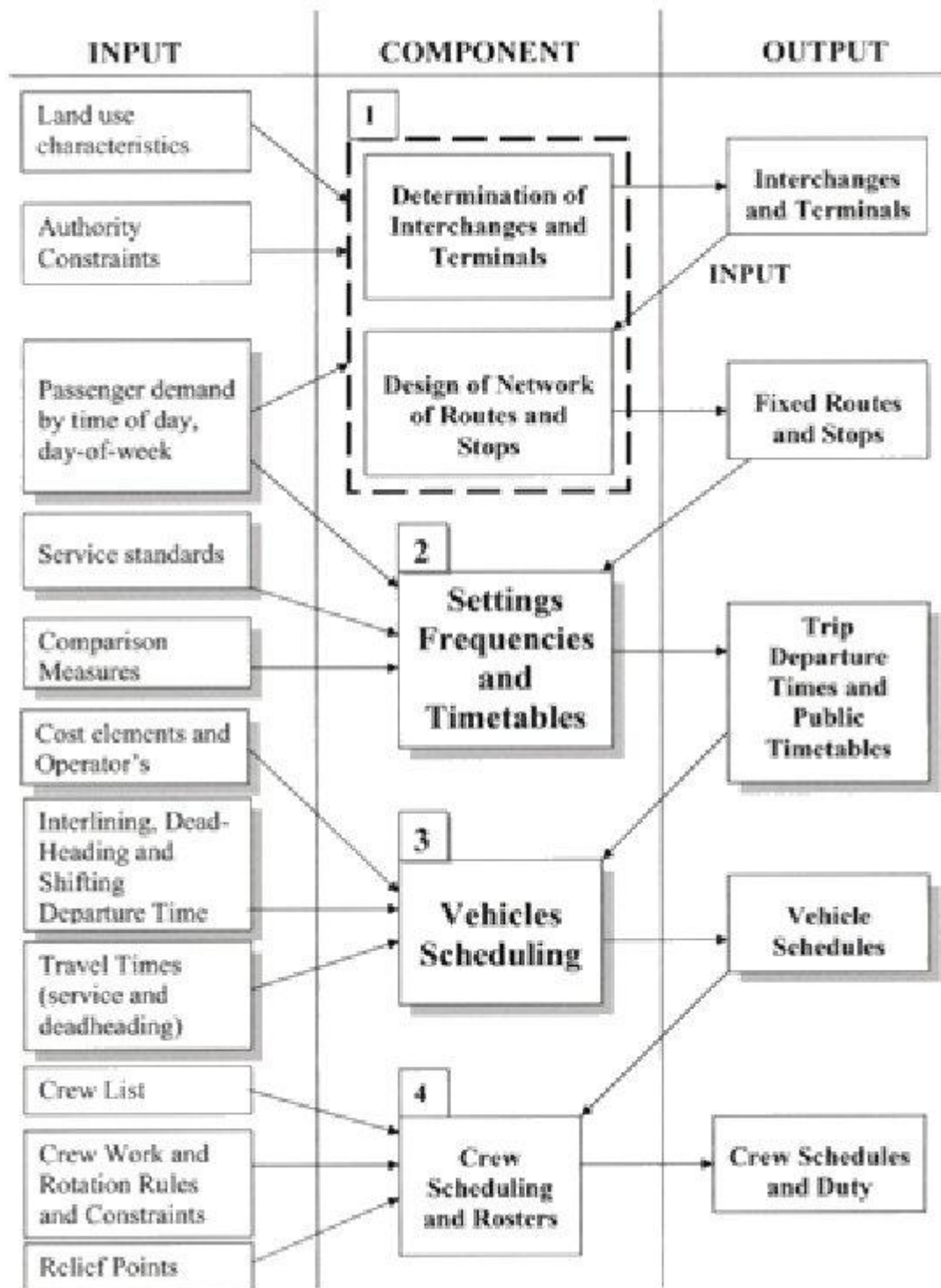


Figure 1.4 - diagram of a common transit-operation planning process

Source: [34]

Most of the goods in domestic transportation have several points of departure and destination, the distances between which are different. In addition, each business unit has a corresponding need and availability of cargo. The choice of the optimal

option for fixing the points of departure by the points of destination is possible by solving the transport problem of linear programming. The criterion of the optimality of such a task can be the minimum volume of freight traffic, which, under the same conditions of transportation of goods, will correspond to the minimum transportation costs. If the road conditions for the transportation of a certain cargo differ significantly, then when solving the problem of choosing the optimal cargo transportation plan, the criterion of optimality should be the minimum transportation costs. Such tasks can be successfully solved by farm specialists with a small expenditure of time by the method of approximation (approximate calculations).

Aviation transport plays an important role in the system of movement of goods, the modern stage of development of which is characterized by a constant increase in the volume of transportation. Such growth is explained by the expansion of international trade in goods with a high degree of processing and scientific products, the prices of which are not significantly affected by high aviation tariffs. This is also due to the increase in requirements of cargo owners for the speed of transportation and preservation of cargo in transit.

An important moment in the development of cargo transportation by air is its entry into the "door-to-door" cargo delivery system, that is, from the point of origin of the cargo to the point of its consumption. This implies the existence of clear interaction and coordination on a national and international scale both between airlines and between airlines and other representatives of the transport services market, including companies of other types of transport (primarily automobile). That is why global air carriers in the conditions of intense competition make significant efforts to reduce their costs, in particular, based on the optimal combination of modes of transport in the chain of mixed connections, where the participation of long-distance air transport can lead to a decrease in aggregate costs.

The distribution of cargo transportation between individual modes of transport depends on their characteristics and economic advantage. At the same time, mathematical, graphic, grapho-analytical, analytical, statistical and matrix models can

be developed to obtain an optimal scheme of interaction of various types of transport in the process of cargo delivery.

Among the advantages of using an air mode of transport, the following can be distinguished:

- Minimum transportation time compared to other types of transportation;
- High level of transportation security;
- Accuracy in the departure and arrival schedule;
- Wide geography of the delivery point;
- Low level of damage and theft;
- Low warehousing costs in the supply chain;
- Reduction of packaging costs.

Contractors who carry out transportation by air transport can be conditionally divided into two groups:

- contractors whose main activity is cargo transportation using cargo planes. By working with them, you can get more favorable rates for certain transportation routes. And the probability that the cargo will be sent by the nearest flight and in full is higher in this case.

- contractors transporting primarily passengers and cargo in passenger aircraft. In the case of transportation of a small volume of cargo, cooperation with similar carriers may be more profitable (regarding transportation by cargo planes).

To ensure a flight with commercial cargo, the carrier engages the necessary agents to organize the sale. Each such agent buys in bulk a certain amount of space for a relatively low cost. Next, the agent organizes the resale of the space to retail customers, taking into account their own interest. Thus, the end customer has the opportunity to transport even a small amount of cargo (from 45 kg and from 1 cubic meter).

Transportation of cargo using an airplane is only one of the stages of the logistics process of delivery. This stage is preceded by preparation for transportation. Activities related to preparation include:

- search and selection of the appropriate agent, and then the carrier;

- approval of the date of transportation;
- determination of the cost of transportation (based on volumetric weight and cost of transportation per kilogram of cargo);
- determination of the transportation route and delivery terms;
- determination of the final cargo delivery terminal;
- determination of the responsible person at the terminal of final cargo delivery.

In order to choose contractors optimally, it is necessary to take into account the specifics of the future transportation, namely:

- transportation route. When choosing an agent, you should consider which regions he works with.

- Cargo characteristics. A priori, passenger planes have fewer opportunities for cargo transportation than carriers operating exclusively with cargo. Therefore, if the volume of cargo is large, it makes sense to interact with cargo carriers.

Direct cargo transportation is realized in a matter of hours. At the same time, preparation for such transportation can last from several days to a week. This includes:

- shipment of goods from the sender;
- cargo delivery to the agreed departure terminal;
- going through customs procedures;
- approval of the layout of the invoice and permit documents;
- cargo loading on the plane.

Obviously, all the procedures listed above require some time. In order to send the cargo on time, you need to carefully plan and competently implement all these procedures. Effective and experienced agents know how to do this.

In practice, the specific cost of cargo transportation (per kilogram of weight) is lower, the greater the weight of the transported cargo. Thus, it is more profitable to transport large consignments of cargo, provided that this particular volume can be transported by plane at all. In addition, the transportation route plays its role in pricing.

In addition to the cost of transportation (air freight), there are additional costs, such as:

- the cost of issuing an air waybill;
- the cost of processing permit documents when sending and receiving cargo.

Without them, the cargo may not be allowed to board the plane;

- the amount of terminal costs during cargo handling at departure and arrival airports;
- the cost of forwarding and/or brokerage services at airports.

The terms of cargo delivery depend on the route of transportation. The fewer intermediate links (loading terminals) there are in the route, the shorter the delivery time. No one can guarantee that the cargo will be sent from the intermediate terminal on time (for example, due to weather conditions). Therefore, the fewer congestions on the flight route (or their complete absence is better, that is, a direct flight), the faster and better. And, accordingly, more expensive.

Cargo always arrives at a specific airport terminal. It is quite possible that the freight forwarder will not be able to work with cargo arriving at certain terminals. Such points must be taken into account and agreed with forwarders.

At the airport of arrival, the cargo must not be abandoned. They need to do it on their own or with the help of a third-party contractor (forwarder).

Chapter 1 summary

Thus, in the first section of the qualification paper, the theoretical aspects of the organization of cargo transportation with the participation of air transport were investigated. The main subjects in the organization of such supply chains are consignors, consignees, carriers and transport forwarding companies. Their activities are regulated by a number of international and national laws, acts, regulations and other legal documents. The scope of activity for providing transport and forwarding

services to the client includes such types of transportation as export from Ukraine, import to Ukraine, transit through the territory of Ukraine or through the territory of other states, internal transportation within the territory of Ukraine. Freight forwarders provide clients with services that are defined by the rules for carrying out transport and forwarding activities, as well as the contract of transport forwarding.

Multimodal transportation is one of the main types of organization of delivery chains today. The main feature of this type of transportation is the involvement of several types of transport. This type of transportation is the most optimal when implementing the "door-to-door" delivery concept. The majority of multimodal transportation in the main delivery area uses sea transport. The use of air transport has its advantages and features in relation to other types of transport. The biggest disadvantages will be the high cost of air transportation, but the main advantage remains the time and safety of delivery, which is most relevant for the delivery of specific, perishable or valuable goods.

CHAPTER 2

ANALYSIS OF PREREQUISITES FOR THE ORGANIZATION OF INTERNATIONAL CARGO TRANSPORTATION WITH THE PARTICIPATION OF AIR TRANSPORT BY THE PULSAR EXPO COMPANY

2.1 Analysis of the transport market of Ukraine

The transport industry in Ukraine, as well as the life of the whole country, changed radically after the full-scale invasion. On the one hand, the strategic importance of the transport complex for the functioning and existence of the country became obvious, and on the other hand, the most vulnerable aspects of the domestic transport infrastructure were highlighted. Thus, during the war, air communication with the outside world became impossible and seaports were blocked. Moreover, some of the ports were under occupation. All passenger and cargo flows were provided by rail and road modes of transport. The railway played a decisive role in the evacuation of the population from dangerous regions. Freight forwarders reoriented many cargoes specifically for transportation by rail. And although the events taking place now in the country are tragic for the entire country, they have become an impetus for the intensification of the railway transport system in the European space. The main factor holding back this process is the difference in track width - in Ukraine, the track width is 1520 mm, and in Europe - 1435 mm.

Railway and road transport currently play an important role in providing the Armed Forces of Ukraine, in the transportation of humanitarian goods, in ensuring the functioning of the country's economy and, of course, give citizens the opportunity to travel both within Ukraine and abroad.

The volumes of cargo transportation for 2022 and 2023 have almost halved compared to previous years (see Table 2.1).

Table 2.1 - Volume of freight traffic by type of transport, mln. T

Type of transport	Years					
	2018	2019	2020	2021	2022	2023
Rail	322,3	312,9	305,5	314,3	-	-
Road	187,2	244,2	191,4	224	-	-
Water	5,6	6,1	5,6	5,3	-	-
Pipeline	109,4	112,7	97,5	77,6	-	-
Air	0,1	0,1	0,1	0,1	-	-
Total	624,6	676	600,1	621,3	317,5	327,9

Source: developed by the author based on [15]

In 2022, the volume of transportation of all types of cargo decreased by 48.9% compared to 2021. In 2023, there was a slight increase in volumes - by 3.3%, but this is still only 52.8% compared to 2021. In general, the dynamics of changes in the volume of transportation by all modes of transport is presented in Fig. 2.1.

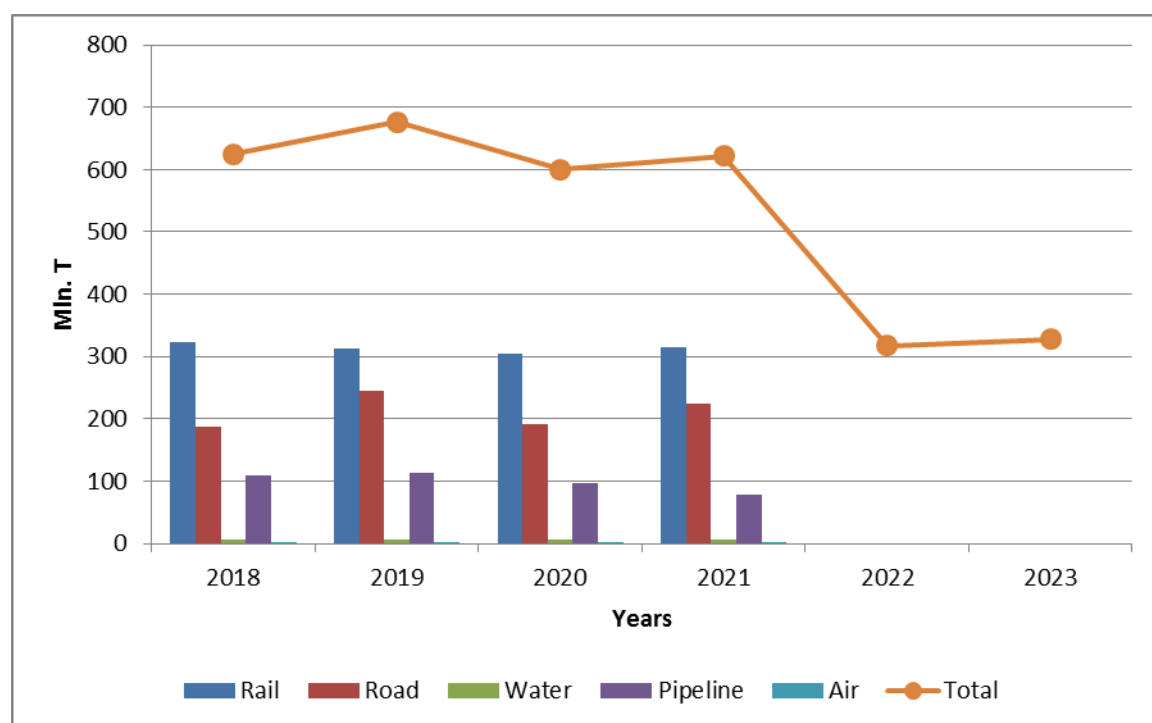


Figure 2.1 - Dynamics of cargo transportation by all modes of transport for 2018-2023

Source: developed by the author based on [15]

According to the source [29], in 2023, almost half of the total volume of cargo was transported by rail transport - 148.4 million tons. From March to December 2023, on average, 23% more cargo was transported by rail in all connections per month than in similar period of 2022. Grain cargo remained the leader among cargo nomenclature in terms of transportation volume in 2023 — 30.6 million tons (+5.9% compared to 2022).

The revival of trade and, accordingly, cargo flows was facilitated by the unblocking of sea ports. In 2023, Ukrainian ports increased cargo transshipment by 5% - up to 62 million tons. This can be considered the beginning of the recovery of the industry after the difficult 2022, when port cargo turnover fell 2.6 times compared to 2021 [27].

The main event of 2023 for the port industry was the opening of a temporary sea corridor in August. According to the results, 430 ships were accepted for loading through the corridor, 400 ships were sent, which exported 12.8 million tons of cargo.

The most dynamic increase in transshipment is observed in the Danube ports ("Izmail", "Reni" and "Ust-Dunaisk"). According to the results of 2023, the total cargo turnover in these ports increased almost twice - to 32 million tons, in 2022 - three times, to 16.5 million tons from 5.5 million tons in 2021. In particular, in 2023, the volume of transshipment in the port of "Izmail" was 20.2 million tons (a 2.3-fold increase by 2022), in "Reni" - 10.1 million tons (+47% y/y).

Although a significant part of the structure of the Danube transshipment is occupied by grain cargoes (62.5% in 2023), these ports are also important for the export of products of the mining and metallurgical industry. In 2023, transshipment of iron ore amounted to 1.9 million tons (5.9% of the total cargo turnover). In absolute terms, transshipment of iron ore decreased by 9.5% compared to 2022, and that of ferrous metals increased by 2.1 times (to 1.7 million tons).

General statistics of the activity of seaports of Ukraine are presented in Fig. 2.2.

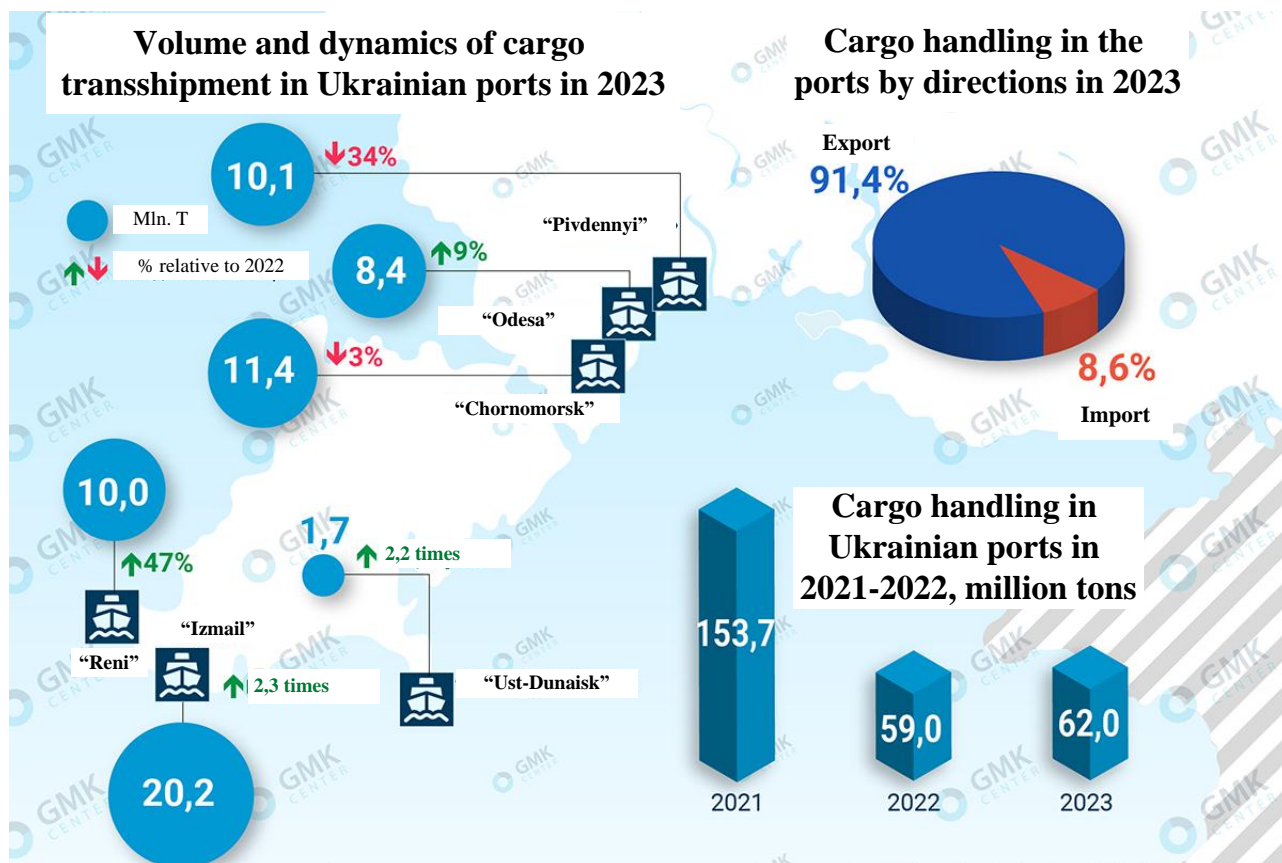


Figure 2.2 - Statistics of the activity of Ukrainian sea ports in 2023

Source: [27]

Analyzing foreign economic activity, we can say that in 2023 goods were exported from Ukraine for \$36 billion, and goods were imported for \$63.5 billion. Merchandise exports decreased for the second year in a row: in 2021, the export of goods from Ukraine reached \$68.2 billion, in 2022 - \$44.2 billion. The key categories of commodity exports of Ukraine are food (mostly grain) and metals, which are highly dependent on the reliability of logistics [17].

In 2023, Ukraine created its own Ukrainian Maritime Corridor to the Black Sea ports of the Odesa region after Russia stopped fulfilling its agreements under the Grain Agreement. This made it possible to gradually increase not only the export of grain, but also to restore the sea export of other goods, as well as to renew the sea import.

However, in 2023, Ukraine also began to suffer from the Polish blockade of the land border, which hit Ukrainian exports and tax revenues of the budget from the

import of goods. The dynamics of the volume of foreign trade in goods for 2018-2023 is shown in Fig. 2.3.

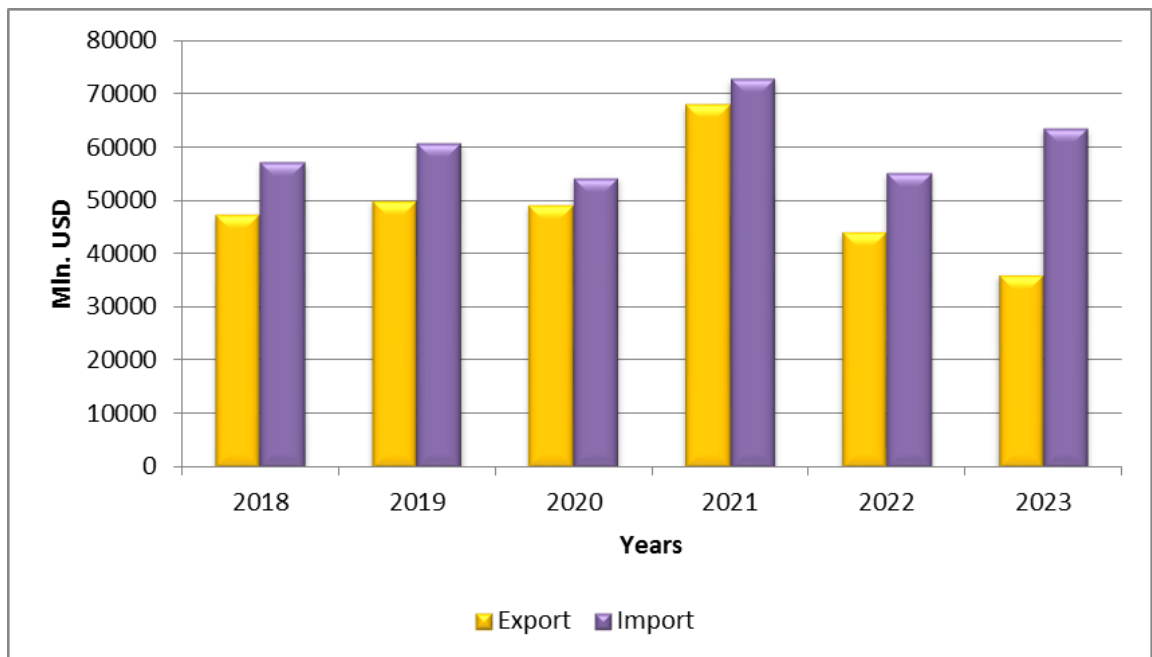


Figure 2.3 - Dynamics of foreign trade volumes in goods for 2018-2023

Source: developed by the author based on [16]

The decrease in export volumes is significantly affected by damage to the country's transport infrastructure - the destruction that has already occurred and the high probability of new ones. According to experts of the Kyiv School of Economics, the total volume of losses of infrastructure facilities in Ukraine is more than \$35 billion. Of these, \$26.6 billion was due to the direct destruction of roads, and another \$4.4 billion was the loss of Ukrzaliznytsia from the war. And there are still destroyed airports and damaged or occupied seaports [31].

According to Oleksandr Kamyshin, the chairman of the board of JSC "Ukrzaliznytsia", 12,000 railway facilities have been damaged, of which about 5,000 have been restored.

According to Ukravtodor, as a result of hostilities, the Russians destroyed and damaged 25,000 km of roads and 315 bridges. Territories that have recently been or are under temporary occupation, as well as Kyiv Oblast, Chernihiv Oblast, Sumy

Oblast, Kharkiv Oblast, Odesa Oblast, and Zaporizhia Oblast, suffered the greatest losses.

Projects of integration into the European space are actively developing in the field of railway transport. Thus, "Ukrzaliznytsia" started the construction of the European track "Chop-Uzhgorod" - one of the projects of the strategic program of the development of railway infrastructure for the integration of Ukraine into the EU [30].

Thus, the construction project provides for:

- construction of 22 km of European standard railway track;
- reconstruction of artificial structures, objects and networks of engineering support;
- equipping the track with two-way semi-automatic blocking and microprocessor dispatching centralization devices.

The implementation of the project will make it possible to launch direct passenger routes on the Eurorail from Uzhhorod to European countries, as well as transfer trains from all regions of Ukraine for further trips to European countries.

It is also possible to note among the infrastructure projects implemented during 2022-2023 on the border with Poland the following [28]:

- 1) The Rava-Ruska - State Border section with an operational length of 8.2 km has been restored.
- 2) Reconstruction of railway facilities with electrification of the Kovel – Izov – Derzhkordon section has been completed.
- 3) Two railway sections have been restored, which will add two additional crossings: Khyrev – Starzhava – State border (14.6 km) and Khyrev – Nizhankovichi – State border (24.2 km).
- 4) Overhaul of the 1,435 mm track on the Kovel – Yagodin – Derzhkordon section was carried out.

The project of building a track of European width to Lviv is actively advancing, which allowed to create a large passenger and freight hub there. But so far the project remains unimplemented due to lack of funding.

Meanwhile, while air transport can be considered non-existent in Ukraine, the indicators of its activity in the world are almost at the pre-pandemic level. The International Air Transport Association (IATA) released data for global air freight markets showing that air cargo demand rebounded in 2023 with a particularly strong fourth quarter performance despite economic uncertainties. Full-year demand reached a level just slightly below 2022 and 2019 [35].

Global full-year demand in 2023, measured in cargo tonne-kilometers (CTKs), was down 1.9% compared to 2022 (-2.2% for international operations). Compared to 2019, it was down 3.6% (-3.8 for international operations).

Capacity in 2023, measured in available cargo tonne-kilometers (ACTKs), was 11.3% above 2022 (+9.6% for international operations). Compared to 2019 (pre-COVID) levels, capacity was up 2.5% (0.0% for international operations).

December 2023 saw an exceptionally strong performance: global demand was 10.8% above 2022 levels (+11.5% for international operations). This was the strongest annual growth performance over the past two years. Global capacity was 13.6% above 2022 levels (+14.1% for international operations).

As for Ukrainian air transport enterprises, it is almost guaranteed that the airports will not function until the end of the war. And currently there are still great risks of their damage during hostilities or shelling. The situation with Ukrainian airlines is somewhat better, because they are able to carry out operational activities abroad.

Today, three large Ukrainian airlines - SkyUp, Windrose and the former Azur Air Ukraine, now known as Skyline Express, continue to provide passenger transportation outside of Ukraine [25].

Today, SkyUp is the largest airline in Ukraine by the number of aircraft in its fleet, which includes nine aircraft.

The company operates two Boeing 737-700 aircraft, as well as seven Boeing 737-800s. Among them, the airline's fleet includes two Boeing 737-800s, one of which burned at Khartoum airport during the events in Sudan, the condition of the second remains unknown.

SkyUp flies to various destinations and cooperates with various airlines. The company also operates flights under its own call signs.

As of September 2023, SkyUp provided charter flights for airlines such as Turkey's Tailwind Airlines, Netherlands' Corendon Dutch Airlines, Moldova's HiSky and Egypt's FlyEgypt, transporting tourists from various European cities to resorts in Europe, Turkey and Egypt.

In addition, SkyUp performed regular flights on behalf of the national airline of Tunisia - Tunisair, and also carried passengers on regular flights of the Moldovan airline Flyone from Chisinau.

The Skyline Express airline, which resumed its flights in 2023, uses two Boeing 757-300 aircraft, which were purchased after the Russian Federation's large-scale invasion of Ukraine. These aircraft are registered in Ukraine and belong to a Turkish airline.

The Boeing 757-300 operated by Skyline Express operates regular flights from Polish airports to popular seaside resorts including Egypt, Turkey, Greece and Bulgaria.

Interestingly, Ukrainian-registered Boeing 757-300s are currently the largest narrow-body aircraft flying from Poland. They have the ability to carry up to 275 passengers, which makes them popular for providing tourist transportation on popular routes.

Windrose Airlines resumed flights in 2023 using aircraft from the UIA fleet, including the Embraer 190, Boeing 737-800 and Boeing 737-900ER. UIA stopped its flights in September 2022 due to a conflict between shareholders.

The Embraer 190 is used for flights from Tivat to various European cities under the Air Montenegro brand of the Montenegrin airline. Boeing 737-800 performs flights between European cities and Egypt on order of FlyEgypt airline.

The Boeing 737-900ER is used for flights between France and Tunisia on the order of the Tunisian airline Nouvelair.

The company also operates flights between Tel Aviv and Chisinau.

It is impossible not to note the Supernova Airlines airline company, which is part of the Nova Poshta group of companies, which in 2023 received the Operator's Certificate under the number UA 062, which provides the opportunity to start its own cargo flights [9]. The company was founded in 2021.

This is the first Ukrainian carrier that was able to fulfill all the requirements and received the Operator's Certificate in wartime conditions. Currently, the airline is actively developing its own fleet of aircraft. The company already has two AN-26, which it took on leasing rights.

Supernova Airlines will operate flights from the Ukrainian international airports "Boryspil" and "Lviv" after the end of the war, and while the Ukrainian skies are closed for flights, air transportation will be carried out from the European airports closest to Ukraine.

In May 2023, Supernova Airlines performed its first flight on the Riga-Rzeszów-Riga route. The plane delivered 7 tons of international parcels of New Post customers from Riga International Airport to Rzeszów in Poland. After that, the parcels were loaded onto trucks and sent to Ukraine.

The first flight was performed in cooperation with the Latvian airline "RAF-Avia" on an ATR 72 aircraft. Supernova Airlines plans to operate a flight on this route twice a week - every Tuesday and every Thursday.

2.2 Analysis of the activity of "Pulsar Expo Ukraine" LLC

Pulsar Expo Ukraine Limited Liability Company has been operating on the market since 2015. Pulsar Expo is a world leader in the manufacture, supply and sale of specialty vehicles and engineering services for global government and private organizations [43].

Pulsar Expo Ukraine was founded in 2015 and has limited liability legal form [26]. Location of the legal entity: Ukraine, 04128, Kyiv, Plodova Avenue, building 1. According to the constituent documents carries out the following activities:

- Basic:

45.11 Trade in cars and passenger vehicles.

- Others:

29.10 Production of motor vehicles,

29.20 Manufacture of bodies for motor vehicles, trailers and semi-trailers,

45.19 Trade in other motor vehicles,

45.20 Maintenance and repair of motor vehicles,

45.32 Retail sale of parts and accessories for motor vehicles,

45.40 Trade in motorcycles, their parts and accessories, maintenance and repair of motorcycles,

82.99 Provision of other auxiliary commercial services, n.e.s.,

46.90 Non-specialized wholesale trade,

47.99 Other types of retail trade outside stores,

64.91 Financial leasing,

69.10 Activities in the field of law,

70.22 Business and management consulting,

71.11 Activities in the field of architecture,

71.12 Activities in the field of engineering, geology and geodesy, provision of technical consulting services in these areas,

73.11 Advertising agencies,

25.61 Treatment of metals and coating of metals,

43.21 Electrical installation works,

46.19 Activities of intermediaries in the trade of a wide range of goods,

69.20 Activities in the field of accounting and auditing; tax consulting,

74.10 Specialized design activities.

Pulsar Expo has many years of experience in performing specialized vehicle conversions, technical assistance and engineering activities. With a diverse

background in sales, engineering, automotive manufacturing and international contract work, the Pulsar Expo team has been working internationally since its inception, with an impeccable reputation among private companies and government organizations.

The company's work includes management and full support of customers in the implementation of complex international deliveries, including procurement, transportation, customs clearance, conversion and individual modification of cars, as well as project implementation in the target country. The company also advises clients on complex issues related to supply and all accompanying documents, as well as the execution of contracts in a particular country.

The structure of the company complies with all state procedures for concluding agreements and regulatory requirements, and experience allows to achieve results and implement projects as efficiently and quickly as possible. The company defines the ability to perform multitasking projects with minimal costs and guaranteed results as a competitive advantage.

The company has experience in the supply of special vehicles and engineering and technical services, equipment, design and construction works, information technology and software to government bodies around the world; in particular, within the framework of international technical assistance projects financed by donor organizations of the European Union, the United States, and the United Nations. The company also modernizes and refurbishes cars for special purposes and diplomatic missions.

In addition to the above, "Pulsar Expo Ukraine" works with private sector companies, offering them professional experience and technical support to adapt existing vehicles and to develop technical solutions taking into account the problems and peculiarities of conditions and activities.

Some of the company's projects are carried out in cooperation with international partners. In these cases, we play a leading role, providing full support for international deliveries to the respective country and bearing all financial risks.

The main competencies of the Pulsar Expo company are presented in Fig. 2.4.

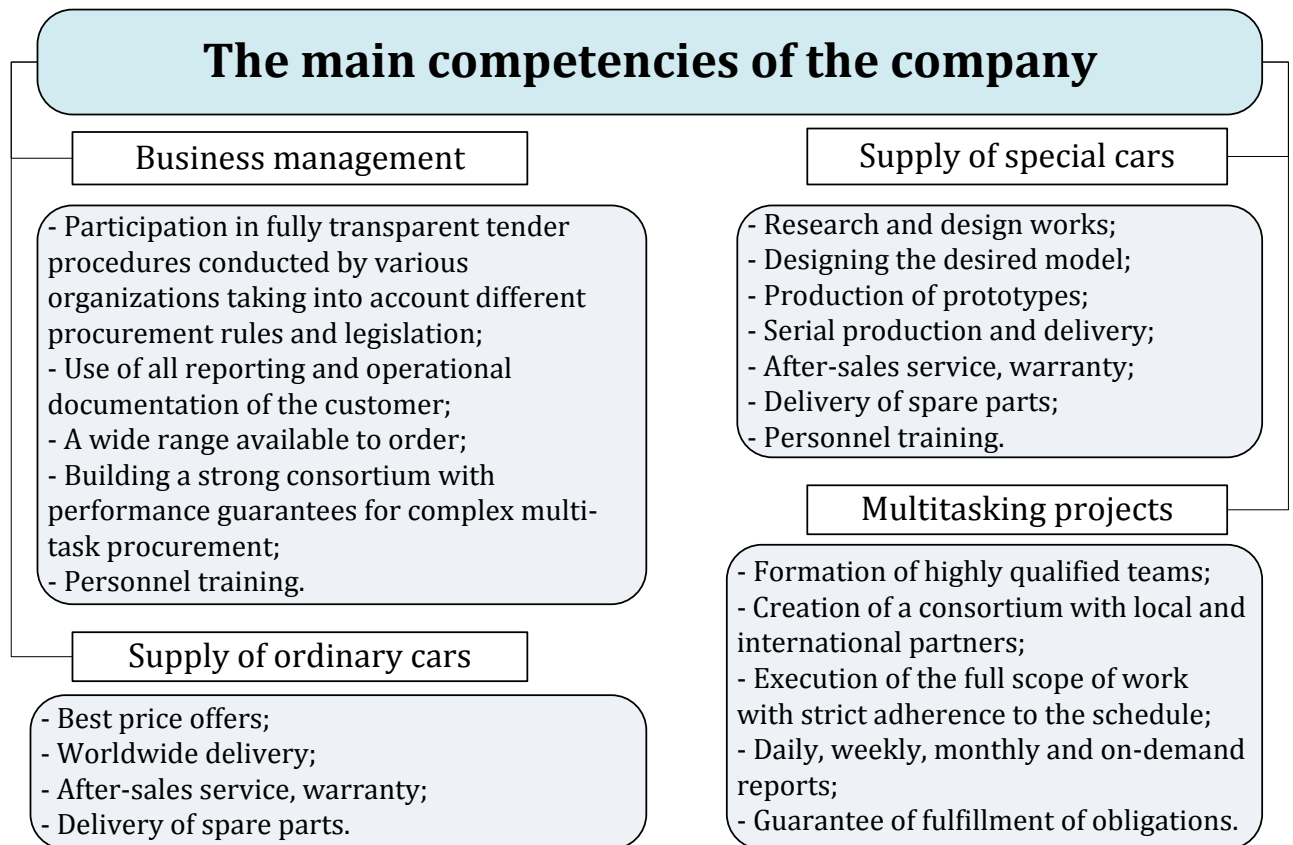


Figure 2.4 – The main competencies of the Pulsar Expo

Source: developed by author

The main office of Pulsar Expo is located in the Czech Republic, at Biskupský dvůr 2095/8, Nové Město, 110 00 Prague 1. Production of Pulsar Expo is located in Slovakia, Horné Srnie 914 42, Družstevná 491.

Organizational structure of the Pulsar Expo is presented in Fig. 2.5.

The General Director is a strategic and operational plan. Ensures the fulfillment of legitimate tasks for the sake of economic indicators; fulfillment of financial commitments before the state budget, starters, customers and banks.

Organizes work and effective interaction of structural divisions of the enterprise on the basis of application of planning methods, financial and labor costs, wide application of experience and improvement of technical level and quality of work, rational and economical expenditures of all kinds of resources, for achievement of high technical and economic indicators.

Provides law enforcement, active management refinement and functioning in market minds, strengthening contractual and financial discipline.

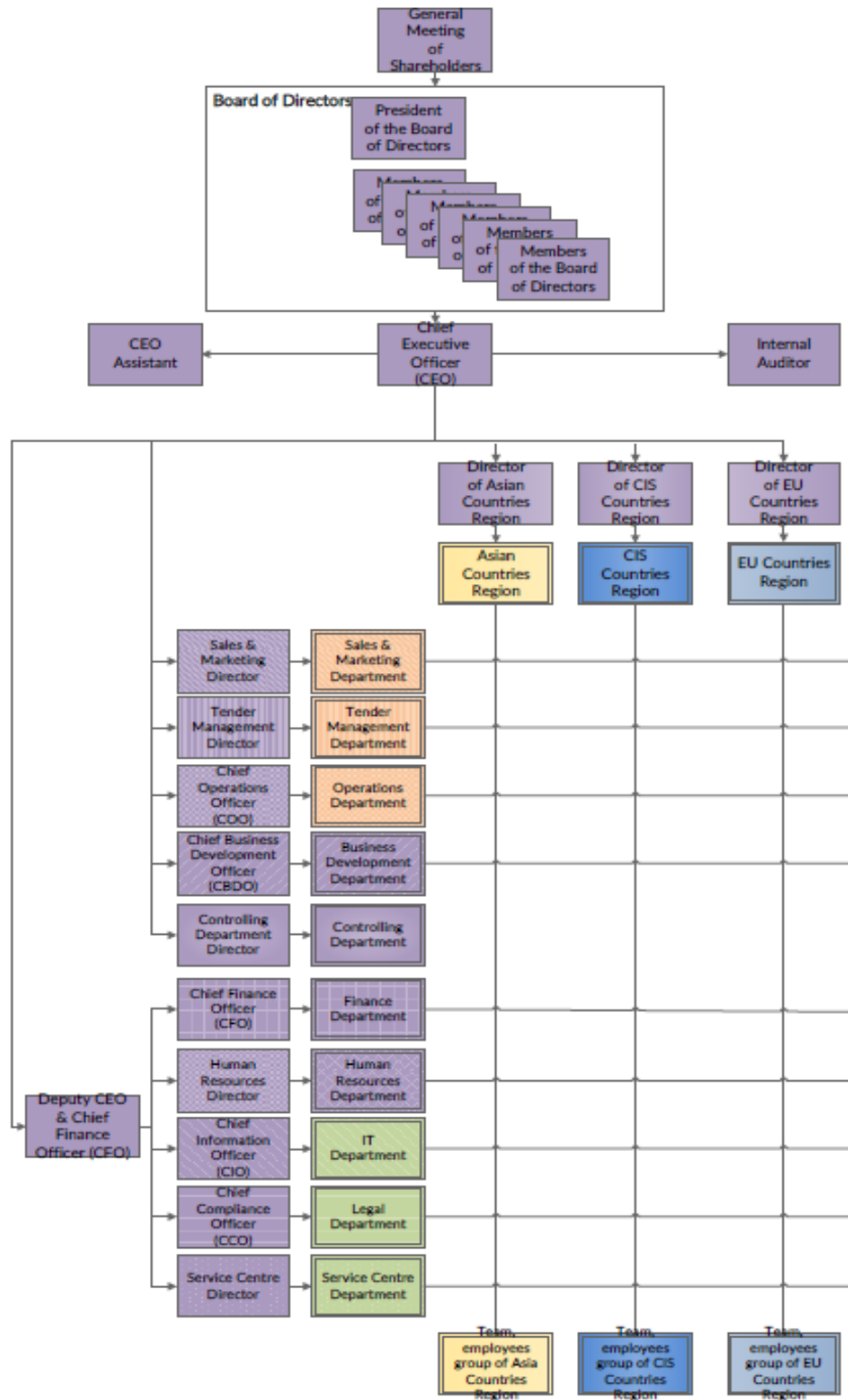


Figure 2.5 – Organizational structure of the Pulsar Expo
Source: developed by author

Deputy Director General – Strategic Planning, Operational Management, Security Issues. He is obliged not only to put the staff in the knowledge of all orders and orders of the higher management, but also to secure their execution.

Financial director – one of the top executives of the company, responsible for managing the financial flows of the business, for the financial plans a report. Defines the organization's financial policy, develops and implements measures to secure its financial stability.

Functional responsibilities:

1. Organization of management of financial resources of business, regulation of financial relations.
2. Conducting negotiations with partners: banks, credit institutions and so on.
3. Coordination of work on conducting the analysis of the financial-economic state of the company.
4. Development and control of the accounting, tax, credit, investment policy.
5. Distribution of financial resources between departments.

Director of Personnel – organizes the conduct of experiments, development and implementation of a set of plans and programs for work with personnel in order to obtain and consolidate the necessary specialties and qualifications at the enterprise of employees based on the application of scientific methods of forecasting and planning the need for personnel, taking into account the balance of development of workers and social sphere, social sphere.

Sales and Marketing Director – an expert in marketing policy development based on an analysis of the characteristics of the services used by the enterprise and forecasting demand. The person who leads the study of the main activities that shape the dynamics of demand for company services, the ratio of supply and demand in the market, technical and other characteristics of competing services.

Tender Management Director – a person who views information on requirements and methods for submitting and preparing proposals, explains the conditions of the tender and manages the preparation of the tender, controls the management of tenders in order to ensure its compliance with the organization's

requirements, contribution to the calculation of costs and prices, coordination of tender reviews and deadlines and adjusting them according to customer requirements.

Chief operations officer – one of the managers responsible for day-to-day operations, the day-to-day operations of the corporation under the supervision of a general director (CEO) and / or board of directors.

The Chief Business Development Officer is a person with knowledge of all matters related to the organization's business, in order to identify new sales prospects and stimulate business growth and product development requirements.

Responsibilities may include:

- develop business development plans, develop and implement processes to support business growth by identifying customers and markets;
- promote business growth by working with clients and business partners;
- application development and other systems.

Controlling department director is the person who manages all the activities in the department. Responsibilities include communication with customers and suppliers, and also acts as a mediator between employees and customers.

Chief Information Officer is the head of the company responsible for the management, implementation and ease of use of information and computer technologies. The CIO analyzes how various technologies benefit the company or improve the existing business process, and then integrates the system to realize this benefit or improvement.

The Chief Compliance Officer is the corporate officer responsible for overseeing and managing compliance issues within the organization, ensuring that the company complies with regulatory requirements and that the company and its employees comply with internal policies and procedures.

Service center director – a person who controls everything related to the amenities for the staff, the duties include quality control of cleaning, the availability of all necessary staff, management of food and household supplies.

The flagship project of the Pulsar Expo company is the Torsus brand, namely all-wheel drive off-road buses developed and manufactured by the Pulsar Expo


company. TORSUS is a pioneer in the field of design, development and production of the world's most durable off-road buses. The iconic PRAETORIAN model is the world's most powerful off-road heavy-duty bus, and the new TERRASTORM represents the brand's bold ambition to further conquer the world's all-wheel drive heavy-duty minibus market.

TORSUS is a brand of off-road buses founded in 2017 by the international company Pulsar Expo s.r.o. with its head office in the Czech Republic and production facilities in a purpose-built factory in Slovakia. It works and sells in global markets to customers in heavy industry, utilities, the public service sector and simply individual customers who want to make their lives more independent from the availability and condition of roads. Warranty and service support is provided in all global markets with the fastest response time in the sector.


Partnerships with MAN and VW in key chassis and powertrain technologies ensure that every TORSUS has maximum durability, reliability, serviceability, value and, of course, strength.

The characteristics of automobiles offered by the Pulsar Expo company are presented in the Table 2.2.

Table 2.2 - The characteristics of Pulsar Expo vehicles

№	Vehicle brand	Characteristics
1	<p>TORSUS PRAETORIAN</p> 	<p>TORSUS PRAETORIAN is designed to conquer the most extreme terrains around the world. PRAETORIAN is capable of safely transporting up to 35 people and wading through the deepest water obstacles. Available in many versions, the PRAETORIAN is suitable for use in many areas: from adventure tourism to use in difficult and emergency situations.</p> <p>MAN Diesel Engine up to 290 HP Max. permissible weight: 13.400 kg Front axle load: Max. 6.300 kg Rear axle load: Max. 7.800 kg Type: 6 cylinder in-row Diesel Make & Model: MAN D0836 LFLAO</p>

The end of the Table 2.2

		Emission level: Euro 6e (Euro IV - VI possible) Output: 290 hp (213 kw) Torque : 1150 Nm Fuel: Diesel
2	<p>TORSUS TERRASTORM</p> 	<p>The new TORSUS TERRASTORM model is designed to meet the challenges of transporting personnel and equipment in the world's harshest road conditions. The TERRASTORM minibus can carry up to 17 people and has an increased ground clearance of 250 mm. It's built to get you where you need to go. With a variety of mods, TERRASTORM will help you push forward no matter what.</p> <p>Max. permissible weight: 3500, 5000 kg Front axle load, max.: 2100 kg Rear axle load, max.: 2100 kg Type: 4-cylinder diesel bi-turbo Make&Model: DAVA, DAWA Emission level: Euro IV-VI(AR) Fuel: Diesel</p>

Source: developed by author based on [46]

The results of Pulsar Expo's economic activity over the past four years can be characterized as positive. Despite the fact that a full-scale war has been going on in Ukraine since 2022, the services of the Pulsar Expo company are in demand at the moment, as the company offers the supply of necessary spare parts for vehicles and repairs, conversions for specific tasks, etc. The dynamics of the company's production indicators are shown in Table 2.3 and Fig. 2.6.

Table 2.3 - Number of contracts concluded by the Pulsar Expo company

№	Commercial field	2020	2021	2022	2023
1	Sale of automobiles	4123	4475	5236	5642
2	Sale and supply of automobile spare parts	11369	12780	13425	12548

The end of the Table 2.3

3	Services in the field of repair and conversion of automobiles	13274	14237	15236	14568
4	Other commercial services	473	428	582	689

Source: developed by author

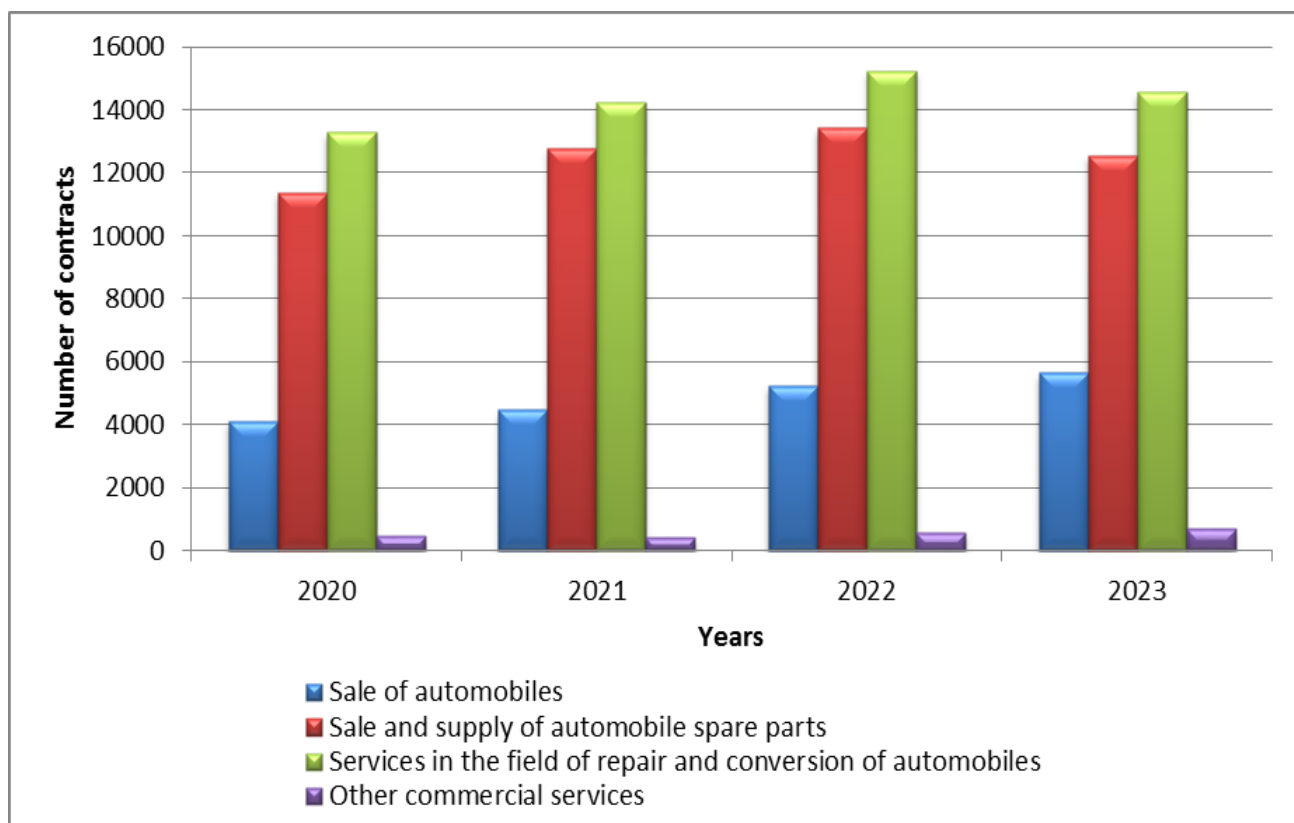


Figure 2.6 - Dynamics of the number of contracts concluded by the Pulsar Expo company in 2020-2024

Source: developed by author

The company's financial results in 2022-2023 showed a profit from operations, while in 2020-2021 - a loss. The main reason for unprofitability was very high costs. In general, the financial results of Pulsar Expo activities are shown in Table 2.4 and on the Fig. 2.7.

Table 2.4 - Financial results of Pulsar Expo Ukraine, thousands UAH

№	Indicator	2020	2021	2022	2023
1	Net income from the sale of products (goods, works, services)	6054,3	5693,2	44175	77616,9
2	Cost of goods sold (goods, works, services)	1063,5	4615,4	35305	59680,7
3	Other operating income	1525,3	868,9	314,4	2854,4
4	Other operating expenses	7780,6	2413,4	6339,2	20192,9
5	Other income	-	-	-	-
6	Other expenses	-	-	-	-
7	Total income	7579,6	6562,1	44489,4	80471,3
8	Total costs	8844,1	7028,8	41644,2	79873,6
9	Financial result before tax	-1264,5	-466,7	2845,2	597,7
10	Income tax	-	-	181,8	105,9
11	Net profit (loss)	-1264,5	-466,7	2663,4	491,8

Source: developed by author

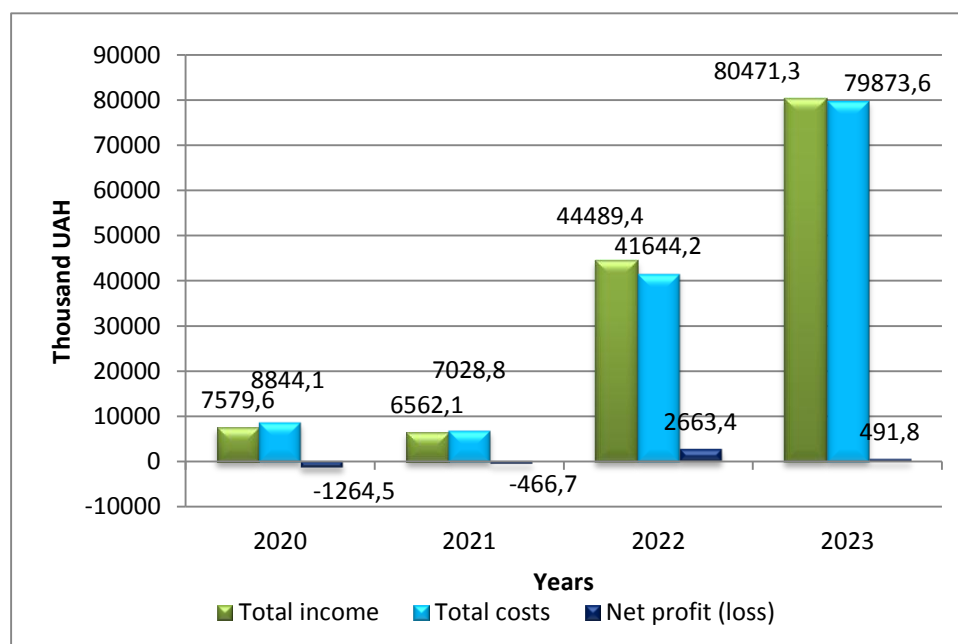


Figure 2.7 - Dynamics of the company's financial results in 2020-2023

Source: developed by author

In Fig. 2.7 we can see a sharp increase in the company's operating income in 2023, but due to the increase in operating expenses, the company's profit has decreased by almost 80%.

2.3 Analysis of the logistics activities of the Pulsar Expo company

The company provides its services to any corner of the world, so it's no secret that one of the main links of the company is logistics, or more precisely, transportation. But it is clear that the transport of cars takes place by sea or by road or on their own. But let's not forget that a significant part of the company is production, and it is for production that automotive spare parts are needed. Transport is usually carried out by road, but it is not unusual to transport by plane. In any case, the transport of cars or spare parts is subject to intermodal transport, which causes some difficulties.

Let's make a more detailed overview of the company, and the following tools will help us with this SWOT-analysis (Table 2.5).

Table 2.5 - SWOT-analysis of Pulsar Expo company

Strengths:	Weaknesses:
<ul style="list-style-type: none"> -Over 10 years of experience in the supply of special vehicles and engineering services. -Wide range of customers in the private sector and government organizations. -Effective international network of contacts and partners. -Deep understanding of the complexities of international logistics management. -Presence in multiple countries (UA, CZ, SK). 	<ul style="list-style-type: none"> - Possible difficulties with the introduction of new technology for monitoring air traffic flows. -Delays in the delivery of new products. -Customer focus is still in the development process.
Opportunities:	Threats:
<ul style="list-style-type: none"> -Growing demand for innovative solutions in air traffic monitoring. -Partnerships with technology companies for joint product development. -Expanding the geography and cooperation with new markets. 	<ul style="list-style-type: none"> -Competition from large technology companies in air traffic monitoring. -Potential decrease in demand after the end of certain conflicts or wars. -Reliance on tenders for projects, which may be impacted by funding availability.

Source: developed by author

We can analyse the strengths, weaknesses, opportunities, and threats based on the information provided to better understand what decisions to make for the company. The TOWS matrix will help us with this (Table 2.6).

Table 2.6 - TOWS matrix of Pulsar Expo company

	Strengths:	Weaknesses:
Opportunities:	<p>Strength-Opportunity (SO) Strategies: -Leverage experience and international network to capitalize on growing demand for air traffic monitoring solutions. -Strengthen partnerships with technology firms to enhance product offerings.</p>	<p>Weakness-Opportunity (WO) Strategies: -Invest in R&D to overcome technological adoption challenges and align with market demands. -Actively pursue market expansion initiatives in new regions.</p>
Threats:	<p>Strength-Threat (ST) Strategies: -Enhance competitiveness against large technology companies through continuous innovation and quality assurance. -Diversify project acquisition strategies beyond tenders to mitigate funding risks.</p>	<p>Weakness-Threat (WT) Strategies: -Address product delivery delays to maintain customer satisfaction and loyalty. -Develop contingency plans for potential decreases in demand post-conflict periods.</p>

Source: developed by author

According to the specifics of the Pulsar Expo company, the transport and logistics department is responsible for organizing the transportation of spare parts, cars, and other accessories, as well as ensuring their storage in temporary storage warehouses. The tasks of the transport and logistics department include the following:

- 1) provision of timely and uninterrupted transport support for the company's activities;
- 2) selection of subcontracted transport companies to ensure reliable and cost-effective transportation of goods;
- 3) reduction of costs for transport and logistics operations;
- 4) drawing up optimal cargo transportation routes.

In accordance with the tasks of the department, the following functions can be distinguished: operative planning and dispatching of transport support; planning the needs for the necessary means of transport in accordance with the forecasts; communication with contracting organizations; development of new delivery routes in accordance with the tasks; ensuring maintenance of all necessary documentation.

The main countries from which material flows are delivered are European countries: the Czech Republic, Slovakia, Germany, Italy, France, Poland etc. The geography of importing countries is presented in Fig. 2.8.



Figure 2.8 - Geography of the import of cargo flows by the Pulsar Expo company

Source: developed by author

In Fig. 2.8 presents the main importing countries, however, smaller deliveries are made from many European countries. The main transport in the organization of the delivery chain is automobile. However, it should be noted that sea transport is actively used for the delivery of cars. The shares of importing countries in the total volume of supply for 2023 are shown in Fig. 2.9.

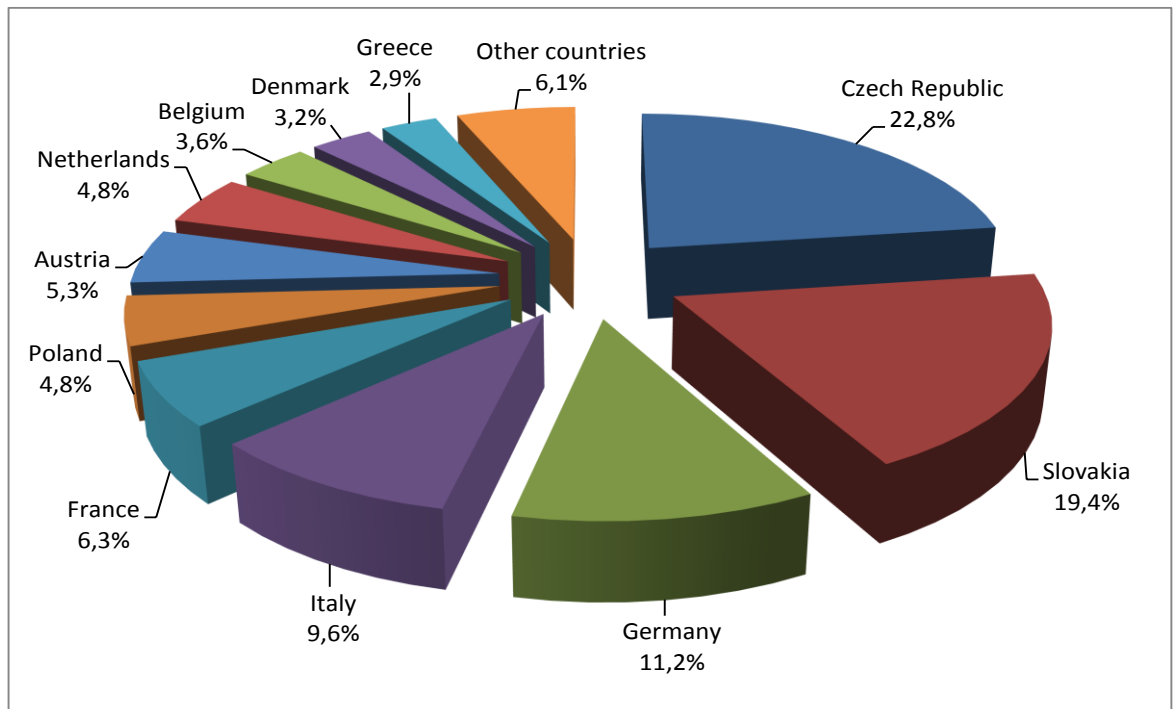


Figure 2.9 - The shares of importing countries in the total volume of supply for 2023

Source: developed by author

In the last months of the company's operation, there have been many requests for the delivery of spare parts from China. The cargo that needs to be transported is quite expensive, and one of the key factors for its delivery is the time factor. Based on this, the transport and logistics department faces the task of developing new optimal routes for the delivery of spare parts with the participation of air transport. Since air delivery is possible only to European airports, it becomes clear that it will be an intermodal route involving air and ground modes of transport.

The main task of the department is to optimize time and cost parameters when developing a new delivery route.

Chapter 2 summary

So, in the second section of the qualification work, the prerequisites for the organization of the delivery route with the participation of air transport were analyzed. A very important condition for the existence of our state during the war is the functioning of the economy. Transportation provision is perhaps the most important condition for maintaining the vitality of the economy. It is difficult to overestimate the role of transport today. It provides the Armed Forces of Ukraine with everything necessary, transport delivers humanitarian goods, and ensures the movement of citizens both inside the country and outside its borders.

Considering the fact that the activity of air transport in our country is completely stopped, and the use of sea transport is extremely limited, many companies had to face the need to develop new cargo delivery routes. The task is complicated by the constant increase in fuel prices, tariff rates, and the growth of other costs.

The object of analysis in the second section of the work was the activity of Pulsar Expo enterprise. This is a company that has been operating on the Ukrainian market for almost ten years. The company is engaged in the supply and sale of special vehicles, repair, maintenance, supply of spare parts, etc. The last few years, like many Ukrainian companies, have been difficult, but the activity of the Pulsar Expo company can be characterized as positive, as the company has been profitable in the last two years.

The main routes of cargo delivery to Ukraine take place with the participation of road transport from European countries. However, the new task that must be solved by Pulsar Expo specialists is the development of optimal routes for the delivery of valuable automobile spare parts from China with the participation of air transport.

CHAPTER 3

DEVELOPMENT OF PROJECT PROPOSALS FOR THE ORGANIZATION OF A MIXED DELIVERY ROUTE WITH THE PARTICIPATION OF AIR TRANSPORT

3.1 Designing a cargo delivery route

The task that must be solved by the transport and logistics department of the Pulsar Expo company is the formation of a chain of cargo delivery in a mixed connection, with the participation of air transport. The point of shipment is the city of Beijing, China. It is necessary to deliver the cargo to Kyiv. From Beijing, deliveries will be made by air transport to European airports. Košice (Slovakia), Warsaw and Krakow (Poland) airports were determined to be the most optimal in terms of location. Therefore, the variations of the delivery routes will be as follows:

- 1) Beijing - air transport - Warsaw - road transport - Kyiv;
- 2) Beijing - air transport - Krakow - road transport - Kyiv;
- 3) Beijing - air transport - Kosice - road transport - Kyiv.

When forming the car delivery sectors, it is planned that the border crossing with Ukraine will take place in Jagodyn for deliveries from Warsaw, at the Berezno checkpoint for deliveries from Kosice, and in Krakowec or Szegyna for deliveries from Krakow.

Alternative routes for cargo delivery from the airports of Warsaw, Krakow and Kosice are presented in Fig. 3.1.

When choosing the optimal delivery route, it is necessary to take into account all the associated costs along the delivery chain, because the rates for service at airports are different, which also significantly affects the total cost of the route and the road transport sector. It is advisable to take into account the cost and delivery time when evaluating routes.

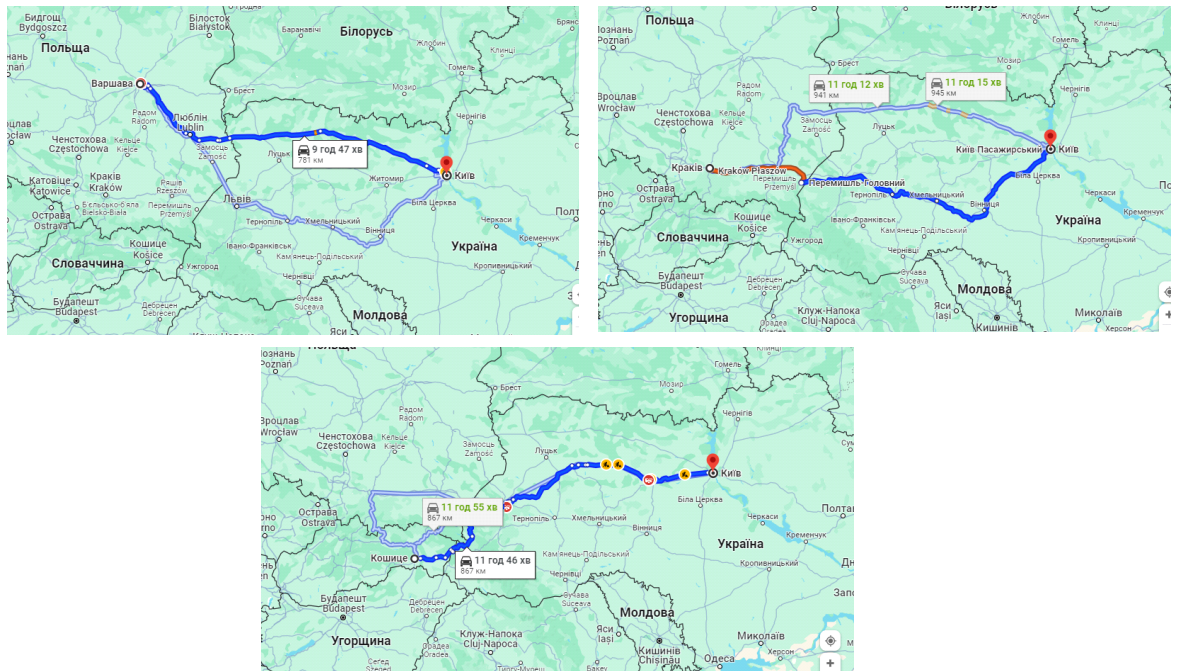


Figure 3.1 - Alternative delivery routes by road transport from various airports

Source: developed by author

In order to evaluate each route in detail, we will display all the components of the delivery chain, taking into account non-transportation works, with the indication of the time and cost of work on each segment of the chain. Detailed information on the routes is summarized in Table 3.1.

Table 3.1 - Cargo delivery works in the direction of Beijing-Kyiv

№ of work		Work characteristics	Cost, USD	Time, days
1	2	Preparation of documents, loading of vehicles and delivery to Beijing airport	550	1,0
2	3	Customs clearance of cargo at Beijing airport and temporary storage in a warehouse	470	2,0
3	4	Preparation of documents and loading of air transport	235	0,5
4	5	Delivery by air transport to Warsaw airport	3450	0,5
4	6	Delivery by air transport to Krakow airport	3780	0,5
4	7	Delivery by air transport to Kosice airport	3368	0,5

The end of the Table 3.1

5	8	Unloading and temporary storage in a warehouse at the Warsaw airport	652	1,0
6	9	Unloading and temporary storage in a warehouse at the Krakow airport	615	1,0
7	10	Unloading and temporary storage in a warehouse at the Kosice airport	545	0,7
8	11	Release of cargo and loading on road transport (Warsaw)	240	0,5
9	12	Release of cargo and loading on road transport (Krakow)	220	0,5
10	13	Release of cargo and loading on road transport (Kosice)	215	0,5
11	14	Delivery by road from Warsaw to Kyiv	795	1,5
12	14	Delivery by road from Krakow to Kyiv	820	2,0
13	14	Delivery by road from Kosice to Kyiv	810	2,0
14	15	Customs clearance of cargo by a customs broker	400	1,5
14	16	Customs clearance of cargo by own forces	200	3,0
15	17	Delivery across Kyiv to the destination warehouse	50	0,2
16	17			

Source: developed by author

Taking into account the fact that the number of options for delivery schemes determines the number of parameter values, in this example there will be six of them.

The time and cost parameters for each delivery scheme are determined by the sum of the corresponding values. The concept of integral total cost is introduced separately - a parameter that also takes into account the cost of the cargo and the integral estimate of time. This indicator is calculated according to the formula (3.1).

$$C' = (C_{cargo} + C_T)(1 + \Delta)^n \quad (3.1)$$

where C' - assessment of the cost of the cargo and its delivery, taking into account the time factor (integral assessment);

C_{cargo} - the purchase price of the cargo;

C_T - transportation cost;

$(1 + \Delta)^n$ - multiplier of interest accrual by interest rate Δ by n periods, $n = \frac{T}{365}$.

In Fig. 3.2 presents the construction of a net graph, which represents alternative ways of delivery.

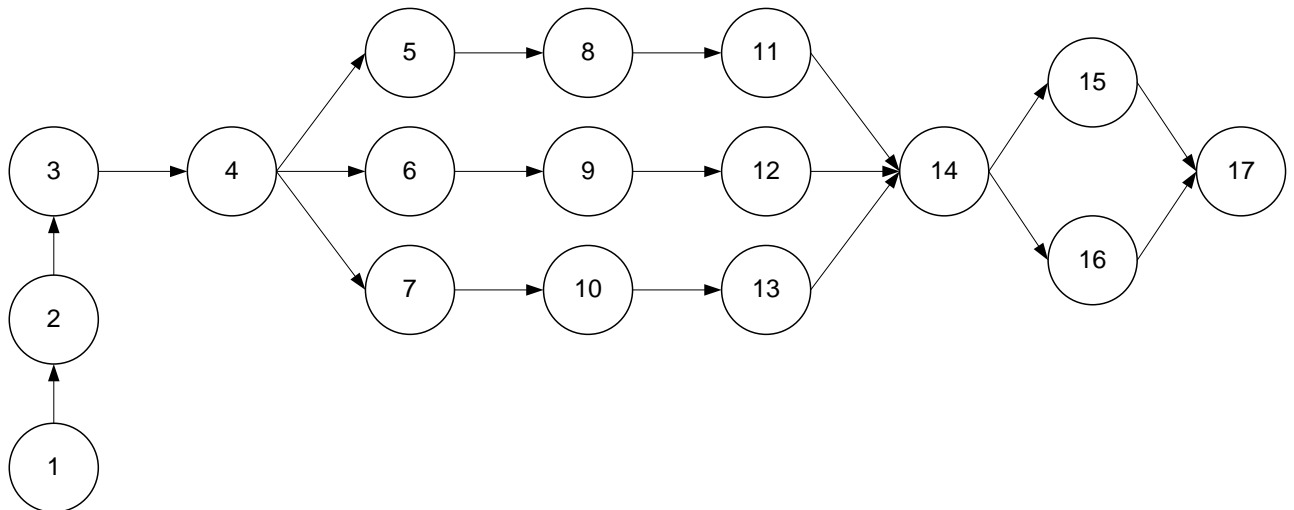


Figure 3.2 – Network graph of cargo delivery schemes on the Beijing - Kyiv route

Source: developed by author

It is known that the average bank rate for short-term currency loans is 17% per year. The cost of the cargo is 17,000 usd. For further calculations, it is necessary to calculate the time, cost and total cost for each alternative delivery route. The results of calculations are given in Table 3.2.

Table 3.2 - Results of parameter calculation for alternative delivery routes

№ of alternative delivery routes	Delivery scheme according to the network graph	Transportation costs C_T , USD	Time T , days	Integral total cost C' , USD
1	1-2-3-4-5-8-11-14-15-17	6842	<u>8,7</u>	23931,39

The end of the Table 3.2

2	1-2-3-4-6-9-12-14-15-17	7140	9,2	24235,72
3	1-2-3-4-7-10-13-14-15-17	6643	8,9	23733,69
4	1-2-3-4-5-8-11-14-16-17	<u>6642</u>	10,2	23745,96
5	1-2-3-4-6-9-12-14-16-17	6940	10,7	24050,44
6	1-2-3-4-7-10-13-14-16-17	6443	10,4	<u>23548,11</u>

Source: developed by author

Analysis of the calculation results shows that the most attractive delivery route when transporting a batch of cargo will be:

- according to the "cost" parameter - the fourth delivery scheme, transportation through the Warsaw airport with customs clearance by own;

- according to the "time" parameter - the first delivery scheme, transportation through the Warsaw airport with cargo clearance by a customs broker;

- according to the parameter "integral total cost" - the sixth delivery scheme, transportation through the Kosice airport with customs clearance of the cargo by own.

But, in the case when all criteria have the same value, it is necessary to use decision-making criteria under conditions of uncertainty. To obtain the results of the comparison, it is necessary to bring the parameters of Table 3.2 into a relative form by dividing the elements of each column by the minimum value. The results of this transformation are summarized in the Table 3.3.

Table 3.3 - Relative values of parameters along the Beijing - Kyiv route

№ of alternative delivery routes	Delivery scheme according to the network graph	Relative parameter values		
		<i>T</i>	<i>C</i>	<i>C'</i>
1	1-2-3-4-5-8-11-14-15-17	1,062	1,000	1,016
2	1-2-3-4-6-9-12-14-15-17	1,108	1,057	1,029

The end of the Table 3.3

3	1-2-3-4-7-10-13-14-15-17	1,031	1,023	1,008
4	1-2-3-4-5-8-11-14-16-17	1,031	1,172	1,008
5	1-2-3-4-6-9-12-14-16-17	1,077	1,230	1,021
6	1-2-3-4-7-10-13-14-16-17	1,000	1,195	1,000

Source: developed by author

The general view of the matrix is shown in Fig. 3.2.

	S_1	S_2	...	S_i	...	S_n
R_1	V_{11}	V_{12}	...	V_{1i}	...	V_{1n}
R_2	V_{21}	V_{22}	...	V_{2i}	...	V_{2n}
...
R_j	V_{j1}	V_{j2}	...	V_{ji}	...	V_{jn}
...
R_m	V_{m1}	V_{m2}	...	V_{mi}	...	V_{mn}

Figure 3.2 - General view of the matrix of possible results

We will decoding the markings in the given matrix:

Rows – possible actions R_j (alternative delivery routes);

Columns – possible states of nature S_i (delivery criteria);

The elements of matrix – the result of choosing the j th action and realizing the i th state V_{ji} .

Next, the values of the needed criteria for the specified parameters are determined.

1. Laplace criterion.

All states of nature $S_i (i = \overline{1, n})$ are assumed to be equally probable All states of nature are assumed to be equally probable. The probability q_i is determined by the formula $q_i = \frac{1}{n}$, i.e. it will be equal: $q_i = \frac{1}{3}$.

The average arithmetic value of losses (M1) is calculated according to formula (3.2) for all variants of delivery routes.

$$M_j(R) = \frac{1}{n} \sum_{i=1}^n V_{ji} \quad (3.2)$$

For example, for the first delivery route, M1 is:

$$M1 = 1/3 \times (1,062 + 1,000 + 1,016) = 1,026.$$

The minimum value of M_j will correspond to the desired delivery option.

All the results of further calculations of this criterion are reduced to Table 3.4.

Table 3.4 - Results of parameter calculations according to the Laplace criterion

№ of alternative delivery routes	Criterion value ($M_j(R)$)
1	1,026
2	1,065
3	<u>1,021</u>
4	1,071
5	1,109
6	1,065

Source: developed by author

2. Wald criterion.

It is based on the principle of greatest caution.

In the case when the result V_{ji} represents losses, the minimum criterion is used when choosing the optimal strategy.

It is necessary to find the largest element $\max\{V_{ji}\}$ in each row at the first stage, and then the action R_j (row j) is selected, which will correspond to the smallest element of these largest elements:

$$W = \min_j \max_i \{V_{ji}\} \quad (3.3)$$

So, we need to determine the largest element in each row.

So, for the first route, the largest value is 1,062, for the second – 1,108, etc.

The results of calculations are summarized in Table 3.5.

Table 3.5 - Results of parameter calculations according to the Wald criterion

№ of alternative delivery routes	Criterion value ($M_j(R)$)
1	1,062
2	1,108
3	<u>1,031</u>
4	1,172
5	1,230
6	1,195

Source: developed by author

3. Savage criterion.

It is based on the use of a risk matrix, the elements of which are determined by the formula:

$$r_{ji} = V_{ji} - \min_j \{V_{ji}\} \quad (3.4)$$

r_{ji} is the difference between the values of V_{ji} and the best (minimum) value in column i . It is recommended to choose the strategy for which the value of the risk will take the smallest value in the most unfavorable situation.:

$$W = \min_j \max_i \{r_{ji}\} \quad (3.5)$$

Then, among the selected elements, the largest one is chosen.

For example, for the first route:

$$r_{11} = 1,062 - 1,000 = 0,062;$$

$$r_{12} = 1,000 - 1,000 = 0;$$

$$r_{13} = 1,016 - 1,000 = 0,016.$$

Maximum value is 0,062.

We form a risk matrix and calculate the value of the criterion (Table 3.6).

Table 3.7 – Risk matrix and results of parameter calculations according to the Savage criterion

№ of alternative delivery routes	r_{j1}	r_{j2}	r_{j3}	Max r_{ji}
1	0,062	0,000	0,016	0,062
2	0,108	0,057	0,029	0,108
3	0,031	0,023	0,008	<u>0,031</u>
4	0,031	0,172	0,008	0,172
5	0,077	0,230	0,021	0,230
6	0,000	0,195	0,000	0,195

Source: developed by author

4. Hurwitz criterion

It is based on the following two assumptions: nature can be in the most unfavorable state with probability $(1 - \alpha)$ and in the most favorable state with probability α , where α is the confidence coefficient. If the elements of the matrix represent losses, then choose an action that fulfills the following conditions:

$$W = \min_j \left[\alpha \min_i V_{ji} + (1 - \alpha) \max_i V_{ji} \right] \quad (3.6)$$

This criterion establishes a balance between cases of extreme optimism and pessimism by weighting these two ways of behavior with the corresponding weights $(1 - \alpha)$ and α , where $0 \leq \alpha \leq 1$. The value of α is determined depending on the

tendency of the decision-maker to be optimistic or pessimistic . If there is no pronounced tendency, $\alpha=0,5$ is most often used.

To determine the desired delivery option according to this criterion, you need to find the sum of the products of the smallest and largest value by the coefficient $\alpha=0.5$.

So, for the first delivery option: $0,5 \times 1,062 + 0,5 \times 1,000 = 1,031$.

The results of further calculations are summarized in the Table 3.7.

Table 3.7 - Results of parameter calculations according to the Hurwitz criterion

№ of alternative delivery routes	$[\alpha \min_i V_{ji} + (1 - \alpha) \max_i V_{ji}]$
1 (1)	1,031
1 (2)	1,069
1 (3)	<u>1,019</u>
1 (4)	1,090
2 (5)	1,126
2 (6)	1,098

Source: developed by author

The results of all calculations according to all criteria are summarized in the resulting Table 3.8.

Table 3.8 - Choosing a delivery scheme based on decision-making criteria under conditions of uncertainty

№ of alternative delivery routes	Laplace criterion	Wald criterion	Savage criterion	Hurwitz criterion
1	1,026	1,062	0,062	1,031
2	1,065	1,108	0,108	1,069

The end of the Table 3.8

3	<u>1,021</u>	<u>1,031</u>	<u>0,031</u>	<u>1,019</u>
4	1,071	1,172	0,172	1,090
5	1,109	1,230	0,230	1,126
6	1,065	1,195	0,195	1,098
Minimal value	1,021	1,031	0,031	1,019
Delivery route	3	3	3	3

Source: developed by author

Thus, according to the obtained results, it is necessary to choose the third option of the delivery route. This option involves delivery by air transport to Kosice airport and car transportation to Kyiv with cargo clearance by a customs broker.

3.2 Information support of the quality of transportation process

In the modern world, the possession of information has become very important, and therefore the trend of recent years in almost all branches of the economy is digitization. The information infrastructure of enterprises becomes vitally important for ensuring the management of information flows. The insufficient level of automation of processes at the enterprise leads to the emergence of a number of problems, namely:

- the occurrence of a large number of errors due to the human factor;
- duplication of information and, because of this, excessive volumes of databases;
- insufficient flexibility and speed of business processes;
- opacity of supply chains;

- loss of market opportunities and, as a result, market positions;
- insufficient communication with stakeholders.

The analysis of the Pulsar Expo company's activities showed that the digitization processes are still in the initial stages and this affects the company's efficiency as a whole. This especially applies to the processes of organization and management of transportation, especially automobile transportation, since the internal organs make up a significant share of the total volume of transportation. The main task is to find carriers and establish a transparent and flexible transport process.

Together with the development of the Internet of Things [37], artificial intelligence (AI) and solutions for data processing and management based on cloud computing, the possibilities of digitization and automation of transport are constantly growing [32].

Digitalization of road transport means the use of modern technologies for the collection, processing and exchange of data related to the fulfillment of transport orders. In practice, this is often related to current data about the transported cargo, the vehicle used, the route, the driver's working hours, as well as the work performed. On the other hand, automation uses tools to eliminate or maximally limit human participation in certain processes, which positively affects the quality of service and significantly reduces the risk of human errors.

Digitization and automation of transport are complex processes, but the associated benefits are enormous. Together with the growing demand for fast, safe and efficient transportation, they are one of the key factors for increasing the company's competitive advantage in the market.

Modern trends in digitalization of transport include computerization of processes in the broad sense and optimization of the transport network. There is a constant increase in the popularity of digital platforms for carriers, as well as a growing interest in the use of artificial intelligence in transport processes and data analysis in logistics.

Telematics and TMS (Transport Management System) invariably play an important role in process automation. Telematics is a set of tools that allows you to

collect and analyze data about vehicles, which positively affects the efficiency of fleet management and allows you to track vehicles in real time. Telematics solutions, such as Gbox Assist, allow operators to monitor the most important parameters, such as fuel consumption and track the working hours of their drivers. Speaking of new products, it is also worth mentioning ETA (Estimated Time of Arrival), that is, the estimated time of arrival at the destination. ETA Smart - a feature from Inelo Group - is a leading example of this technology, which not only provides a detailed estimate of arrival time, but also takes into account working hours and includes mandatory rest.

In turn, TMS systems are tools that offer functions such as the automation of logistics processes, such as planning and organizing transportation, assigning and tracking orders, and maintaining documentation. Software such as fireTMS offers a number of modern options for dispatching, logistics and accounting, as well as functionality to improve and accelerate contact with the driver.

The introduction of modern technologies in road transport provides many advantages for both carriers and their customers. These innovations allow transport companies to increase the number of deliveries, while avoiding the need to increase costs. Automation and digitalization of road transport allows to reduce the time of order fulfillment and increase control over cargo. In practice, the advantages of introducing modern technologies in road transport are invaluable, and their use has even become necessary to maintain a high level of services and maintain competitiveness in the market.

Modern transportation technology is also a way to overcome unresolved problems such as driver shortages and rising costs. Digitization and automation contribute to increasing the efficiency of the use of the working time of drivers and the company's fleet (in particular, by reducing the number of empty runs).

In times of rapid technological development and progressive digitalization, more and more industries are using platform solutions that facilitate more efficient information exchange and service provision. The transportation industry is not far

behind, so digital platforms for carriers to post and search for transportation offers are gaining popularity. Their main functions and advantages are as follows:

- easy search and comparison of offers: digital platforms allow potential customers to more easily find available transport options and compare prices and services offered by different carriers;
- automated process of ordering transport services;
- order tracking capabilities;
- simplified management of documentation such as invoices, receipts and customs documents;
- ratings and opinions: Digital platforms allow customers to rate and express their opinions, which helps other customers in choosing the right service provider.

Digital platforms for operators are particularly convenient for small and medium-sized enterprises, allowing them to compete effectively with larger, more technologically advanced companies.

One of the companies offering digital platform solutions for organizing the transport process is CargoON. The founder of this brand is Trans.eu Group S.A. This company was founded in 2004 and from the very beginning saw the development of freight exchanges in Europe and the introduction of digital platforms as its mission. The company also provided road transport management services, providing a platform for interaction and cooperation between manufacturers, shippers, carriers, forwarders and logistics operators. Today, the company unites the largest network of transport subcontractors throughout Europe. 25,000 transport companies and logistics providers provide 30% of European international transport and unite 150,000 professional drivers. The company's services are also used by 9,000 forwarding companies and 6,000 shippers.

The company offers on its platform the management of transport requests, digital fulfillment of requests, management of time slots, conducting tenders and generating reports (see Fig. 3.3). Also, in Fig. 3.4 we can see the interface of the CargoON program.

FREIGHTS
Seamless creation and communication up to freight order acceptance

VISIBILITY
CargoON is a complete system for transport execution including: freight .statuses, incidences and claims

DOCK SCHEDULER
When your carriers are unable to meet your needs, thanks to the platform you can .flexibly tap into available capacity

SIMPLE TENDERS
Simple and quick tenders among your trusted carriers or among the Trans.eu community, which brings together .thousands of potential new associates

REPORTS
As part of CargoON, BI reports are available, that will change your view of .logistic processes

Figure 3.3 – CargoON services

Source: [24]

Driving towards operation: B - unloading
ETA at place B: 16:15 (delay 02h 15min)
TT 2 min ago

Time	Location	Event	Task
02.10.2020, 15:00	Remaining distance 520 km		02.10.2020, 15:00
02.10.2020, 12:06	Remaining distance 445 km		02.10.2020, 12:06
		Traffic jam at the border crossing	TransTask
		Delay: 14 min, 12 km	
02.10.2020, 15:38	PL, 53-022 Wrocław	Vehicle movement after stopping	TransTask
02.10.2020, 15:09	PL, 53-022 Wrocław	Failure	TransTask
		Delay: 415 min	
02.10.2020, 12:55	DE, 97233 Alfeld-Wendebach	Vehicle movement after stopping	GPS
		Loading	Planned: 02.10.2020, 12:30 Arrived: 12:04
02.10.2020, 12:54		Departure from operation area	TransTask
02.10.2020, 12:04		Entry into the loading zone	TransTask
10.05.2018, 10:03	PL, 53-022 Wrocław, Katowice	Task in progress	TransTask

Figure 3.4 – Interface of CargoON

Source: [24]

One of the company's tasks is to increase the efficiency of the supply chain, which depends on the time required to complete the entire process of delivering products from the supplier to the consumer (or in the reverse direction if we talk about reverse logistics). Acceleration of this process is possible with the use of appropriate infrastructure, especially IT.

In the process of managing the supply chain, you can understand that its individual links are not the same in time and therefore require harmonization, which, in turn, can reduce stocks.

Supply chain management should aim to ensure that information flows between links in the right form, in the right space and at the right time. In particular, issues such as ensuring a sufficient level of stock of materials or raw materials, determining the terms of fulfillment of orders or guaranteeing cash flows to ensure stocks are important.

Supply chain management is based primarily on organizing work in such a way as to ensure the exchange of information in real time. From the very beginning, supply chain management should be based on building strong relationships, achieving full transparency and integrating information flows with customers and suppliers. This will help to improve the coordination of the flow of goods and reduce transport costs. In addition, it will accelerate sales and improve customer service. Transparent logistics and supply chain management is possible today mainly thanks to IT systems. The key point here is modern technology. They must coordinate the individual links of the chain in such a way that everything is interconnected: from planning to warehousing, sales, transportation and customer service.

The use of the services of the CargoON digital platform is provided on the basis of an annual subscription. Before that, the package of services, the number of system users, the conditions for supporting the implementation of the project and individual settings for business are discussed. It should be noted that an additional fee will be charged for additional users during the period.

For the successful implementation of the project in the company's activities, it is necessary to form a systematic approach to its implementation. At the first stage, it

is necessary to appoint the main person responsible for the project for clear management and coordination, and the group that will deal with its implementation. The next stage is to draw up a clear project plan with the allocation of tasks and goals at each step. It is mandatory to highlight the main goal of project implementation with the indication of quantitative indicators, which will be used to measure the effectiveness of its implementation.

In Fig. 3.5 presents the conceptual stages of project implementation.

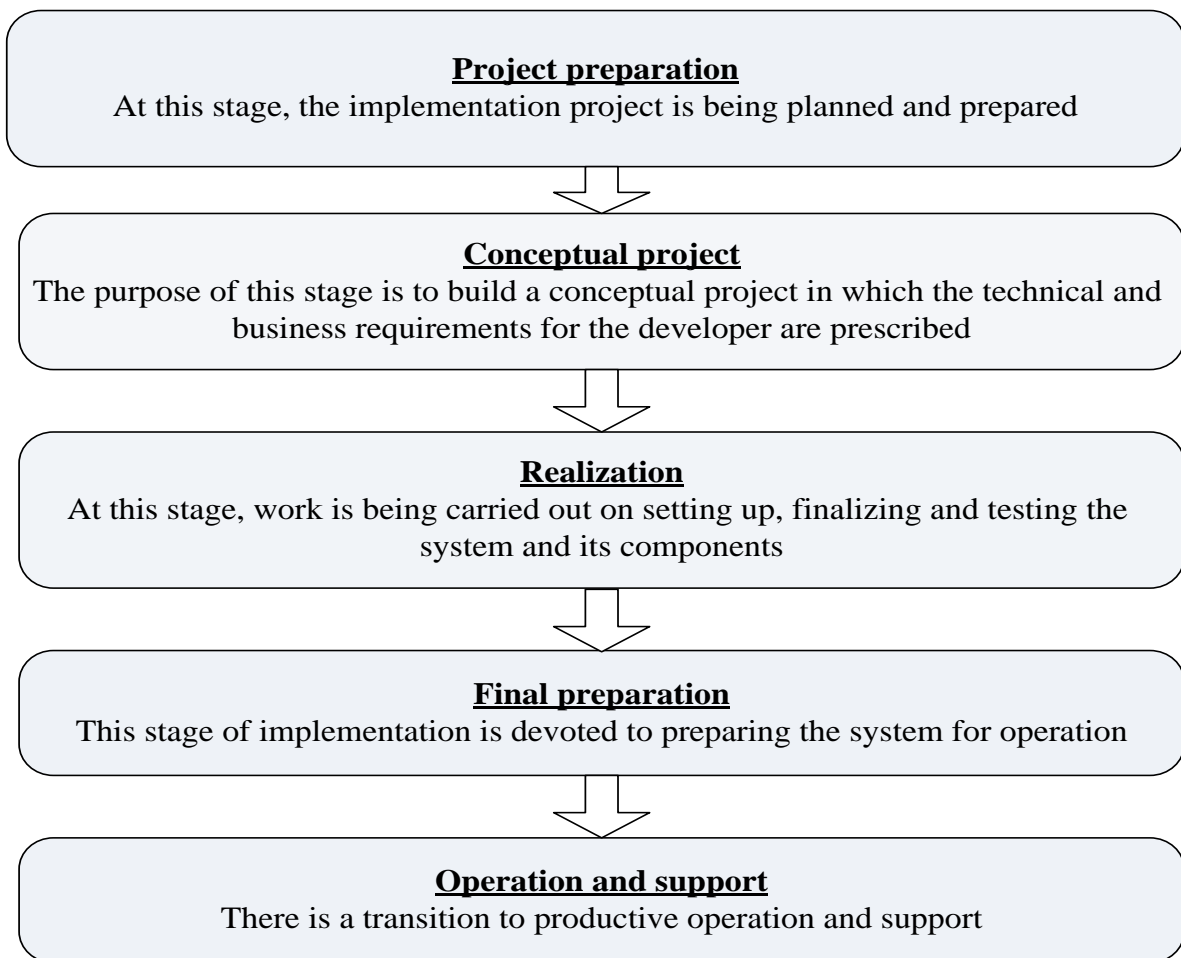


Figure 3.5 – Stages of project implementation

Source: developed by the author

In the phase of project preparation, the transformation of an abstract idea into a meaningful goal takes place. At this stage, you need to develop a business case and outline the project at a broad level. To do this, it is necessary to determine the need for the project and create a project plan.

A project plan is an important document that consists of details such as project constraints, objectives, appointment of a project manager, budget, expected schedule, etc.

When the goals and scope of the project are specified, it is necessary to identify the key stakeholders of the project - the people who will be involved in the project. A stakeholder register is created with roles, assignments, communication requirements and influence.

Although a clear project goal is established at this stage, the project charter does not contain any of the technical details that occur in the planning stage.

The conceptual design stage requires complete diligence as it describes the project's road map. If modern project management methodology is not used, such as flexible project management, the second stage of project management is expected to take almost half of the entire project time period.

At this stage, the main tasks are to define technical requirements, develop a detailed project schedule, create a communication plan and establish goals/results.

A detailed project schedule with each deliverable is another important element of the planning phase. Using this schedule, project managers can develop a project communication plan and a schedule for communicating with relevant stakeholders.

Risk mitigation is another important aspect of project management that is part of the planning phase. The project manager is responsible for extrapolating past data to identify potential project management risks and develop a strategy to minimize them.

An important element that professionals often forget is an effective change management plan. The project manager must be ready to make some changes to the project to avoid bottlenecks and project delays.

In the absence of a change management work plan, scope creep occurs, which causes huge problems for the project team in later stages of the project. Therefore, it is best to minimize the possibility of unforeseen changes as much as possible.

At the project implementation stage, the team performs actual work. The project manager's job is to establish effective work processes and closely monitor the team's progress.

Another responsibility of the project manager at this stage is to constantly support effective cooperation between the project stakeholders. This ensures that everyone stays on the same page and the project runs smoothly without any issues.

During the management of the project implementation, its manager performs constant monitoring and control to ensure that no one deviates from the original plan by establishing critical success factors (CSFs) and key performance indicators (KPIs).

When monitoring project management, the manager is also responsible for quantitatively tracking efforts and costs during the process. This tracking not only ensures that the project stays within budget, but is also important for future projects.

After the project has been implemented and the stage of system operation has come, the implementation team must draw up a report in which every aspect of its implementation will be highlighted. This is necessary in order to document the successes and failures during the implementation of the project to improve the overall productivity of the team in the future.

3.3 Evaluation of the economic efficiency of the developed project proposals

The implementation of any project takes place after evaluating its effectiveness, when companies try to determine whether it will be cost-effective. In the scientific literature, there are many methods of evaluating the effectiveness of the project. Let's consider some of these approaches.

However, before evaluating the economic efficiency, it is necessary to determine the project budget and forecast the costs associated with it. Such financial

flows can be one-time in the form of investments or permanent (support and maintenance costs).

When introducing the CargoON electronic platform into the Pulsar Expo company's operations, the primary expenses will be allocated to the registration of the subscription, because the use of this service is provided according to this scheme. It is also necessary to plan costs for modernization of technical equipment, software, personnel training, technical service and support, etc. Possible investments in the project are listed in the Table 3.9.

Table 3.9 – Possible financial investments in the project, UAH

№	Cost item	1 year	2 year	3 year	4 year	5 year	Total
1	2	3	4	5	6	7	8
1	Registration of an annual subscription for the use of the service	75000	0	0	0	0	75000
2	Modernization of technical equipment	36000	0	0	0	0	36000
3	Software modernization	35000	0	0	0	0	35000
4	Costs for integrating the system into the company's work	10000	0	0	0	0	10000
5	Personnel training costs	10000	0	0	0	0	10000
6	System audit	0	15000	0	0	0	15000
7	Maintenance and support costs	3000	9000	9000	9000	9000	39000
8	Study of the opinions of stakeholders regarding the results of using the system	0	15000	0	0	0	15000

The end of the Table 3.9

1	2	3	4	5	6	7	8
9	Costs for additional system users	10000	10000	10000	10000	10000	50000
10	Total	179000	49000	19000	19000	19000	285000

Source: developed by the author

The purpose of evaluating any project is to answer the question: do the future revenues of the project justify the current costs.

The theory of investment analysis involves the use of a certain system of analytical methods and indicators, which together make it possible to reach a fairly objective conclusion about the effectiveness of the project [45]. Five main methods are most often used. In turn, they can be combined into two groups:

1. Methods based on the application of discounting:

- the method of determining the net present value;
- method of calculating return on investment;
- method of calculating the internal rate of return.

2. Methods that do not involve the use of the concept of discounting (simple methods):

- method of calculating the investment payback period;
- a method of determining the return on investment.

A necessary condition for the assessment is also the assumption that all costs and all results that will be associated with the analyzed investment projects are of a monetary nature.

The first indicator that we will apply is Net Present Value - NPV. This is the most famous and most used criterion [41]. There are other names of discounted net benefits in the literature.

NPV is the difference between the future value of the expected flow of benefits and the present value of the present and future costs of the project throughout its life

cycle. NPV is discounted value of the project (current value of income or benefits from investments).

To calculate a project's NPV, you need to determine the discount rate, use it to discount the stream of costs and benefits, and sum up the discounted benefits and costs. In financial analysis, the discount rate is usually the cost of capital for the firm. In economic analysis, the discount rate is the basic cost of capital, that is, the profit that can be obtained by investing in the most profitable alternative projects.

If the result of the NPV calculation is positive, the project can be recommended for financing. In a situation where the NPV is equal to zero, it will mean that the income from the project will be enough only to restore the invested capital. In the event of a situation where the NPV is less than zero, the recommended project should not be accepted for implementation, or the financing articles should be revised. NPV is calculated using the formula:

$$NPV = \sum_{t=1}^n \frac{I_t - O_t}{(1+r)^t} \quad (3.7)$$

where I_t , - incoming financial flows of the project per year t;

O_t , - outgoing financial flows of the project per year t;

r – discount rate;

n – the life span of the project.

We will calculate the net present value according to three scenarios - pessimistic, optimistic and realistic. We will present the calculations themselves in tabular form (Table 3.10).

Table 3.10 – Calculation of the Net Present Value of the project, UAH

Year	Income flow	Outcome flow	Net benefits	Discount rate r=15%	Discounted net benefits	Discount rate r=25%	Discounted net benefits
t	I_t	O_t	CF_t	$1/(1+r)^t$		$1/(1+r)^t$	
Pessimistic scenario							
1	40890	179000	-138110	0,870	-120095,7	0,800	-110488,0

The end of the Table 3.10

2	60030	49000	11030	0,756	8340,26465	0,640	7059,2
3	74820	19000	55820	0,658	36702,55609	0,512	28579,8
4	85260	19000	66260	0,572	37884,37005	0,410	27140,1
5	97440	19000	78440	0,497	38998,54312	0,328	25703,2
				NPV	1830,1	NPV	-22005,6
Realistic scenario							
1	47000	179000	-132000	0,870	-114782,6	0,800	-105600,0
2	69000	49000	20000	0,756	15122,87335	0,640	12800,0
3	86000	19000	67000	0,658	44053,58757	0,512	34304,0
4	98000	19000	79000	0,572	45168,5064	0,410	32358,4
5	112000	19000	93000	0,497	46237,43638	0,328	30474,2
				NPV	35799,8	NPV	4336,6
Optimistic scenario							
1	51700	179000	-127300	0,870	-110695,7	0,800	-101840,0
2	75900	49000	26900	0,756	20340,26465	0,640	17216,0
3	94600	19000	75600	0,658	49708,22717	0,512	38707,2
4	107800	19000	88800	0,572	50771,68821	0,410	36372,5
5	123200	19000	104200	0,497	51805,81582	0,328	34144,3
				NPV	61930,3	NPV	24599,9

Source: developed by the author

In most cases, the amount of discounted net values has a positive value, which characterizes the project as one that will have a positive impact on the company and can be recommended for implementation.

The Internal Rate of Return (IRR) is also an important criterion for evaluating project efficiency [38]. A project's IRR is equal to the discount rate at which the total discounted benefits equal the total discounted costs, that is, the IRR is the discount rate at which the project's NPV is zero. The IRR is equal to the maximum interest on loans that can be paid for the use of the necessary resources, remaining at the break-even level.

The IRR calculation is performed by the method of successive approximations of the NPV value to zero at different discount rates. The formula for calculation is as follows:

$$IRR = A + \frac{a(B - A)}{(a - b)} \quad (3.8)$$

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

B – this is the value of the discount rate at which NPV becomes negative;

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

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

Pessimistic scenario. The discount rate at which NVP begins to take on a negative value is 16% (-1160.63). Accordingly, the IRR calculation will be as follows:

$$IRR = 15\% + \left(\frac{1830,1 \cdot (16 - 15)}{1830,1 - (-1160,63)} \right) \% = 15,61\%.$$

A realistic scenario. The discount rate at which NVP begins to take on a negative value is 27% (-311.45). Then, the IRR will be equal to:

$$IRR = 15\% + \left(\frac{35799,8 \cdot (27 - 15)}{35799,8 - (-311,45)} \right) \% = 26,89\%.$$

An optimistic scenario. The discount rate at which NVP begins to take on a negative value is 36% (-651.75). Calculation of IRR is as follows:

$$IRR = 15\% + \left(\frac{61930,3 \cdot (36 - 15)}{61930,3 - (-651,75)} \right) \% = 35,78\%.$$

Also, a very common method of determining IRR is the graphical method. For this, a graph of the dependence of the NPV value on the discount rate is constructed (see Fig. 3.6).

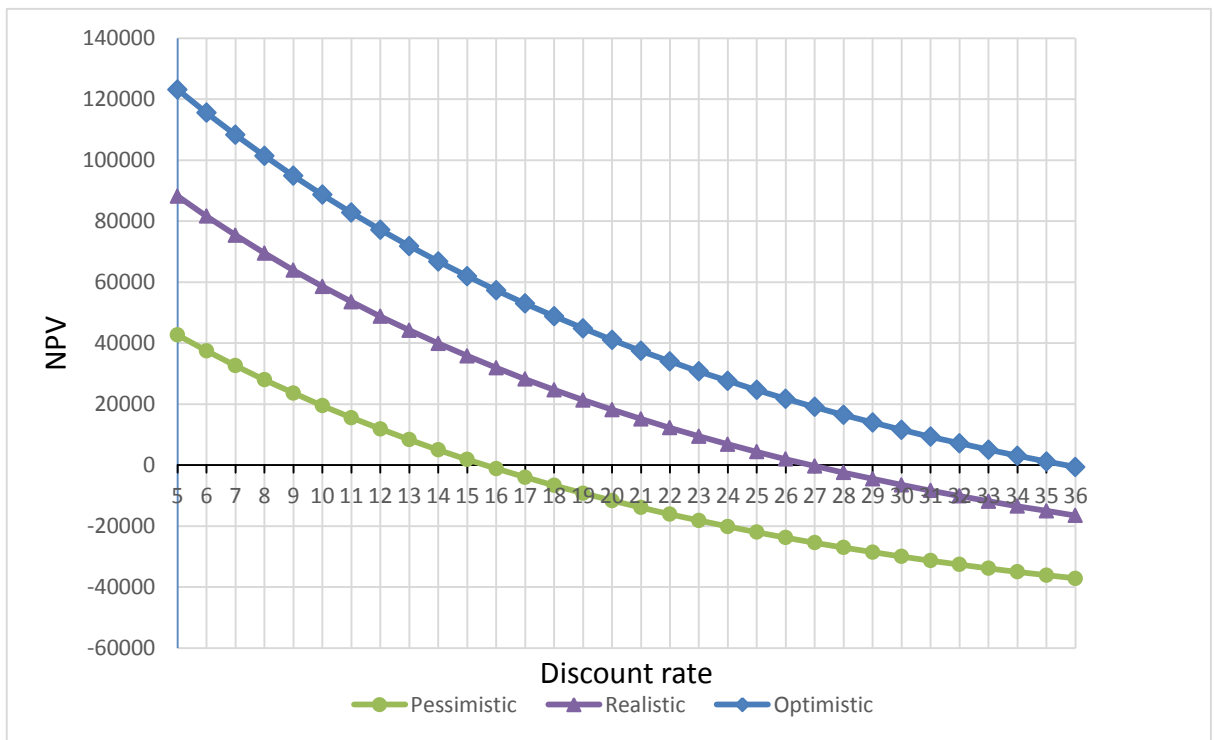


Figure 3.6 – A graphical method of determining IRR

Source: developed by the author

The graphic method confirms the results obtained by the formula method.

The current indicator of project effectiveness is the Payback Period (PP) [42]. The investment payback period means the time required for the amount of the incoming financial flow of the project to reimburse the investment for its implementation. This indicator can be calculated using the following formula:

$$PP = \min n \text{ за якого } \sum_{i=1}^n CF_i > IC \quad (3.9)$$

where IC - Invest Capital,

CF_i - Cash Flow in the year i , except current costs,

n – the number of time periods considered.

We will calculate this indicator in tabular form (Table 3.11).

Table 3.11 – Calculation of the Payback Period of the project

№	Time period (year), T	Invest Capital, IC	Cash Flow, CF	Financial flow in cumulative sum
1	Pessimistic scenario			
2	1	166000	37890	37890
3	2	166000	21030	58920
4	3	166000	65820	124740
5	4	166000	76260	201000
6	5	166000	88440	289440
7	Realistic scenario			
8	1	166000	44000	44000
9	2	166000	30000	74000
10	3	166000	77000	151000
11	4	166000	89000	240000
12	5	166000	103000	343000
13	Optimistic scenario			
14	1	166000	48700	48700
15	2	166000	36900	85600
16	3	166000	85600	171200
17	4	166000	98800	270000
18	5	166000	114200	384200

Source: developed by the author

Financial flows over time periods were determined as the difference between expected benefits and current costs, which were assumed at the level of UAH 3,000. in the 1st year, 39,000 UAH. in the 2nd year, 9,000 UAH. in the 3rd year, UAH 9,000. in the 4th year and UAH 9,000. in the 5th year. Capital investments at the beginning of the project amounted to UAH 166,000. Based on the calculations, we build graphs to more conveniently display the moment of the beginning of the predominance of cash flows over capital investments (Fig. 3.7).

According to the calculations, we see that the payback period of the project comes after the 3rd year according to all variants of the forecast.

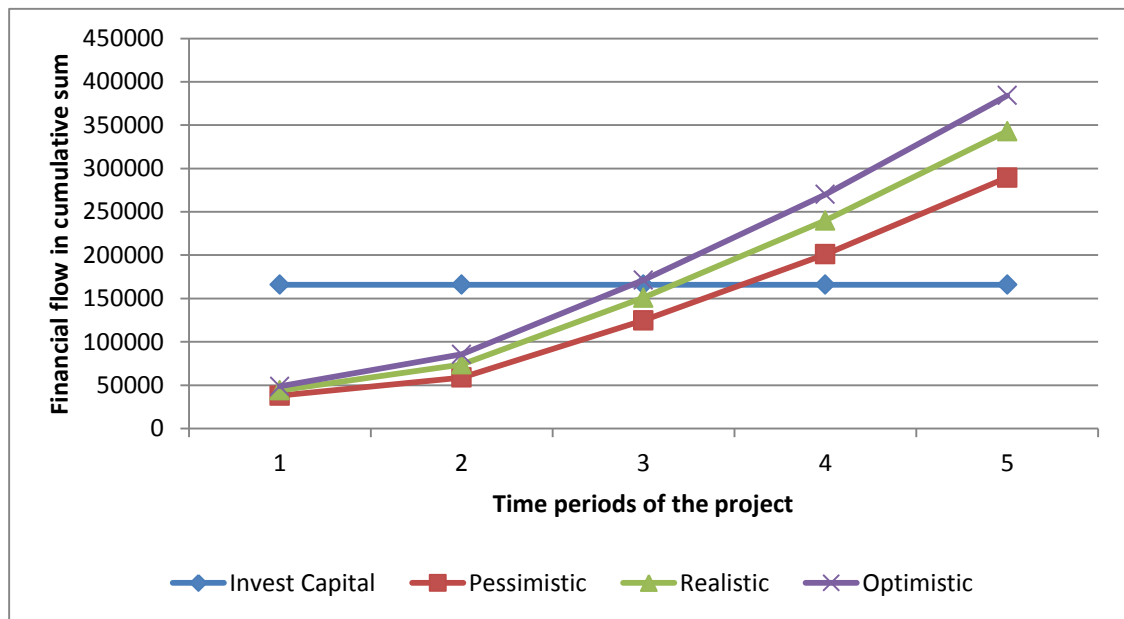


Figure 3.7 – Graphical interpretation of the payback period of the project

Source: developed by the author

Having evaluated the effectiveness of the project according to various indicators, it is possible to conclude that the project is viable and worth implementing in practice.

Chapter 3 summary

Therefore, in the design section of the qualification paper, proposals were developed regarding the organization of mixed transportation with the participation of air transport and the optimization of the information support of the company's functioning.

The analysis of the Pulsar Expo company's activities showed that there is a need to organize intramodal deliveries from China with the participation of air transport. This is explained by the need for expensive car spare parts and the need to deliver them to Ukraine as soon as possible. Also, air transportation ensures the greatest economy of cargo during transportation.

Since the starting point in the design of the delivery route is the city of Beijing, China, the development of alternative delivery schemes involved consideration of flights to the airports of Warsaw, Krakow and Kosice. These airports are international, have good infrastructure for handling air cargo and are located not far from Ukraine. However, different airports have different rates for ground handling, which affects the cost of the entire delivery route.

In the work, alternative cargo delivery schemes were calculated according to the "cost", "time" and "integral total cost" criteria. Since all these criteria are equally important when making the final decision regarding the choice of the route, the method of decision-making under conditions of uncertainty was applied. This made it possible to select the most optimal route, namely transportation through the Kosice airport.

Since the company's activities in the modern world require constant monitoring of both internal processes and processes of interaction with stakeholders, it was proposed to increase the efficiency of information support of the transport and logistics solution by introducing the CargoON digital platform into the company's work. This will make it possible to choose the most optimal car carrier faster due to the transparency of the platform and the tender approach. Such a platform will make it possible to optimize the company's internal processes by reducing errors due to the human factor, speeding up document flow and rational use of employees' time.

Since the implementation of such a platform in the company's activities will require some investments, the methods of calculating the economic efficiency of project proposals were applied. The indicators that were calculated in the work were Net Present Value, Internal Rate of Return and Payback Period. The calculated indicators showed the investment attractiveness of the proposed project.

CONCLUSIONS AND RECOMMENDATIONS

So, the qualification work on the topic "Organization of international cargo transportation by air" was completed on time and in accordance with the defined task. The topic of the research is relevant, since the design of delivery routes in mixed international traffic is the main task of the logistics of Ukrainian companies. The functioning of the economy largely depends on the efficiency of transport processes, and in conditions of limited resources, the search for the most optimal delivery schemes determines the efficiency of business as a whole.

In the first section of the qualification paper, the theoretical aspects of the organization of cargo transportation with the participation of air transport were investigated. The main subjects in the organization of such supply chains are consignors, consignees, carriers and transport forwarding companies. Their activities are regulated by a number of international and national laws, acts, regulations and other legal documents. The scope of activity for providing transport and forwarding services to the client includes such types of transportation as export from Ukraine, import to Ukraine, transit through the territory of Ukraine or through the territory of other states, internal transportation within the territory of Ukraine. Freight forwarders provide clients with services that are defined by the rules for carrying out transport and forwarding activities, as well as the contract of transport forwarding.

Multimodal transportation is one of the main types of organization of delivery chains today. The main feature of this type of transportation is the involvement of several types of transport. This type of transportation is the most optimal when implementing the "door-to-door" delivery concept. The majority of multimodal transportation in the main delivery area uses sea transport. The use of air transport has its advantages and features in relation to other types of transport. The biggest disadvantages will be the high cost of air transportation, but the main advantage remains the time and safety of delivery, which is most relevant for the delivery of specific, perishable or valuable goods.

In the second section of the qualification work, the prerequisites for the organization of the delivery route with the participation of air transport were analyzed. A very important condition for the existence of our state during the war is the functioning of the economy. Transportation provision is perhaps the most important condition for maintaining the vitality of the economy. It is difficult to overestimate the role of transport today. It provides the Armed Forces of Ukraine with everything necessary, transport delivers humanitarian goods, and ensures the movement of citizens both inside the country and outside its borders.

Considering the fact that the activity of air transport in our country is completely stopped, and the use of sea transport is extremely limited, many companies had to face the need to develop new cargo delivery routes. The task is complicated by the constant increase in fuel prices, tariff rates, and the growth of other costs.

The object of analysis in the second section of the work was the activity of Pulsar Expo enterprise. This is a company that has been operating on the Ukrainian market for almost ten years. The company is engaged in the supply and sale of special vehicles, repair, maintenance, supply of spare parts, etc. The last few years, like many Ukrainian companies, have been difficult, but the activity of the Pulsar Expo company can be characterized as positive, as the company has been profitable in the last two years.

The main routes of cargo delivery to Ukraine take place with the participation of road transport from European countries. However, the new task that must be solved by Pulsar Expo specialists is the development of optimal routes for the delivery of valuable automobile spare parts from China with the participation of air transport.

In the third section of the qualification paper, proposals were developed regarding the organization of mixed transportation with the participation of air transport and the optimization of the information support of the company's functioning.

The analysis of the Pulsar Expo company's activities showed that there is a need to organize intramodal deliveries from China with the participation of air transport. This is explained by the need for expensive car spare parts and the need to deliver them to Ukraine as soon as possible. Also, air transportation ensures the greatest economy of cargo during transportation.

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Since the company's activities in the modern world require constant monitoring of both internal processes and processes of interaction with stakeholders, it was proposed to increase the efficiency of information support of the transport and logistics solution by introducing the CargoON digital platform into the company's work. This will make it possible to choose the most optimal car carrier faster due to the transparency of the platform and the tender approach. Such a platform will make it possible to optimize the company's internal processes by reducing errors due to the human factor, speeding up document flow and rational use of employees' time.

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