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BASIC OF ENGINEERING LOGISTICS

Tutorial

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Структуру посібника подано в дев'яти розділах, які за змістом відповідають навчальному плану дисципліни "Дисципліна вибору 1. Основи інженерної логістики". Наведено чіткі означення наукових термінів, які використовуються в роботі, що виключає різне тлумачення через різне розуміння тих самих термінів.

Для студентів, що навчаються за спеціальністю «Прикладна механіка»

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The structure of the manual is presented in nine sections, which in content correspond to the curriculum of the discipline "Discipline of Choice 1. Fundamentals of Engineering Logistics." There are clear definitions of scientific terms that are used in the work, which excludes different interpretations due to different understanding of the same terms.

For students studying in the specialty "Applied Mechanics".

Fig. 10. Tab. 8. Bibliogr.: 10 ref.

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CONTENTS

1.THE ESSENCE OF LOGISTIC APPROACH

1.1. Logistics: history, concepts, novelty, specificity

The term "logistics" comes from the Greek word "logistike", which means "thinking, calculating, practicability". The Romans understood this term as the "distribution of food". In Byzantium, logistics was considered a way of organizing military supplies and managing the army. Historically, logistics, as a practical activity, developed due to military affairs. Thus, in the first millennium AD, the military vocabulary of a number of countries with logistics was associated with the activities of transport management, the arming of the army, the planning and supply of troops with material resources (MR), the content of stocks, etc. At the beginning of the 20th century, logistics was recognized as a military science. Logistic principles and models were widely applied during the First and Second World Wars. Thus, during the First World War, the Russian Empire used the models of troop transportation, supply and supply, developed by St. Petersburg scientists in the theory of transport logistics. During the Second World War, logistics was actively used in the material and technical supply of the US Army, which allowed for a clear interaction between the military industry, logistics and logistics bases and transport. **Like the research of operations, mathematical optimization, network models and other methods of applied mathematics, which showed their effectiveness in the military field, logistics gradually moved into the sphere of economic practice and became widely used in the economy by the 60s and 70s of the 20th century.**

There are several dozen definitions of the concept of logistics as economic activity. The broadest interpretation is understood by logistics as the management of all types of flows (material, human, energy, financial, etc.) that exist in economic systems. Managing any object implies first making a decision, and then implementing it. In order to make decisions, certain knowledge is necessary, and for practical implementation of the decisions taken, concrete actions are needed. Proceeding from this, let us consider logistics, on the one hand, as a science, and on the other hand, as an economic activity.

Logistics as a science develops scientific principles, methods, mathematical models that allow planning, controlling and managing the transportation, warehousing and other material and intangible operations performed in the process:

- bringing raw materials and materials to the production enterprise;
- Intrafactory processing of raw materials, materials and semi-finished products;

- finishing finished products (GP) to the consumer in accordance with its requirements;

- transfer, storage and processing of relevant information.

Logistics as an economic activity is the process of managing the movement and storage of raw materials, materials, semi-finished products and SOEs in the economic circulation from the primary source of raw materials to the final consumer of the GP, as well as information related to these operations.

Logistics allows on a scientific basis to solve many different tasks of varying complexity and scale. We list only a few of them:

- forecasting of demand and determination of the necessary stock on its basis, development of a stock management system (KM);

- determination of the necessary capacity of production and transport;

- organization of distribution of GP;

- management of transshipment processes and transport-warehouse operations at points of production and from consumers;

- modeling the functioning of logistics systems (LS);

- design of drugs;

- Planning and implementation of supply, production, storage, marketing, transportation;

- coordination of objectives and coordination of activities of individual enterprises in the supply chain and various units within the enterprise, etc.

The main object of logistics management, as an economic activity, is the through material flow, ie, the material flow (MP) (Fig. 1.1), **passing through the logistics chain** (LC), starting from the primary source of raw materials through all intermediate processes, to the end user.

During the passage through the logistics chain, the MP is brought to the enterprise, then its rational movement is organized through a chain of warehouse and production sites, after which the GP is brought to the consumer. The qualitative composition of the MP as it moves through the LC changes. Between the source of raw materials and the first processing enterprise, as well as between different production enterprises, mass uniform goods usually move: raw materials, materials, semi-finished products. Within the individual productions, various parts, blanks, semi-finished products move between the shops and inside the shops. At the end of LC consists of a variety of goods ready for use.

During the movement along the logistics chain (Fig. 1.2), the MP passes through the stages of procurement, supply, storage, production, distribution and consumption of SOEs.

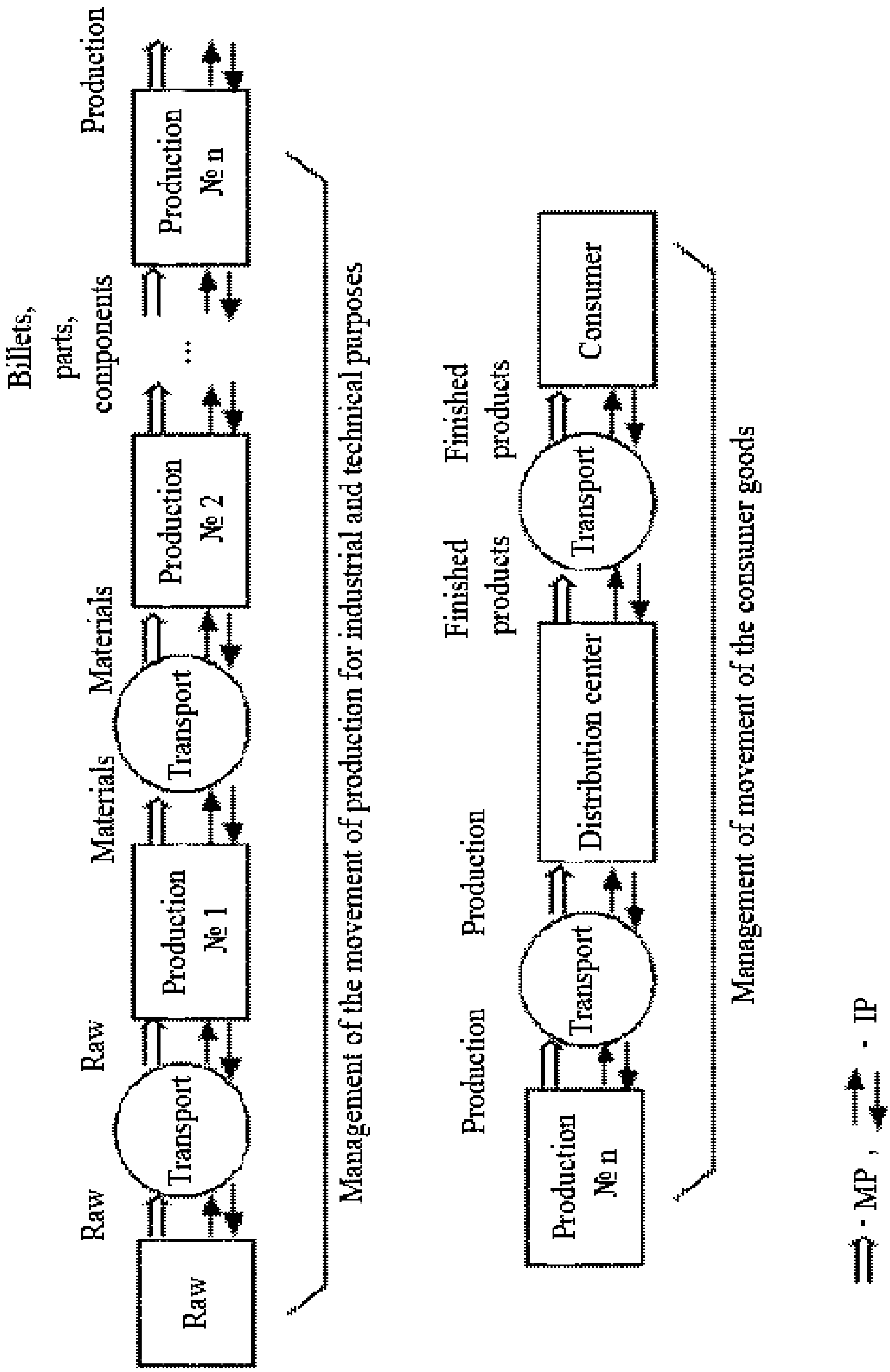


Fig. 1.1. Schematic diagram of LC, cross-cutting IP and IP

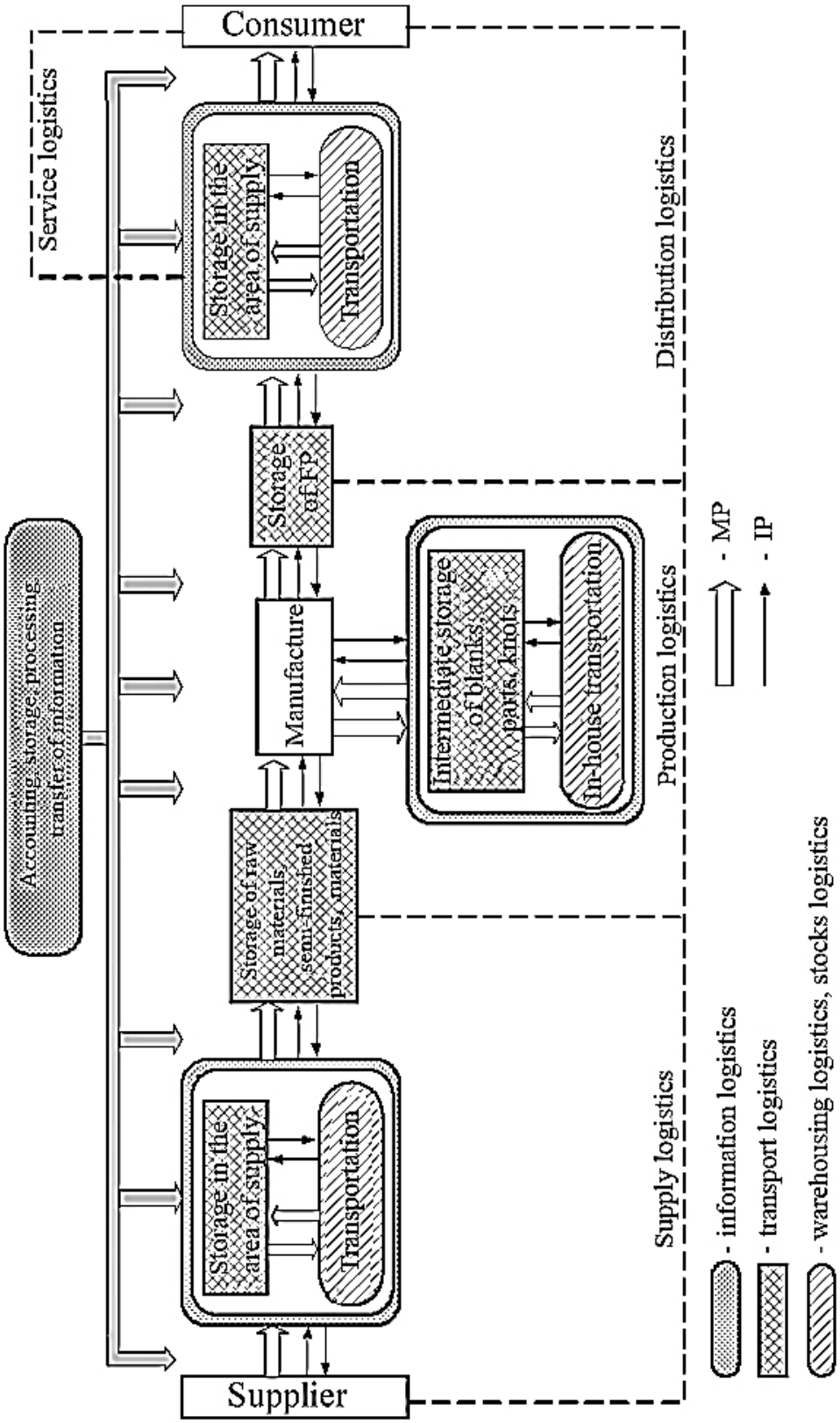


Fig. 1.2. Schematic diagram of MT transformations in LC

The novelty of logistics consists in changing priorities between various types of economic activity in favor of enhancing the importance of activities for managing cross-cutting MP. The separation of MP as a management object and the related abstraction from a number of factors lead to some simplification of economic processes and to a substantial reduction in the dimension of modeling tasks. This allows us to design cross-cutting LCs, to solve the tasks of through monitoring of the movement of goods, starting from the primary source of raw materials through all intermediate processes, up to the arrival to the final consumer, and, in general, opens up new possibilities for formalized research of economic processes. Fig. 1.3 shows the traditional and logistical approaches to managing MP at the macro level.

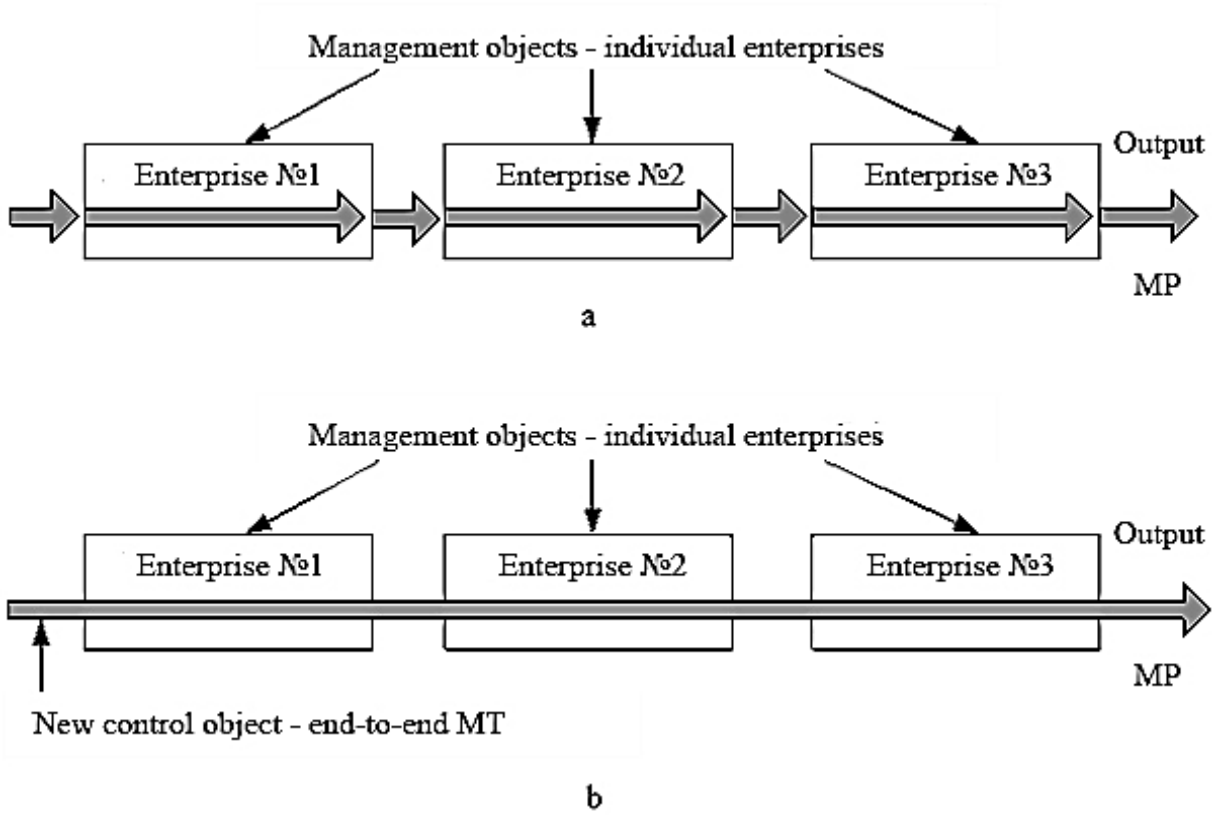


Fig. 1.3. Approaches to the management of MP at the macro level:
a - traditional; b - logistics

At the macro level, the MP passes through a LC, which consists of several independent enterprises. Traditionally, each of the enterprises is managed separately by its owner (see Fig. 1.3, a). At the same time, the notion of an end-to-end MT is not singled out, and the task of management is not put and not solved. As a result, such important indicators of this flow as cost, reliability of receipt, quality and others, at the outlet of the chain are added to a certain degree by chance and are far from optimal. In the case of a logistic approach, the control object is an end-to-end MT (see Fig. 1.3, b). At the same time, the isolation of enterprises is largely overcome with the aim of coordinating the management of cross-cutting IP. The right load starts to arrive

at the right place, at the right time, in the required quantity and quality. Within the whole chain, MP promotion takes place with minimal costs.

At the micro level, LC consists of different services of one enterprise. With the traditional approach, the task of improving the end-to-end MT within the enterprise, as a rule, does not have a priority value for any of the divisions (Fig. 1.4, a). Indicators of MP at the output of the enterprise, as well as in the case of a macrolevel, are far from optimal.

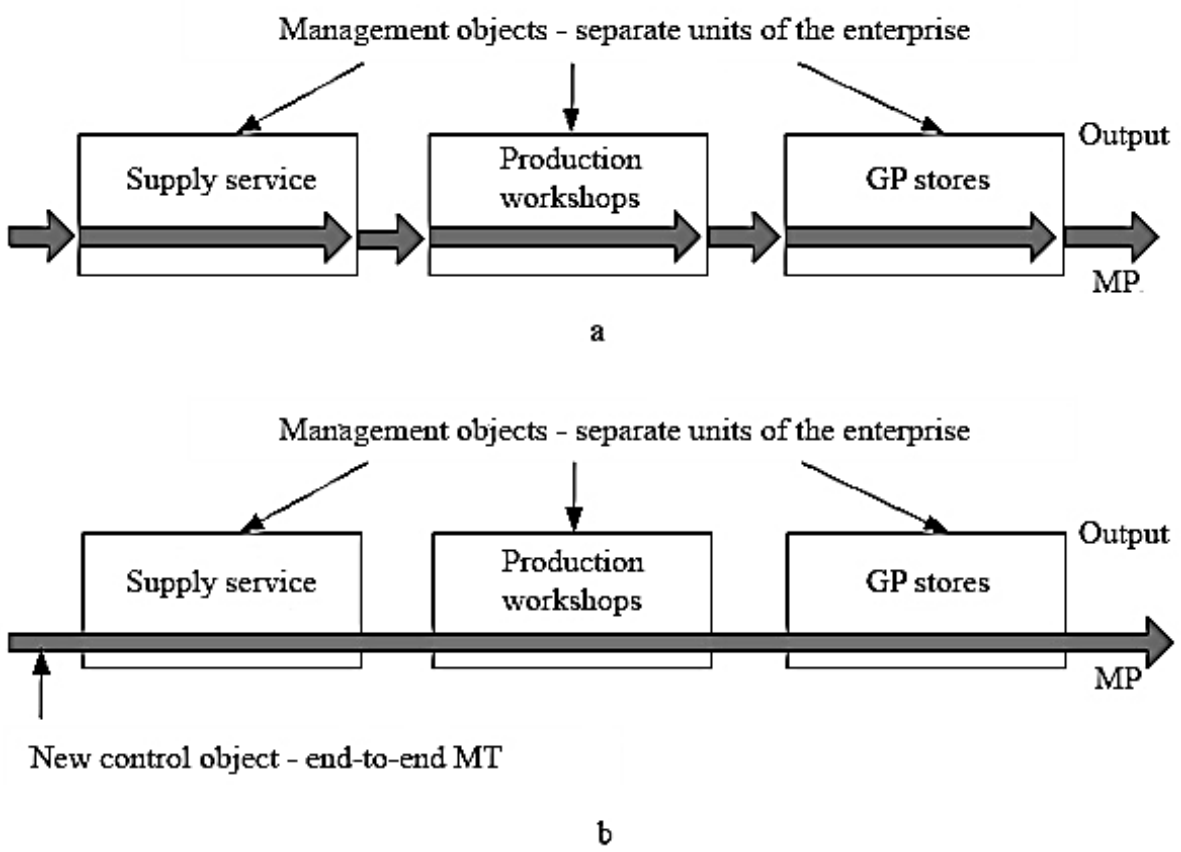


Fig. 1.4. Approaches to the management of MP at the micro level
a - traditional; b - logistics

Under the logistical approach (Fig. 1.4, b), the logistics service is allocated and receives significant rights at the enterprise, for which the priority task is to manage the through-going MT coming from outside and passing through the warehouses of the supply service, production workshops, GP stores and outgoing to the consumer. As a result, the company's output at the output of the enterprise becomes manageable.

Thus, the fundamental difference between the logistics approach and the management of the MP from the traditional one is:

1) in the unification of disparate MPs into a single cross-cutting IP;

2) in the allocation of a unified management function for cross-cutting IP;

3) in the technical, economic, information integration of individual links of the LC into a single system (at the macro level - different enterprises, at the micro level - different services of the enterprise).

1.2. Factors of logistics development

The objective development of market economies in the 20th century led to the need for a logistical approach to enterprise management. Let us consider the main factors (prerequisites) that caused the emergence and development of logistics.

1.2.1. Development of competition caused by the transition from the seller's market to the buyer's market

Until the early 1960s, countries with developed market economies had a rapidly growing market. For example, in the US it was characterized by the introduction of new production technologies, high level of specialization, abundance of natural resources, and minimal state regulation of the economy. Demand of buyers for goods basically exceeded the offer of sellers, i.e. there was a seller's market. In these conditions, the main focus of management was directed to how to saturate the market, i.e. on the search for reserves in the production of products.

The released goods, one way or another, fell into final consumption, however, production, wholesale and retail trade worked without close ties with each other. Therefore, manufacturers sought to increase their competitiveness primarily through the production of new products, expansion and improvement of production. And such operations as transportation and storage of goods, organization of various forms of service for the consumer, after-sales service, were considered as technical and not worthy of attention.

But by the beginning of the sixties a buyer's market had started to be formed, characterized by a surplus supply, in which sellers were having difficulty selling their products at the expected prices. Consumers became more legible: they demanded higher quality products, lower prices, convenient and diverse services. This led to the need to find new ways to create competitive advantages.

Entrepreneurs began to pay more attention not to the product itself, but to the quality of its supply. Improvement of work in the distribution of goods did not require such large additional investments as, for example, the development of the release of a new product, while ensuring a high competitiveness of the supplier by reducing the cost of production, reducing the lead time for an order, and maintaining an agreed delivery schedule. The money invested in the distribution sphere began to influence the position of the supplier in the market much more than the same means invested in the sphere of production. In these conditions, high competitiveness did not depend on the size of capital investments, but on the ability to properly organize the logistics process.

Thus, suppliers who paid special attention to the effective organization of distribution of goods sought to reduce the cost and time of the order and at the same time guaranteed the delivery of the goods to the consumer on time, the

required quantity, quality and assortment, which was a significant advantage in competition.

1.2.2. Complicating the system of market relations and increasing the quality requirements for product distribution processes

Increasing the requirements for the quality of the processes of implementation of the GP (the quality of goods, the timing of orders, schedules of supplies, assortment, cost, etc.), caused by severe competition, led to the same requirements on the part of producers to suppliers of raw materials, materials, components, semi-finished products.

As a result, a complex system of links between various market participants was formed, which required improvement of existing models of supply and sales organization. Thanks to this, the methods and models for the optimal location of warehouses, the determination of optimal supply routes, optimal routes for transportation routes, etc., were actively developed.

1.2.3. Energy crisis of the 70s of the XX century

Increasing the cost of energy carriers forced entrepreneurs to look for new ways to improve the economy of transport. The traditional approach was the rational organization of transport, but this was not enough in the conditions of the energy crisis. Greater effectiveness of this task could be achieved through the harmonization of the actions of all participants in the logistics process, which was a new step in the practice of enterprise management in enterprises.

1.2.4. Scientific and technical progress in the creation of flexible automated productions

Replacing traditional conveyors with automated production lines has led to the creation of flexible production structures. This made the production of products in small batches cost-effective. Work on the principle of "small parties" entailed corresponding changes in the system for ensuring the production of MR and the sale of GP. In this connection, there was no need to have large warehouse capacities at enterprises, there was a need for deliveries of cargo in

small lots, but in more severe terms. All this drew attention to the methods of solving the problem of efficient organization of the logistics process.

1.2.5. Scientific and technological progress in the field of communication facilities and informatics

The most important achievements of STP in the field of communication and informatics, which allowed implementing the ideas of logistics management in practice, include:

1) computerization of the management of logistics processes, namely:

- creation and mass use of computers;
- creation of application software systems that automate the processes of planning, forecasting, decision making, database maintenance, solution of optimization tasks, etc .;

2) development of means of data transmission:

- development of information transmission standards;
- creation of means of information transfer (fax machines, EDI - electronic data interchange, computer networks, etc.), including high-speed (satellite telecommunication systems, etc.).

This made it possible to track all the stages of the movement of raw materials, parts, GP, which made it possible to clearly identify the huge losses in the existing control schemes of the MP. Therefore, there was a need to develop new, effective ways of organizing and managing all types of flows in enterprises. In addition, there are fundamentally new opportunities:

- automatic tracking of the availability of semi-finished products, the release of GP, the state of production reserves, the volume of MR supplies, the location of goods on the way from the producer to the consumer;
- prompt transmission of information about the details of the transported goods (especially in international traffic);
- real-time monitoring and management in all phases of the product movement - from the primary source of raw materials through intermediate production, warehousing and transportation processes up to the end user;
- prompt receipt, processing and analysis of information on sales markets, on the activities of the firm, assessing its competitive position;
- the use of "paperless" technologies: electronic signature, electronic payment systems, the transfer of electronic accompanying documents in the preparation of bank accounts, the conclusion of contracts, the transport of goods, etc .;
- the creation of e-commerce systems.

The use of information technology has made it possible to raise the effectiveness of MP management to a fundamentally new level. To this end, information systems (both at the level of individual enterprises and covering

large areas) and information services operating with all information flows (IP) and responsible for the operation of enterprise information systems have been created at enterprises.

1.2.6. Development of the theory of systems and the theory of trade-offs

The theory of systems allowed from the scientific point of view to consider the problem of commodity circulation as an integrated one, and various enterprises participating in commodity circulation should be represented as a single system. This led to an understanding of the need to take into account and harmonize the features, interests, internal and external relationships of all LC participants.

The theory of compromises made it possible to choose solutions that reduce the total costs or increase the total profit, despite the damage to the activities of individual units of the firm or individual enterprises participating in the overall logistics process.

1.2.7. Unification of rules and norms of foreign economic activity, standardization of technical parameters in different countries

Until the 1980s, the international movement of goods was complicated by the following factors: differences in national product standards, excessively increased volume of documentation on international transactions with goods and financial calculations, availability of import quotas and export restrictions, stringent requirements for packaging and labeling of goods, variety in technical parameters vehicles and means of communication, etc. Therefore, measures were taken to unify the rules of foreign economic activity, to simplify the passage of customs barriers, control and technological procedures at border crossings. International distribution centers (DCs) were created, concentration of reloading and storage points occurred in the context of integration of the economies of Western Europe, packagings, rolling stock and technical parameters of communication routes were unified, new transportation technologies (for example, intermodal) and information processing were introduced, automatic systems for reading and addressing goods.

1.3. Stages of logistics development

Stages of historical development of logistics were due to:

- objective trends in the market;
- breadth of understanding of the possibilities of the logistics approach and the level of development of concepts, methods and models of logistics management;

- level of coverage by logistic management of various spheres of activity of enterprises;

- the complexity of logistics management;

- the level of development of technical means of data processing and transmission, mechanization and automation of production.

In the modern economy there are several approaches to distinguishing the stages of the development of logistics. Consider a generalized approach.

1.3.1. Stage of formation

Integration of the transport and storage process for the distribution of SOEs. Objective trends in the market. The objective economic factors that accelerated the development of logistics at the stage of formation (60s of the XX century) include: increasing attention to customers, the emergence of a large number of competitive goods, methods for better customer service, the transition to a buyer's market, which led to seeking new ways of coordinating demand and suggestions, as well as methods for better customer service. The increase in the variety of goods led to a significant increase in the cost of creating and maintaining stocks in distribution systems, which required finding new ways to reduce these costs.

Level of development of the theory of logistics management. The formation of the theory and practice of logistics management began. A wide spread abroad was the philosophy of marketing. There are new logistical approaches to reducing the cycles of order and production. The understanding has come that:

- existing, as it were, separate flows in the storage and transportation of SOEs can be linked by a single management system;

- the physical distribution area of the GP has a great potential in terms of cost reduction;

- the combination of individual functions of the physical distribution of GP can give a significant economic effect.

At this stage, understanding and formulating a key concept of total costs in physical distribution comes. Its meaning is as follows: in this way, it is possible to regroup costs in the distribution of SOEs, that their overall level will decrease with the promotion of goods from the producer to the consumer. For example, if you switch the transport of goods from road to air, you can eliminate the need for intermediate warehouses and the corresponding costs for storage, storage and ultrasound. At the same time, transportation costs will increase, but the overall level of costs in the distribution network will decrease.

The level of coverage of various spheres of activity of enterprises. The logistical approach was originally used in the sphere of circulation, covering at the stage of formation the organization of storage and transportation of SOEs. Transport and storage, previously associated only with loading and unloading

operations, begin to work for one economic result on a single schedule and on a single agreed technology. In other words, the tasks of organizing the transport and storage process are being jointly solved.

The complexity of logistics management. This stage is characterized by the least perfect form of logistics management. The management system operates on the principle of directly responding to daily fluctuations in demand and failures in the process of distribution of products. The tasks of optimizing the physical distribution of products were resolved earlier. For example, the frequency and size of the shipment was optimized; location and operation of warehouses; transport routes and schedules, etc. However, traditionally these tasks were solved separately, which could not provide a significant systemic effect. The joint solution of certain tasks for the management of small businesses, undertaken at the stage of formation, turned out to be much more complicated than their isolated solution, required other methods, other training of specialists, use of computer technology and specialized software.

Level of achievements NTP. The development of computer technologies, which began to be actively introduced into business since the mid-1950s, allowed to automate the solution of such multi-alternative and optimization tasks as choosing a mode of transport, optimizing the location of production and warehouses, optimal routing, managing multi-assortment stocks of products, forecasting demand and requirements for resources, etc.

1.3.2. Development Stage

Integration of production, storage and transportation processes. Objective trends in the market. A distinctive feature of the 1970s was the intensification of competition against the background of a shortage of high-quality raw materials (energy crisis). The previous growth in investment in the means of production was replaced by relative stabilization. At the same time, logistics costs, the cost of physical distribution, have significantly increased. The main task of most companies was the rational use of raw materials, materials, semi-finished products and components. The resource factor (reduction in energy intensity and material consumption of products) has become the main factor in competition.

Level of development of the theory of logistics management. The stage of development is characterized by:

- search for rational use of raw materials, materials, semi-finished products and components;
- search for new ways to reduce costs in production and distribution based on the concept of logistics;
- development and application of the principles of industrial logistics;
- the spread of the philosophy of universal quality management.

The level of coverage of various spheres of activity of enterprises. At the development stage, the production, storage and transport facilities of enterprises began to operate as a single coherent mechanism, i.e. there was a flow control of the goods produced from the production line to the end user.

The complexity of logistics management. On the one hand, this stage is characterized by the spread of medicines, and on the other for most firms the logistics approach has not yet become obvious. Attempts to introduce logistic coordination of various divisions of the company, to introduce organizational changes necessary for the implementation of the end-to-end management of the MP, were met by opposition from the middle and senior management, accustomed to performing the traditional separate functions of procurement, transportation, cargo processing.

Additional difficulties were created by accounting systems that were not adapted to identify and control the components of logistical costs and to evaluate the results of LO.

Level of achievements NTP. Logistic management began to cover production, which was facilitated by the appearance of computer control systems and production management, the introduction and development of automated control systems (ACS) by technological processes and production units. The use of computers for collecting information and controlling logistical processes has become widespread.

By the end of the 1970s, the so-called "packaging-packaging" revolution had come to the end in the West, which radically changed the set of operations, organization, technical and technological support of the warehouse process. The development of transport and storage equipment, the standardization and production of new types of packaging and packaging, the development of modern automated warehousing systems, the introduction of containerized cargo transportation began actively.

1.3.3. The Integration Stage

Integration of production, storage and transportation processes, including work with raw materials and finished products. Objective trends in the market. In the 1980s there were changes in the state regulation of the economic infrastructure; the widespread dissemination of the philosophy of universal quality management; structural changes in the organization of business. There was a rapid growth of partnerships and strategic alliances in business, in the provision of specialized transport services, in wholesale trade and distribution, which replaced the previous practice of mistrust, suspicion and fierce competition.

Level of development of the theory of logistics management. It was understood that along with the MP, it was necessary to manage service flows (services) and related IP and FP.

The concept of universal quality management, which revolutionized the theory and practice of management, has become widespread. The concept of universal quality management is a kind of management philosophy that recognizes that the needs of the consumer and the goals of business are inseparable. The concept of universal quality management is a management approach that focuses on the task of improving quality and based on the participation in this task of all members of the organization at all stages of production and promotion of products (services). It allows you to achieve long-term success by meeting the needs of consumers and thanks to the mutual benefit of each member of the organization and society as a whole.

The level of coverage of various spheres of activity of enterprises. The stage of integration is characterized by the combination of the logistics functions of the firm and its logistics partners in the so-called full LC, including procurement - production - distribution and sale.

The complexity of logistics management. Thanks to the revolution in information technologies and changes in the economy, a phenomenon of logistical "take-off" occurred at this stage, characterized by:

- increasing the qualifications of managers in the field of logistics;
- establishment of advisory departments on logistics problems at the enterprises;
- Long-term planning in the field of logistics;

centralization of physical distribution;

- a sharp decline in inventories in the LC;
- a clear definition of the actual distribution costs;
- the definition and implementation of measures to reduce the cost of promoting the MP to the end user;
- Development of a logistics approach in the service industry;
- the transfer of some or all of the logistics functions of a particular enterprise to specialized external logistics organizations;
- the creation of international medicines.

Logistic management was implemented not on the principle of direct response, but on the basis of long-term planning.

Level of achievements NTP. There was a revolution in information technology and the introduction of personal computers. On the basis of personal computers, automated workstations were created. The software allowed the use of personal computers in interactive integrated logistics management procedures from the procurement of materials to distribution and sales of SOEs. By the 1990s, electronic data interchange (EDI) technology was introduced, the first users of which were supermarkets that linked their inventory control systems directly to supplier systems. The defining importance in the development of the integrated concept of logistics was the ability to continuously monitor all phases of the movement of MP from the primary source of raw materials to the end user in real time and remote access thanks

to modern communication technologies (electronic data exchange, satellite communication technologies, computer networks, etc.).

1.3.4. The Globalization Stage

Objective trends in the market. In the 1990s, the concept of logistics, the key position of which is the need for integration, was recognized by most participants in the supply, production and distribution chains. There were fundamental changes in the organization and management of market processes in the entire global economy. Companies began to operate not only at the regional or national levels, but also at the global level. Globalization of the world economy began.

The complexity of logistics management. In connection with the globalization of the world economy, the need to attract "third parties" - customs and expedition agencies, banks, etc. - increased. This brought new demands on logistics managers:

- knowledge of legislative bases, tax systems, features of government regulation of economy of different countries;
- meeting the requirements for packaging, marking, taking into account language differences;
- the ability to quickly process and prepare complex documentation;
- Ability to eliminate customs barriers.

Nationally and internationally specialized societies and logistics associations have been established in industrialized countries, which have their own research centers, advisory departments, information banks, training centers, etc.

Level of achievements NTP. An e-mail technology was created, electronic business was developed. Electronic procurement became widespread. E-commerce began to occur both between different firms (B2B-business-to-business), for example, the supplier and producer, and between electronic firms and end users (B2C - business-to-customer). To maintain electronic data interchange, technologies were developed for encoding goods in the form of a bar code or a magnetic stripe, as well as electronic money transfer.

1.3.5. Current trends in logistics development

The modern stage of logistics development (2000s) is determined by two main factors: the globalization of the world economy and the global scientific and technological revolution, which generate new customer needs for logistics services and various forms of their satisfaction.

The globalization of business is as follows:

- Improved communications and transportation have made physical distances less significant, thanks to which enterprises can operate on a single, world-wide market;

- there is a reduction in trade barriers between countries and an increase in international trade and competition;

- The location of enterprises is not based on the national principle, but in countries and regions with low production costs (for example, German enterprises in Poland, American enterprises in Mexico, and Japanese enterprises in China).

At the present time in the world in the field of science and technology there is the so-called global revolution, which consists in the fact that technological changes occur everywhere, and do not arise somewhere in one place, and then gradually spread - as it happened before - in the agricultural and industrial revolution. The factors described above predetermined the following main trends of modern logistics.

Expansion of the range of logistics services offered:

- postponement that almost complete products are transferred to the distribution system, while modifying or taking into account the latest requirements of consumers are postponed until the very last possible moment, which significantly reduces the level of stocks;

- transshipment, use of direct shipment, which reduce to zero supplies and related costs in distribution centers;

- mass production of products to order, combining the benefits of mass production with the flexibility of products to order (B2C);

- direct delivery via electronic data transmission networks, as well as through courier services and express delivery services of parcels;

- the seller's inventory management service, which consists in the fact that suppliers manage both their own reserves and stocks stored in the lower links of the supply chain, which reduces the total costs;

- synchronized movement of materials, in which information about the movement of the MP is brought to all participants in the supply chain at the same time, which allows you to quickly coordinate the movement of MR;

- much more.

Outsourcing. The transfer of control functions over the distribution of SOEs from producers to specialized firms is called outsourcing. This trend manifested itself back in the 1980s, first in Western Europe and Japan and later in the United States, but is still present. Large and medium-sized enterprises are increasingly inclined to purchase integrated logistics solutions. This allows them, firstly, to use the greater experience of specialized logistics firms in the distribution of products, and secondly, to concentrate more on their core activities - production, development and promotion of their products on the market, and, thirdly, to reduce their overheads costs. Thus, they manage to use the skills and experience of a logistics company to improve their own efficiency.

Most of these specialized logistics companies have been formed through the spin-off of logistics departments from large corporations. In addition, transport companies that previously offered one type of regional transportation become logistics, i. offer transportation with global geography by different modes of transport, and, in addition, end-to-end service throughout the supply chain (warehousing, customs clearance, distribution, etc.).

Reduction in the number of suppliers and formation of long-term cooperation with logistics companies. In the past, firms had a large number of suppliers that competed with each other, which helped to make profitable deals. At present, logistics firms are increasingly involved in managing all processes in the supply chain, and client companies are increasingly introducing them to their long-term goals in order to jointly develop mutually acceptable solutions. Customers increasingly value their time and increasingly rely on logistics professionals, with whom they cooperate, seek to limit their number, but to develop long-term cooperation with those whom they have chosen as partners.

Improvement of methods of management of logistical processes. New methods of managing logistics processes are being developed and are being improved to address known logistics challenges: reduce inventory, react quickly to changes in demand, reduce production costs, optimize transport flows, coordinate the activities of all LC elements, and so on.

1.4. Sources of economic benefit from the use of logistics

MP, moving from the primary source of raw materials through a chain of production, transport and intermediary links to the final consumer, is constantly increasing in value. Studies conducted in the UK showed that in the cost of a product that reaches the final consumer, about 70 % is spent on storage, transportation, packaging and other operations that promote the MP (Fig. 1.5).

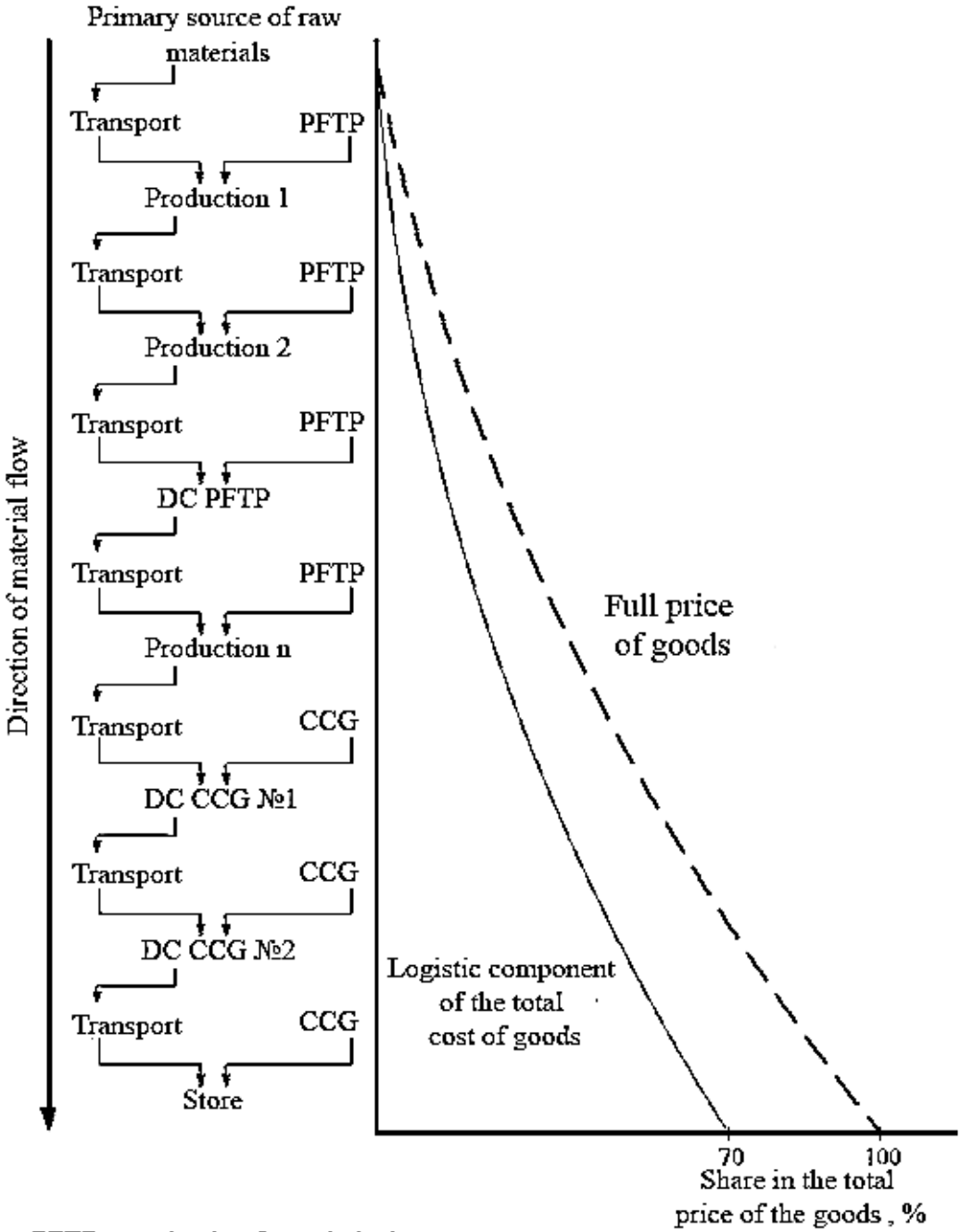
In the economies of developed countries, such as the United States, Japan, France, Germany, Great Britain, logistic costs account for about 20 % of the gross domestic product. A high share of logistics costs shows that the optimization of the management of the MT has significant reserves for improving the economic performance of enterprises. Let's consider the main sources of economic effect from the use of logistics.

Reduction of reserves in the way of movement of the MP. According to the European Industry Association, cross-cutting monitoring of the MP provides a 30...70 % reduction in inventories (according to the data of the US Industrial Association - 30...50 %). The high importance of stock optimization is explained by the following:

- in the overall structure of logistics costs, maintenance costs are about 50 %, including management costs, as well as losses from spoiling or theft of goods;

- a large part of the working capital of enterprises, as a rule, is diverted to stocks (from 10 to 50 % of all assets of enterprises);

- In production, the cost of maintaining stocks is up to 25...30 % of the total costs.



PFTP - production for technical purposes,
CCG- common consumption goods,
DC CCG №1 - distribution center of a wholesaler in places of concentration of production, purchasing large quantities of CCG,
DC CCG №2 - distribution center of the wholesaler in places of concentration of production, realizing large consignments of CCG.

Fig. 1.5. Structure of the goods cost on the way from the primary source of raw materials to the end user with the allocation of logistics component

Reduction of the time of goods passing through LC. In Western countries, only 2...5 % of the time spent on the movement of goods from the primary source of raw materials to the final consumer is spent on actual production, and 95 % on storage, warehousing, handling and other logistic operations (LO). Reduction of this component makes it possible to accelerate the turnover of capital, accordingly increase the profit received per unit time, reduce the cost of production.

Reduction of transportation costs. The total transport costs in the US and Canada are estimated at about 6,5 % of the gross national product. According to various estimates, the cost of performing operations using vehicles is 30 % ...50 % of the total cost of logistics. In connection with the globalization of the world economy, international transport has become more important, which are more complex and expensive than in less extensive national markets. The costs for them, depending on the type of goods being transported, can reach 25...35 % of the cost of sales of export-import products, compared to 8...10 % of the value of goods intended for shipment in the domestic market. Thus, the reduction of transportation costs is an important reserve for reducing the cost of production.

Reducing the costs of manual labor and related costs for operations with cargo. Reducing the costs of manual labor for operations with cargo leads:

- to a significant reduction in the time of loading and unloading and warehouse operations, which shortens the lead time and, in general, the duration of the logistics cycle;
- Reduction of the corresponding costs for operations with cargo, including through the use of the same type of mechanization, the same packaging, the use of similar technological methods of cargo handling in all segments of the LC.

2. BASIC CONCEPTS AND DEFINITIONS

2.1. Flows in logistics. Material flows

The object of studying logistics as a science is the MP and the corresponding FP and IP. At the same time, a flow is understood as a directed movement of the aggregate of something conditionally homogeneous (for example, products, information, finance, materials, raw materials, etc.). The concept of MT is the key in logistics.

The material flow is MR, unfinished products, GPs, considered during the process of application of various logistical operations (transportation, storage, etc.) and assigned to a certain time interval. The dimension of the MP is the ratio of the dimension of the product (unit, ton, m3, etc.) to the dimension of the time interval (day, month, year, etc.). MP can be calculated for specific areas of the enterprise, for the enterprise as a whole, for individual operations with cargo. MP, which is considered for a given moment or time period, becomes a material reserve (MZ).

Parameters of MP can be: nomenclature, assortment, quantity of products, dimensional, weight, physical and chemical characteristics of cargo, characteristics of packaging, packaging, terms of sale, transportation and insurance, financial characteristics, etc. There is a wide variety of MR, products and operations with them. Table 2.1 shows one of the possible classifications of MP. Each MP corresponds to some PI and FP.

The information flow is a stream of messages in the speech, documentary (paper and electronic) and other form generated by the source MP in the considered LAN, between the LAN and the external environment and intended for the implementation of control functions. Table 2.2 shows one of the possible IP classification.

Between MP and IP there is no one-to-one correspondence, i.e. synchronism in time of occurrence, orientation, etc. The IP can outrun the MP (holding negotiations, concluding contracts, etc.) or lag behind it (information on receipt of the delivered goods). Possible is the presence of several IPs accompanying the MP.

Table 2.1

Classification of material flows

Classification flag	Type of MP	Description
Attitude to the LS and its links	External	Consists of goods related to a particular enterprise, but moving in an external environment for the enterprise
	Interior	It is formed as a result of the execution of a linear department with a cargo inside the LS
	Input	Enters into the LS from the external environment
	Output	Comes from the LS to the external environment
Stock	One-Assortment, Multi-assortment	
Quantity of cargo	Mass	Occurs when transporting goods not by a single vehicle, but by their group, for example, by train, column car, caravan of ships, etc.
	Large	Occurs when transporting goods by several wagons, motor vehicles, ships, etc.
	Average	Intermediate between large and small MP (transported by single wagons, cars)
	Small	There is during transportation of such quantity of cargoes that does not allow to fully use the carrying capacity of a vehicle and requires, when transporting a combination with other cargoes
Share of cargo	Heavy	In the process of its transportation, the full use of the carrying capacity of vehicles with a smaller volume occupied, for example, for the transport of metals
Share of cargo	Lightweight	It is formed by cargoes that do not allow full use of the carrying capacity of the vehicle with full use of its volume, for example, tobacco products

The end of the table 2.1

Classification flag	Type of MP	Description
Degree of compatibility	Incompatible	Such MPs can not be jointly transported, for example, household chemical goods and food products
	Compatible	Can be shipped together on the same vehicle
Consistency of cargo	Bulk	Transported without packaging in specialized vehicles: open wagons, on platforms, in containers, in motor vehicles. The main property of these goods is flow ability (for example, grain)
	B/C	Transported without packaging, some can be frozen, caked, caked (for example, coal, sand, salt), have flow ability
Nomenclature	Tarno-piece	Cargoes in bags, containers, boxes, without tare, which can be counted
	Bulk	Transported in tanks and tankers and requires for the reloading, storage and other linear department special technical means
	Single-product, multicommodity	
Certainty	Deterministic	All parameters are fully known.
	Stochastic	At least one parameter is unknown or is a random variable
Continuity	Continuous	Streams of raw materials and materials in continuous production (technological) processes of a closed cycle, flows of oil products, gas, transported by pipeline transport, etc
	Discrete	MPs that are not continuous

Table 2.2

Classification of information flows

Characteristic of classification	Type of IP
Attitude to the LS and its links	Internal, external, horizontal, vertical, input, output
Type of media	On paper carriers, magnetic media, optical, digital, electronic
Periodicity of use	Regular, periodic, operational
Purpose of information	Directive (managers), normative-reference, accounting-analytical, auxiliary
Degree of openness	Open, closed, secret
Method of data transmission	By courier, by mail, by telephone, by telegraph, by teletype, by e-mail, by fax, by telecommunication networks
Information exchange mode	«on-line», «off line»
Directivity relative to MP	In the forward direction with the MP, in the opposite direction with the MP
Synchronicity with MP	Leading, simultaneous, subsequent

Financial flows. The financial flow in logistics is understood as the directed movement of financial assets circulating within the LAN, between drugs and the external environment, necessary to ensure the effective movement of a certain MP.

Thus, the specificity of financial flows in logistics is precisely the need to service the process of moving in space and in time the corresponding flow of commodity-material or commodity-intangible values. One of the possible classifications of FP is given in Table 2.3.

Table 2.3

Classification of financial flows

Characteristic of classification	Type of LP
Attitude to the LS and its links	Internal, external, entrance, output
Assignment	The resulting purchases, investment, in the reproduction of labor, the formation of material costs in the production process, due to the process of selling products
The method of transferring the advanced value for goods	Associated with the movement of fixed assets, caused by the movement of current assets
Type of economic relations	Horizontal, vertical
Form of payment	Cash (cash), information-financial (non-cash), accounting and financial (with the formation of material costs in the production process)

Stream of services. In addition to the material, informational and financial types of streams, there is also a flow of services, which is the number of services provided over a certain time interval.

A service is a special type of activity that meets public and personal needs (transport services, wholesale-retail, consulting, information, etc.).

Services can be provided by people and equipment in the presence of clients and in their absence, aimed at meeting the personal needs or needs of organizations.

Need to introduce the concept of "flow of services" is due to the growing importance and development of the service industry and the concentration in it of an increasing number of companies and the population.

2.2. Logistics operations

Logistic operations - an independent part of the logistics process, performed in one workplace and / or using a single technical device; a separate set of actions aimed at the transformation of material and / or information flows. By LO with MP, they include packaging, loading, transportation, unloading, unpacking, packaging, sorting, storing, packing, etc. Table 2.4 shows one of the possible classifications of LO.

Table 2.4

Classification of logistics operations

Characteristic of classification	Type of LO
Transfer of ownership	One-sided, two-sided
Nature of the flow	MP, flow of services, IP
Directivity of realized logistical functions	External (supply and marketing functions), internal (within the function of production)
Type of logistics functions being implemented	Basic, key, supporting

2.3. Logistic systems

The concept of drugs is one of the basic concepts of logistics. The system is a set of elements that are in relationships and connections with each other and form a certain integrity, unity. The system element is a part of the system that is not conditionally divided into component parts. One of the possible classifications of systems is shown in Table 2.5.

Table 2.5

Classification of systems

Characteristic of classification	Kind of systems
Complexity	Simple, complex, large
Change in time	Static, dynamic
Interrelation with the environment	Closed, open
Anticipation of system development	Deterministic, stochastic
Reaction to environmental change	Adaptive, non adaptive

It is necessary to distinguish between complex and large systems. A complex system is a system with a branched structure and a significant number of interconnected and interacting elements (subsystems) having different types of connections, capable of maintaining partial operability in the event of failure of individual elements (property of robustness). A large system is a complex system with a number of additional features: the existence of subsystems that have their own special purpose, subordinated to the overall purpose of the whole system; a large number of various connections (material, information,

energy, etc.); external relations with other systems; presence of self-organizing elements in the system.

For an object to be considered a system, it must have the following four properties:

1. Integrity and jointness. The system is an integral set of elements interacting with each other, but for the purposes of analysis the system can be conditionally divided into separate elements.

2. Integrative qualities (emergence) are qualities inherent in the system as a whole, but not inherent in any of its elements individually.

3. Connections - this is what connects objects and properties in the system process to the whole. Between the elements of the system, there are links that determine the integrative qualities of the system. The links between the elements of the system must be more powerful than the connections of the individual elements with the external environment.

4. Organization - is the internal orderliness, consistency of interaction of the elements of the system, a certain structure of connections between the elements of the system.

A logistics system is a dynamic, open, stochastic, adaptive complex or large feedback system that performs certain logistical functions (LF), for example, an industrial enterprise, a territorial production complex, a trading enterprise, etc. The drug, as a rule, consists of several subsystems and has developed connections with the external environment. The purpose of drugs - the delivery of goods and products in accordance with the maximum requirements of consumers with a minimum (pre-set) level of costs.

Micro-logical systems are subsystems, structural components of macro-logical systems. They are associated with a particular enterprise and are designed to manage the flows in the production, supply and marketing process. Depending on the purpose of drugs and the degree of coverage of basic LR, the following types of micrologistic systems are distinguished:

- Intra-production LS optimize the management of MPs within the technological cycle of production (reduction of inventories of MR and work in progress, acceleration of turnover of the working capital of the firm, reduction of the length of the production period, MR inventory management, optimization of the technological transport operation);

- external drugs solve the problems associated with managing flows from their sources to destinations outside the production technological cycle. These are supply and distribution tasks, such as rationalizing the movement of MR and GP in commodity distribution chains, reducing the time of delivery of MR and GP and the time for fulfilling customer orders, transporting, storing, handling, coordinating the goals of suppliers, intermediaries and consumers;

- integrated LANs include internal and external logistics systems as elements.

The macro-logistics system is a large management system of the MP, covering enterprises and organizations of industry, intermediary, trade and transport organizations of various departments located in different regions, regions of the country or in different countries. The goals of macro-logical systems may differ from those of micrological systems, that is, be ecological, social or political, and not related to the extraction of profit. Macrological systems distinguish:

- on the basis of the administrative-territorial division of the country (regional, inter-district, city, regional and regional, regional and inter-regional, republican and inter-republican;

- for object-functional characteristics (for a group of enterprises of one or several industries, departmental, sectoral, interdepartmental, intersectoral, military, etc.).

Consider the properties of the system as applied to drugs. Integrity and Integrity. LS has the property of integrity. This means that drugs can be isolated from their environment as a single object that has its own goals of functioning, development, the end result of the activity. On the other hand, drugs can be divided into separate elements. Elements of drugs at the macro level, i.e. when the MP passes from the enterprise to the enterprise, these enterprises (the supplier and the consumer) themselves and the transport connecting them are themselves. If the individual elements of the LAN are viewed as a system, they are called subsystems. Elements of drugs at the micro level are departments and services of the enterprise.

Connections. In macro-logical systems, links between individual elements are established on the basis of commodity-money relations, formalized in the form of a contract. Inside the micro-logical system, the elements are linked by intra-production relations, that is, the basis of the ties is the non-productive, the organizational one.

Organization. The links between the elements are ordered by various legislative, regulatory documents, regulations, job descriptions.

Integrative qualities. Only drugs in general can supply goods, having met all delivery requirements, and also adapt (adapt) to the changing conditions of the external environment. Individual elements of drugs can not independently solve such problems.

3. OBJECT, SUBJECT, GOALS, OBJECTIVES AND LOGISTICS FUNCTIONS

Object of study of logistics cross-cutting MT, service flows and associated financial and information flows.

The subject of the study of logistics optimization of MT, service flows and the accompanying financial and information flows.

There are so-called "six rules of logistics", which describe the ultimate goal of logistics management:

1. Cargo is the right product.
2. Quality is the required quality.
3. Quantity is the required quantity.
4. Time - the cargo must be delivered at the right time.
5. Place - in the right place.
6. Costs - with minimal costs.

The tasks of logistics are very diverse and are conditioned by the ultimate objective of logistic management described above. Their classification and examples are given in Table 3.1.

Logistic function is an aggregated group of LOs that are homogeneous in terms of the purpose of these operations and are significantly different from the other set of operations. Classification of the main logistics functions is given in Table 3.2.

The following organizations implement LF:
- transport enterprises;
- trading enterprises;
- commercial and intermediary organizations;
- manufacturers;
- specialized external logistics organizations.

The resulted classification LF allows to allocate following functional areas (spheres) of logistical management: purchasing logistics; production logistics; distribution logistics; transport logistics; stock logistics; logistics warehousing; service logistics; information logistics.

Table 3.1

Classification and examples of problems solved in logistics

Global Challenges	Common tasks	Particular problems
1. Achieve maximum effect of drug use with minimal costs	1. Creation of an integrated system of regulation of MP and IP	1. Decrease in the level of insurance stocks
	2. Development of methods for managing the movement of goods	2. Reduction of time of storage of production in stocks
2. Modeling of drugs and conditions for their reliable functioning	3. Definition of strategy and technology of physical movement of goods	3. Reduction of transportation time
	4. Development of a system of accounting and analysis of logistics costs	4. Determination of the optimal number of warehouses in the serviced territory
	5. Implementation of the quality system in the enterprise	5. Searches, selection of suppliers
	6. Forecasting the volumes of production, transportation, demand, etc.	6.Organization of acceptance, unloading, warehousing MR
	7. Identify imbalances between needs and opportunities	7. Increasing the current level of customer service
	8. Organization of pre-sale and after-sales services to consumers	8. Choose the location of the outlet
	9. Designing and optimizing the structure of automated warehouse complexes	9. Short-term increase in the capacity of drugs
	10. Implementation of traffic control systems for MP MRP, JIT and their modifications	10. Elimination of unproductive sites
	11. Capacity planning of the LC	11. Ordering
	12. Inspection of the MP	12. Selecting the type of reseller
	13. Coordination of activities of various divisions of enterprises	13. Selection of the mode of transport for the transport of goods
	14. External and internal integration	14.Selecting the transportation route
	15. Development of a logistics strategy	15. Registration of foreign trade transaction

Table 3.2

Classification of logistics functions

Characteristic of classification	Type	Description
Nature of tasks performed	Operational	Organization of work, direct management, flow control
	Coordination	Identification and comparison of needs and capacities of drugs, coordination of goals and coordination of actions of various units within the enterprise and various links of LC
Content	Basic	Supply, production, marketing
	Crucial(Key)	Maintenance of service standards, procurement management, determination of volumes and directions of MP, forecasting of demand, inventory management, physical distribution of products, determination of the sequence of promotion goods through warehousing sites, transportation and all necessary operations with cargo on the route, management of production procedures, for the supply of goods or services
From the conceptual point of view	Supporting	Management of warehouse operations, development, placement and organization of warehousing, delivery and acceptance goods, storage, sorting, preparation of clothes, packing, marking, preparation for loading, handling operations, cargo handling, protective packaging, return of goods, provision of spare parts and service, information and computer support
	Forming System	Organization of a system for managing all resources
	Integrating	Association, coordination, coordination of actions of the participants of the logistical process inside the enterprise and inside the LC
	Regulatory	Saving resources, minimizing waste of all kinds (wasting time, ineffective operations, MR waste), minimizing costs
	Resulting	It is aimed at achieving the ultimate goal of logistics management - the implementation of six rules of logistics

4. LOGISTICS PRINCIPLES (PRINCIPAL PRINCIPLES OF EFFECTIVE USE OF LOGISTICS IN BUSINESS PRACTICE OF ENTERPRISE)

The concept is a system of views, a certain understanding of any phenomena, processes. The principle is the basic, the starting position of any theory, doctrine, science. The conceptual provisions (principles) of logistics include:

- the principle of a systematic approach. The approach to research objects as systems is one of the main features of logistics. The maximum effect can be obtained only if the MT is optimized all the way from the primary source of raw materials up to the final consumer, and not within the framework of a separate enterprise or division. At the same time, all links of LC should work as a single well-coordinated mechanism. Therefore, all links of the LC should be considered as an integral system in order to harmonize the economic interests of its individual elements, technical issues, technological processes, etc.;

- the principle of total costs. One of the main tasks of logistics is to minimize the total logistics costs throughout the LC from the primary source of raw materials to the final consumer. A necessary condition for an effective solution of this problem is the possibility of an accurate measurement of logistics costs, but this is possible only if the system of accounting for production and processing costs allows you to allocate logistics costs. Therefore, it is necessary to separately identify and analyze the costs of implementing the LO, determine the most significant costs, identify their interdependence, etc .;

- the principle of global optimization. In the process of optimizing the structure or management of medicines, it is necessary to reconcile the individual goals of the functioning of the individual elements of the system in order to achieve a global optimum;

- the principle of logistic coordination and integration. In the process of logistics management, it is necessary to achieve coordinated, integral participation of all links of drugs or LC from its beginning to the end in the management of all types of flows in the implementation of the objective function;

- use the theory of trade-offs for the redistribution of costs. A compromise is understood as the harmonization of the economic interests of the participants in the logistics process. At the beginning of the development of the logistics approach in the formation of the system of logistics management, the criterion of the minimum of the total costs for the material distribution was used. This, on the one hand, opened up new opportunities in decision-making, but, at the same time, in a certain way limited the effectiveness of the solutions obtained. Therefore, later came the understanding that the criterion should be the maximum profit from the LO of all participating firms. Thus, the decrease in

profit (increase in costs) in one of the links of drugs is permissible and necessary, provided that this entails an increase in profits (a reduction in costs) for all drugs as a whole;

- refusal to produce universal technological and handling equipment. The meaning of this provision in the use of equipment, corresponding, in general, to specific conditions. Optimization of streaming processes through the use of specialized equipment is possible only in conditions of mass production and use of a wide range of various means of production. This means that in order to translate this principle into practice, a high level of scientific and technological development of society is required;

- the principle of development of logistics services. Compared with the improvement of the quality of goods or the release of a new product, there is a much less costly way to increase the competitiveness of an enterprise, namely the achievement of a modern level of logistics service and its development (providing flexibility, reliability and high quality: timely delivery, convenient packaging, acceptable lots, etc.);

- the principle of modeling and information and computer support. In the analysis, synthesis and optimization of objects and processes in drugs, various models are widely used: mathematical, graphic, physical, imitative, etc. Realization of logistics management is currently impossible without adequate information and computer support;

- the principle of developing the necessary set of subsystems that ensure the process of logistics management: technical, economic, organizational, legal, personnel, environmental, etc .;

- the principle of TQM (total quality management) - universal quality management. Ensuring the reliability of the functioning and high quality of each element of medicines to ensure the overall quality of goods and services supplied to end-users;

- the principle of humanization of all functions and technological solutions in drugs. All solutions must comply with environmental requirements for environmental protection, ergonomic, social, ethical requirements for the work of personnel, etc. For example, one of the most important elements of drugs are personnel capable of performing their functions with the necessary share of responsibility. To attract disciplined, qualified personnel, modern working conditions, prospects for career growth, increasing the prestige of such work, etc are necessary in the field of management of the MP;

- the principle of sustainability and adaptability. The external environment of enterprises is characterized by a high degree of uncertainty and fluctuations in market demand for goods and services, sharp fluctuations in prices for raw materials, transport services, fluctuations in the qualitative and quantitative characteristics of MT, changes in terms of supply and purchase, etc. In these conditions, the drug should be able to rebuild, changing goals, parameters, optimization criteria, the program of functioning, ie, adapt to new environmental conditions. This is an essential factor of a stable position in the market.

5. METHODOLOGY OF ACCEPTING LOGISTIC SOLUTIONS

Methodology is the doctrine of structure, logical organization, methods and means of activity. Modern logistics theory is conceptually based on four methodologies: system analysis (general systems theory), cybernetic approach (cybernetics), operations research, forecasting. Let us formulate the logical sequence of using the described scientific directions in the analysis, synthesis and optimization of drugs.

1. LC with moving through streams moving through it objectively represents a complex or large LS, i.e. can be investigated by means of the general theory of systems.

2. drugs are artificial, dynamic and purposeful. For such systems control problems, analysis and synthesis problems of controllable and control systems that can be studied, solved and modeled by cybernetics methods are actual.

3. If we are talking about a management system, then there are problems of choosing the optimal solution and evaluating the effectiveness of management. Solving these problems provides methods for investigating operations.

4. Any organizational and economic activities, and hence the management of logistical flow processes, are inconceivable without perspective planning, without scientifically based forecasts of parameters and trends in the development of the external environment, indicators of logistics processes in drugs, etc. Such tasks are solved on the basis of methods and principles of prognostication.

5.1. System analysis

The general theory of systems is a scientific discipline that develops the methodological principles of system research. The main feature of the general theory of systems in the approach to objects of research as to systems.

System analysis is a methodology of the general theory of systems, consisting in the study of any objects through their representation as systems, their structuring and subsequent analysis.

The main tasks of system analysis are:

- the problem of decomposition means the representation of the system in the form of subsystems consisting of smaller elements;

- the problem of analysis consists in finding various types of properties of the system, its elements and the environment in order to determine the patterns of the behavior of the system;

- The synthesis task is to create a model of the system based on the knowledge of the system obtained in the solution of the first two tasks, to determine its structure, parameters that ensure the effective functioning of the system, the solution of problems and the achievement of the set goals.

The main functions of system analysis within the framework of the three main tasks described are presented in Table 5.1.

Table 5.1

Main tasks and functions of system analysis

Structure of the system analysis		
Decomposition	Analysis	Synthesis
Definition and decomposition of a common goal, the main function	Functional-structural analysis	Development of the system model
Isolating the system from the environment	Morphological analysis (analysis of the relationship of components)	Structural synthesis
Description of the factors	Genetic analysis (analysis of prehistory, trends, forecasting)	Parametric synthesis
Description of development trends, uncertainties	Analysis of analogues	Evaluation of the system
Description as a "black box"	Efficiency analysis	
Functional, component and structural decomposition	Formation of requirements to the system being created	

System analysis is based on a variety of principles, i.e. General provisions that generalize the experience of a person with complex systems. One of the basic principles of system analysis is the principle of the ultimate goal, which is the absolute priority of the global goal and has the following rules:

1) for carrying out a system analysis, it is first necessary to formulate the main objective of the study;

2) the analysis should be conducted on the basis of understanding the main purpose of the system under study, which will allow to determine its main properties, quality indicators and evaluation criteria;

3) in the synthesis of systems, any attempt to change or improve the existing system should be evaluated as to whether it helps or prevents it from reaching its ultimate goal;

4) the objective of the functioning of an artificial system is, as a rule, set by a system in which the system under study is an integral part.

The application of system analysis in logistics allows:

- to define and organize the elements, goals, parameters, tasks and resources of drugs, determine the structure of medicines;

- Identify the internal properties of drugs that determine its behavior;

- to identify and classify the links between elements of drugs;

- Identify unresolved problems, bottlenecks, uncertainty factors affecting operation, possible logistical arrangements;

- formalize poorly structured problems, disclose their content and possible consequences for entrepreneurs;

- highlight the list and indicate the expedient sequence of the tasks of the functioning of medicines and its individual elements;

- to develop models that characterize the problem to be solved from all the main sides and allow "to lose" possible options for actions, etc.

5.2. Cybernetic approach

Cybernetics is the science of general control laws in nature, society, living organisms and machines, studying information processes related to the management of dynamic systems. The cybernetic approach is the study of a system based on the principles of cybernetics, in particular by identifying direct and inverse connections, studying control processes, considering the elements of the system as certain "black boxes" (systems in which only their input and output information is available to the researcher, and the internal device may be unknown).

Cybernetics and the general theory of systems have much in common, for example, the representation of the object of research in the form of a system, the study of the structure and functions of systems, the study of control problems, etc. But unlike the theory of systems, cybernetics practices an information approach to the study of control processes that distinguishes and studies in the objects of research different types of information flows, the ways of their processing, analysis, transformation, transmission, etc. Under management in the most general form is understood the process of formation of purposeful behavior of the system through information impact produced by a person or device.

The following management tasks are distinguished:

- the task of goal-setting - determining the required state or behavior of the system;

- the problem of stabilization is the retention of the system in the existing state under the conditions of disturbing influences;

- the task of program execution is the transfer of the system to the required state under conditions when the values of the controlled quantities vary according to known deterministic laws;

- tracking task - ensuring the required behavior of the system under conditions where the laws of variation of the controlled quantities are unknown or change;

- the optimization task is to hold or transfer the system to a state with extreme values of characteristics under given conditions and constraints.

From the point of view of the cybernetic approach, the management of medicines is viewed as a set of processes for the exchange, processing and transformation of information. The cybernetic approach represents a LAN as a system with control (Fig. 5.1), which includes three subsystems: control system, control object and communication system.

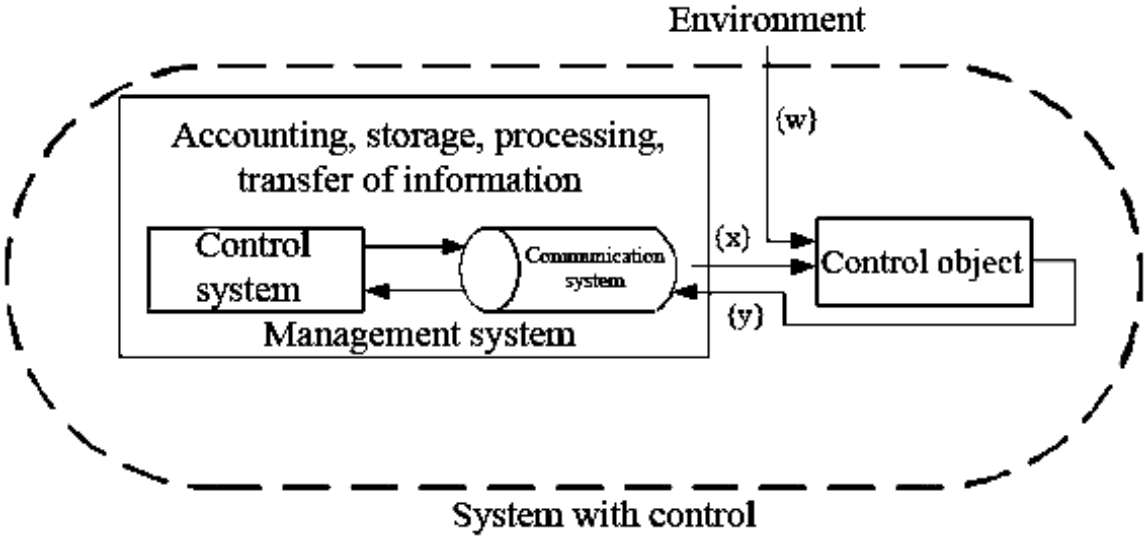


Fig. 5.1. Cybernetic approach to the description of drugs

The control system together with the communication system forms a control system. The communication system includes a direct communication channel, through which the input information {x} and the feedback channel are transmitted, on which information about the state of the control object {y} is transmitted to the control system. Information about the managed object and the external environment is perceived by the control system, processed in accordance with a particular control objective and transmitted to the control object in the form of control actions. Using the concept of feedback is a distinctive feature of the cybernetic approach.

The main groups of functions of the management system are:

- decision-making functions or information content transformation functions are the main ones in the control system, expressed in the transformation of the content of information about the state of the control object and the external environment into control information;
- routine information processing functions do not change the sense of information, but cover only accounting, control, storage, retrieval, display, replication, transformation of the information form;
- the functions of information exchange are related to bringing the solutions developed to the object of management and the exchange of information between decision makers (collection, transmission of text, graphic, table, electronic, etc. information by phone, fax, local or global data networks, etc .).

The application of the cybernetic approach to logistics requires the description of the basic properties of medicines using mathematical models.

This allows you to develop and automate algorithms for optimizing the cybernetic control system.

5.3. Operations research

The efficiency of industrial and commercial activities is largely determined by the quality of decisions that are routinely taken by managers of different levels. In this regard, the importance of improving the processes of making logistics decisions, which can be solved by research operations. The term "operation research" was first used in 1939-1940. in the military field. By this time, military technology and its management had become fundamentally more complicated due to the scientific and technological revolution. Therefore, by the beginning of the Second World War, there was an urgent need for scientific research in the field of the effective use of new military equipment, the quantification and optimization of command decisions. In the post-war period, the successes of the new scientific discipline were in demand in peaceful areas: in industry, business and commercial activities, in state institutions, in educational institutions.

Operations research is the methodology of applying mathematical quantitative methods to justify the solution of problems in all areas of purposeful human activity. Methods and models of operations research make it possible to obtain solutions that best meet the objectives of the organization.

The basic postulate of operations research is the following: the optimal solution (control) is a set of values of variables, in which the optimal (maximum or minimum) value of the criterion of effectiveness (objective function) of the operation is achieved and the specified constraints are observed. The subject of research of operations in logistics are the tasks of making optimal decisions in a logistics system with management based on an assessment of the effectiveness of its operation. Typical concepts of operations research are: model, variable variables, constraints, objective function.

5.3.1. Classification of types of modeling

Modeling is the process of studying a real system, including building a model, studying its properties, and transferring the information obtained to a simulated system. A model is a certain material or abstract object that is in a certain objective correspondence with the object under study, carrying certain

information about it and capable of replacing it at certain stages of cognition. Classification of the types of modeling is given in Table 5.2.

Table 5.2

Classification of types of modeling systems

Characteristic of classification	Kinds of models	Description
Aspect of modeling	Functional	Describes the totality of functions, functional subsystems, their interrelationships
	Information	Reflects the composition and interrelations between the elements of the system
	Behavioral (event)	Describes the dynamics of functioning with the help of concepts: system state, event, transition from one state to another, transition conditions, sequence of events
Relevance to original	Full	Obtain isomorphic models that are in strict accordance with the original and give about it exhaustive information
	Approximate	Homomorphic models are obtained by conscious coarsening of the process under study, a significant reduction in the number of factors, selection among them of the most significant
Form of implementation	Reality	The possibility of investigating characteristics either on a real object or on its part
Presence of controlled variables	Mentality	It is used when models are not realizable in a given time interval, or there are no conditions for their physical creation
	Constructive	Inclusion in the model of controlled variables, which allows you to find an effective control effect
	Descriptive (descriptive, conceptual)	A preliminary meaningful description of the investigated object, which does not contain controllable variables, plays an auxiliary role, precedes the construction of a constructive model (for example, mathematical). Models have the form of schemes that reflect our understanding of which variables are most significant and how they are related to each other
Change in time	Static	It serves to describe the state of an object at a fixed point in time
Degree of certainty	Dynamic	Serves to explore an object in time
Method of implementation	Deterministic	The mapping of processes in which all the parameters and effects are assumed to be not accidental but causally conditioned

The end of the table 5.2

Characteristic of classification	Kinds of models	Description
	Stochastic	Probabilistic processes and events are taken into account
	Mathematical (symbolic)	The process of establishing the correspondence between the real object of a certain set of symbols and expressions, for example, mathematical ones. Mathematical models are most convenient for research and quantitative analysis, they allow not only to obtain a solution for a particular case, but also to determine the influence of the system parameters on the result of the solution
	Imitation	Reproduction (with the help of a computer) of an algorithm for the functioning of complex objects in time, the behavior of an object. The elementary phenomena that make up the process are simulated, with the preservation of their logical structure and sequence of flow. This is an artificial experiment, in which instead of carrying out full-scale tests with a real object, experiments on mathematical models
Method of implementation	Full-time	Carrying out of research on the real explored object
	Physical	Studies are conducted on installations that preserve the physical nature of the object under study, but differ from it in size, shape, and other characteristics (the wind tunnel in which the properties of the aircraft are worked out)
	Analog	A set of some properties is used to display the properties of another physical nature: the hydraulic system as an analogue of the electrical or transport one; electric system as an analog of mechanical, transport systems

5.3.2. Stages of construction of mathematical models

The essence of constructing a mathematical model is that the real system is simplified, schematized and described with the help of this or that mathematical apparatus. The following main stages of modeling are distinguished.

1. A meaningful description of the modeled object. The object of modeling, the purposes of its functioning, the environment in which it functions, the possible elements, possible states, characteristics of the object and its elements are identified, the interrelations between the elements, states, characteristics are defined. Such a preliminary, approximate representation of the object of study is called a conceptual model. This stage is the basis for the subsequent formal description of the object.

2. Formalization of operations. On the basis of a meaningful description, the initial set of object characteristics is determined and analyzed, the most significant of them are identified. Then, controllable and unmanaged parameters are selected, character symbols are introduced. A system of constraints is defined, and the objective function of the model is constructed. Thus, there is a substitution of a meaningful description with a formal description (symbolic, ordered).

3. Check the adequacy of the model. The initial version of the model should be checked for the following:

1) are all essential parameters included in the model?

2) Is there any non-essential parameter in the model?

3) are the relationships between the parameters correctly reflected?

4) Are restrictions on parameter values correctly defined?

The main way to verify the adequacy of the model to the object under investigation is practice. After a preliminary check-up, they begin to implement the model and conduct research. The received results of modeling are subjected to the analysis on conformity to known properties of the investigated object. Based on the results of checking the model for adequacy, a decision is made about the possibility of its practical use or about the adjustment.

4. Adjustment of the model. At this stage, the existing information about the object and all the parameters of the constructed model are refined. Modifications are made to the model, and the adequacy assessment is again performed.

5. Optimization of the model. The essence of optimization (improvement) of models consists in their simplification at a given level of adequacy. The optimization is based on the ability to convert models from one form to another. The main indicators on which the model can be optimized are the time and costs of resources for conducting research and decision making with the help of the model.

5.3.3. Overview of typical tasks of operations research

Resource allocation tasks

Distribution problems arise when available resources are not enough to perform each of the planned activities in an effective manner and the resources for the work should be best distributed according to the chosen optimality criterion. Methods for solving resource allocation problems allow:

- allocate resources between jobs in such a way as to maximize profits or minimize costs;

- determine the composition of work that can be performed using available resources, while at the same time achieving a maximum of a certain measure of efficiency;

- Determine what resources are needed to perform the specified work at the lowest cost.

An example of a distribution task is the development of a supply plan. There are a number of enterprises that consume certain types of raw materials, and there are a number of raw materials bases that can supply this raw material. Bases are connected with the enterprises by some ways of supply with their tariffs. It is required to develop such a plan for supplying enterprises with raw materials (from what base, in what quantities and what raw materials to deliver), so that the requirements for raw materials are met with minimal expenses.

Tasks of repair and replacement of equipment

Any equipment eventually wears out and grows old, and therefore requires timely preventive or repair repair or a complete replacement for new equipment.

The tasks of repair and replacement of equipment allow to determine:

- such terms of repair repair and the moments of replacement of equipment, in which the costs for repair, replacement for the whole period of its operation are minimized;

- determine such periods of preventive control for the detection of malfunctions, which minimize the amount of costs for monitoring and expected losses from equipment downtime due to failure of some parts of equipment.

Inventory management tasks

The tasks of inventory management arise when an economic object can not work without production or commodity stocks, since their absence leads to downtime, fines, loss of customers, catastrophes, etc.

The tasks of inventory management allow answering the following questions:

- what are the optimal values of the volume of the order for the purchase or production of goods, the period of supply of orders, the size of the stock, the moments of the order of goods, which allow minimizing the total costs for the purchase, production, delivery, storage of goods;

- that it is more profitable to produce goods or purchase them; it is advantageous to use discounts for the purchase of goods, etc.

Tasks for network planning of complex projects

Examples of complex complex projects: construction and reconstruction of any large objects; performance of research and development; preparation of production for production; conducting marketing and other research.

Using network models allows:

- build a network schedule that represents the interrelationships of the project's work, which allows you to analyze in detail all the work and make improvements in the structure of the project even before its implementation;

- build a calendar schedule that determines the moments of the beginning and end of each work, the minimum possible time for the project, critical work; allows to optimize the project parameters: to identify and eliminate problems in providing work by performers, to reduce the number of simultaneously employed executors, to shorten the duration of individual works and the project as a whole;

- promptly monitor and correct the progress of the project.

Route Selection Tasks

A typical task of choosing a route is to find some route from one city to another, if there are multiple paths through various intermediate points. The task is to determine the most economical route by the criterion of time, distance or cost of travel. Existing routes may be subject to restrictions, for example, a ban on returning to an already passed track, the requirement to bypass all points, and in each of them you can visit only once (the traveling salesman's problem).

Queuing tasks

Queuing tasks are devoted to the study of queuing systems requirements. The reason for the queues is that the flow of customer requirements is random and unmanageable. Typical examples of such situations are queues of passengers to ticket offices, queues of subscribers waiting for a call on the intercity automatic telephone exchange, queues of aircraft waiting for take-off or landing.

Queuing tasks allow you to determine how many maintenance devices are needed to minimize the total expected losses from untimely maintenance and downtime of maintenance equipment.

Ordering tasks

Standard formulation of the ordering problem (scheduling): there are many details with certain technological routes, as well as several machines, on which the parts are processed. Then, the ordering consists in determining the order in which each part is machined on each machine, in which the total duration of all work is minimized, or the total delay in the machining of parts, or loss from lagging, etc.

5.3.4. Mathematical tools for operations research

Let us consider some mathematical disciplines that are most often used in solving problems of operations research.

Mathematical programming ("planning") is a branch of mathematics that deals with the development of methods for finding extreme values of a function whose arguments are constrained. Methods of mathematical programming are widely used to solve distribution problems.

Linear programming (LP) - is the simplest and best studied section of mathematical programming. It deals with problems in which the optimality index is a linear function of the variables of the problem, and the constraints imposed on the possible solutions have the form of linear equalities or inequalities. Accordingly, non-linear programming considers problems with non-linear objective functions and constraints.

Problems solved using network modeling (graph theory) can be formulated and solved by linear programming methods, but special network algorithms allow solving them more effectively. Examples: the task of finding the shortest path, the critical path, the maximum flow, minimizing the cost of the flow in a network with limited capacity, etc.

Targeted programming is a method of solving linear programming problems with several objective functions that can conflict with each other.

Integer linear programming is used to solve problems in which all or some variables must take integer values.

Dynamic programming involves splitting the task into several stages, each of which is a subtask with respect to one variable and is solved separately from the other subtasks.

The apparatus of probability theory is used in many problems of operations research, for example, for forecasting (regression and correlation analysis), probabilistic inventory management, simulation of queuing systems, simulation modeling, etc.

Methods of modeling and forecasting time series allow to reveal tendencies of change of actual values of parameter Y in time and to predict future values of Y.

The theory of games and decision making considers the processes of choosing the best of several alternatives in certainty situations (the data are known exactly), under risk (data can be described using probabilistic distributions), under uncertainty conditions (probability distribution is either unknown or can not be determined).

Methods and models of the theory of fuzzy sets allow in a mathematical form to present and use for decision-making subjective verbal expert information: preferences, rules, estimates of the values of quantitative and qualitative indicators.

5.4. Forecasting

Prognostics is the science of the laws and methods for developing predictions of dynamic systems. Forecast is a scientifically grounded judgment about possible states (in quantitative estimation) of a forecasting object (OP) in the future and / or alternative ways and terms of their implementation.

Classification of the main types of forecasts and methods of forecasting by various characteristics is given in Tables 5.3 and 5.4 respectively.

Table 5.3

Classification of forecast

Characteristic of classification	Forecast type	Description
Subject of forecasting	Search	Forecast – possible trends and prospects for the development of a particular process in the future or the most likely future state of the facility
	Normative	Forecast - ways, measures and terms of achievement of possible conditions of the object, taken as a goal
Preemption period	Operational	Up to 1 year
	Medium-term	Up to 5 years
	Long-term	More than 5 years
Stages of planning the activities of the organization	Objective	Describes the desired state of the phenomenon in the future ("what exactly is desirable and why?")
	Planned	Search and normative forecasts for the selection of the most appropriate planning standards, tasks ("how, in which direction should you plan for achieving your goals?")
	Project	Forecasting specific images in the future in the absence of a number of conditions ("how exactly is this possible, how it might look like?")
	Program	The forecast of possible ways, measures and conditions for achieving the desired state ("what is specifically needed to achieve the desired?")
	Organizational	Forecast current decisions in the management of the organization to achieve the goal ("in which direction to guide decisions in order to achieve the goal?")

Table 5.4

Classification of forecasting methods

Characteristic of classification	Type of method	Description
By the character of the initial data	Factual	It is based on the use of sources of factual information
	Statistical	It is based on the analysis of dynamic series of parameters of OP
	Expert	Based on the use of expert information
On the used approach to forecasting	Expert assessments	Based on the subjective assessment of experts of the current situation and development prospects, takes into account the knowledge, experience, intuition of experts
	Analysis and prediction of data series	It is connected with the study of the series of values of indicators, the identification of the dependence of indicators, trends and their use for forecasting (if the independent indicator is time, then the series is called temporary)
	Causal and investigative	They are based on the search for factors that determine the behavior of the OP, the construction and use for predictions of the corresponding model of its behavior
By the way of processing and analysis of initial data and forecasting	Smoothing	Conversion of initial dynamic series of data into series with smoothed (reduced) deviations from the prospective trend
	Extrapolation	Determination of future values of values on the basis of available data on trends in their changes in past periods
	Interpolation	Determination of the intermediate value of the parameter Y on the basis of data on its dependence on X, obtained on a certain interval of values of the parameter X
	Analogy	It is based on the establishment and use for prediction of the analogy of OP with other objects on some common features
	Modeling	On the basis of mathematical and simulation models, possible states of OP are predicted for different values of the initial data
	Projected scenario	It is based on the establishment of a logical sequence of the state of the OP in time under various conditions for determining the development objectives of this object
	Morphological analysis	A matrix of parameters of OPs and their possible values is constructed, followed by a search and an evaluation of the variants of combinations of these values

Stages of the prediction procedure:

1. Definition of forecast objects.
2. Selection of parameters that are predicted.
3. Determination of time horizons of the forecast.
4. Selection of prediction models.

5. Justification of the forecasting model and collection of data necessary for the forecast.

6. Drafting the forecast.

7. Tracking the results.

The main trends in the development of modern medicines

Currently, there are three main trends in the development of typical drugs, which determine the complexity and significance of accurate forecasting for effective management.

The first trend is a continuous reduction in the life cycle of drugs (when one drug is replaced by one brand new). Another 30-40 years ago, this cycle was comparable to the length of the average work experience of the employee, and now is usually (in the West) for several years.

The second trend is determined by the increase in the number of possible alternatives to the solution of the problem being studied.

The third trend is determined by the increased costs of creating and operating the vast majority of drugs. And this fact predetermines the problem of forecasting costs, prices, tariffs, i.e. the growth of capital investments in the future requires an assessment of their effectiveness in the relevant period.

5.5. Methods of solving logistics problems

The scientific base of logistics is made up of a wide range of methods developed within different disciplines. We list some of them.

Mathematics: probability theory; math statistics; the theory of random processes; matrix theory; factor analysis, mathematical logic; theory of fuzzy sets, etc.

Operations research: linear, nonlinear and dynamic programming; game theory; theory of statistical solutions; queuing theory; theory of inventory management; method of simulation; method of network planning and management; efficiency theory, etc.

Technical cybernetics: the theory of large systems; theory of forecasting; general management theory; theory of automatic control; graph theory; information theory; scheduling theory, etc.

Economic cybernetics: theory of optimal planning; efficiency theory; theory of qualimetry; functional and cost analysis; methods of marketing research; management; decision theory; production management; strategic and operational planning; pricing; quality control; personnel Management; project management; investment management; social Psychology; economy and organization of transport, warehousing, trade, etc. **Forecasting**: methods of long-term economic forecasting; forecasting of time series; regression and correlation analysis; methods of logical prediction; expert methods, etc.

6. INTEGRATION OF LOGISTICS

6.1. Integration within the enterprise

In the traditional organization of management, the enterprise allocates special units engaged in a specific type of logistics activities, for example, supply, transportation, storage, marketing, etc. Logistical management in this case becomes fragmented, which gives rise to many problems. Each department in the enterprise has its own goals, objectively conditioned by the specifics and priorities of its specific activities. For example, the supply department is looking for reliable suppliers, the transport department is striving to fully load vehicles, the sales department is interested in responding quickly to demand, production is interested in uninterrupted operation, the storage department is trying to reduce stocks, etc.

All these goals in themselves are undoubtedly important for the effective functioning of each unit separately, but for objective reasons they tend to conflict with each other. For example, a warehouse seeks to reduce resource stocks in order to save money, which can lead to a shortage of raw materials, materials, components, etc. Production aspires to work without a deficit, which leads to the idle time of equipment and workers, to the disruption of supplies of GP. The supply department may seek to reduce its costs by placing orders more rarely, but on a larger scale. But this increases the amount of stocks, the costs of their storage and the money associated with storing. As a result, each logistics sector of the company increases the efficiency of its own activities to the detriment of the effectiveness of other areas and, most importantly, to the detriment of the overall efficiency of the enterprise.

Let's list the main disadvantages of fragmented logistics inside the enterprise:

1) the conflict of the objectives of the various divisions of one enterprise;

2) information exchange between units is hampered and slowed down;

3) poor coordination of the activities of various units;

4) surplus stocks of all kinds;

5) lack of information on the overall logistics costs and, as a consequence, the lack of the ability to manage them;

6) decrease in the efficiency of the enterprise.

In practice, it is quite difficult to integrate all logistics within an enterprise for several reasons:

1) a wide variety of different types of logistics activities, logistics operations;

2) the geographical dispersion of various divisions of the enterprise;

3) absence of a specialist with the necessary knowledge, enthusiasm, ability and authority;

4) lack of common control systems and inaccessibility of integrated information.

A common approach to combining logistics within an enterprise (internal integration) is a gradual integration, incremental with time. An example of this growth is the stages of the historical development of the logistics approach to enterprise management, namely: the integration of the transport and warehousing process for the distribution of SOEs; integration of production, storage and transport processes with GP; integration of production, storage and transportation processes, including work with raw materials and GP.

Specific actions to integrate logistics are related to overcoming each of the difficulties listed above. In particular, an expert in logistics should have an automated system for collecting, storing, analyzing, distributing and presenting information. To do this, you need to use data networks and specialized software for working with information, analysis and decision-making.

In the presence of common control systems for logistics processes, it is necessary to analyze the interdependence between individual activities. There are situations where a reduction in the cost of one activity entails an increase in costs for another, but the overall logistics costs are reduced. Purposeful use of the effect of reducing the overall logistics costs is possible only in integrated logistics.

6.2. Integration within the supply chain

6.2.1. Problems of external integration

Like different divisions within the same enterprise, different organizations operating in one LC, with a traditional approach pursue their own goals, try to get benefits at the expense of the partner, i.e. in a sense compete with each other. This leads to the following negative consequences:

- there arises uncertainty in the activity of the LC, for example, due to the wide fluctuation in demand and the lack of exchange of relevant information between partners;
- to compensate for uncertainty, increased insurance reserves are created, resulting in an increase in the corresponding costs;
- LC reacts slowly to changing conditions, in particular, to changing demand;
- there is no trust and as a result confidence in long-term and mutually beneficial cooperation, which does not allow to develop long-term plans for joint development, leads to conflictual relations.

Example of negative consequences of LC fragmentation

Let the supply chain consist of a regional wholesaler, local wholesaler and retailer. If the retailer noticed that the demand for the goods grew by 5 units per week, then he can assume that demand will continue to grow. Therefore, he will order the local wholesaler of 10 additional units of goods to meet the growing demand for the coming week. A local wholesaler, arguing in a similar manner, will order from the regional wholesaler 20 additional units. The regional wholesaler, not having information about the whole supply chain, will argue in the same way as the previous participants of the chain, and will order 40 units for his supplier. Thus, as the order moves through the supply chain, the relatively small initial order change ultimately becomes huge. This example illustrates the creation of surplus stocks, erroneous reaction to the change in demand, which arise from the lack of information exchange between the LC participants and the inconsistency of their actions.

Example of external integration

Confederated Bottlers Corporation used to deliver bottles from its main company in Elizabethville to a Johnston brewery located 115 miles away. After filling in the brewery, the bottles were sent to a distribution center located 20 miles from Elizabethville. To transport their products, both companies used their own trucks, which returned empty after the delivery of the goods. After analyzing this situation, the companies created a single transport company, whose trucks deliver both empty and filled bottles. As a result of this integration, transportation costs have decreased almost half (Fig. 6.1).

The unification of interests of all LC participants (external integration) brings more effect than the one they can achieve individually. But with all the obvious benefits of external integration, its practical implementation is hampered for the following main reasons:

- the attitude to the LC partner as a competitor;
- distrust of another organization and, as a consequence, insufficient information exchange;
- different goals, priorities of activity;
- differences in the way information processing, control, management;
- different levels of staff training;
- geographical dispersion, etc.

The first problem that arises with external integration is overcoming the traditional view of other organizations as competitors. If an enterprise pays money to its suppliers, then, as a rule, people proceed from the fact that they can win only at the expense of the other party. In other words, if an enterprise makes a good deal, it automatically, in their opinion, means that the supplier in this case loses something, and vice versa, if the supplier gets a good profit, it is an obvious sign that the organization pays too much. In order to overcome this situation, it is necessary to change the business culture and replace the conflict-based approach to resolving issues with a collaborative approach (see Table 6.1).

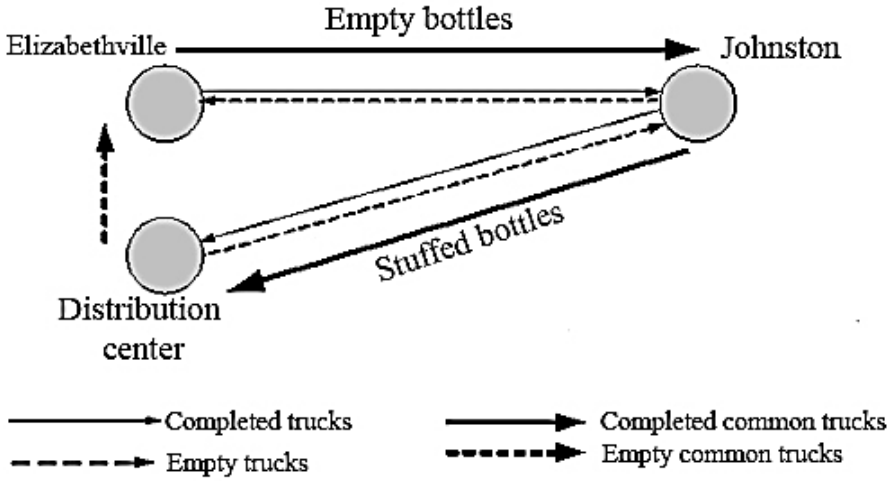


Fig. 6.1. External Transport Integration

Thus, the rule should be that organizations operating in one LC should compete not with each other, but with organizations operating in other supply chains.

Table 6.1

Different approaches to solving issues of teamwork in LCs

Factor	Conflict approach	Collaborative approach
Profit	Profit by the enterprise to the detriment of the profits of the other	Both enterprises make a profit
Relationships	One of the parties dominates	Equal partnership
Confidence	Small	A significant
Communications	Limited and formal	Comprehensive and open
Information	Restricted	Openness and active exchange
Control	Intensive	Delegation of authority and responsibility
Quality	Making claims	Joint problem solving
Terms of contracts	Hard	Flexible
Focusing	At own operations	On the consumer

6.2.2. Ways to organize cooperation in LC

Let's consider existing ways of organization of cooperation of enterprises in LC.

Informal agreements of enterprises on the joint performance of certain actions. For example, companies can jointly purchase goods to receive discounts for the volume of purchases; Combine cargo for transportation, reducing transportation costs; coordinate the size of the package to facilitate cargo handling; use of general lists of preferred suppliers, etc. In Japan, there is the practice of creating groups of organizations (keiretsu) working together without formal partnership.

Pros: flexibility and lack of commitment. Cons: either party can terminate cooperation without warning at any time convenient for it.

Formal agreements of enterprises with written contracts establishing the obligations of each party. For example, an electrical company may agree to supply energy at fixed prices over the next few years, provided that the customer acquires some fixed amount of energy.

Pros: a detailed indication of the characteristics of cooperation, i.e. each side clearly knows what it should do. Cons: loss of flexibility and the need to work in harsher conditions.

Formation of a strategic alliance or partnership. The basis for the formation of such unions is mutually beneficial joint work in the past, when the enterprises have the confidence that none of them will be able to win if they begin to interact with other partners. Strategic alliances provide for long-term obligations of the parties, which guarantee future orders and deliveries. This stability allows enterprises to invest in improving their products and operations.

For example, suppliers can reduce the range of products produced by releasing the remainder with the highest possible efficiency, or concentrate on providing a small number of services, but with very high quality. Customers, however, reduce the number of their suppliers, because are confident in partners and that they do not have to look for more profitable options. For example, the Japanese company Toyota has formed a partnership with 250 suppliers, while General Motors worked independently with each of the 4000 suppliers.

Vertical integration (Fig. 6.2), the level of which shows the extent to which the LC belongs to one organization and which can manifest itself in the following forms.

Acquisition of a minority stake in another company. This allows to some extent to influence operations, although it is not necessary to control them.

Establishment of a joint venture. For example, the creation of a joint transport enterprise, as in the example described above.

Buying another organization is the most frequent option for external integration.

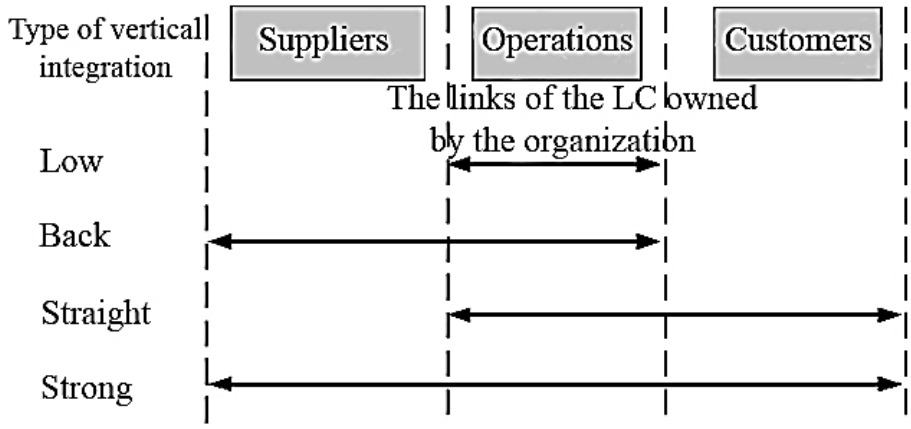


Fig. 6.2. Different levels of vertical integration

There is no better universal option for external integration for any situation. In some cases, efforts to create and maintain a specific form of integration may not justify itself. Therefore, it is necessary to analyze current operations, future plans, potential partners, potential businesses for purchase, which will help to find out to what extent this form of integration will be profitable for the organization.

A comparative description of the various options for organizing cooperation in the LC is shown in Fig. 6.3.

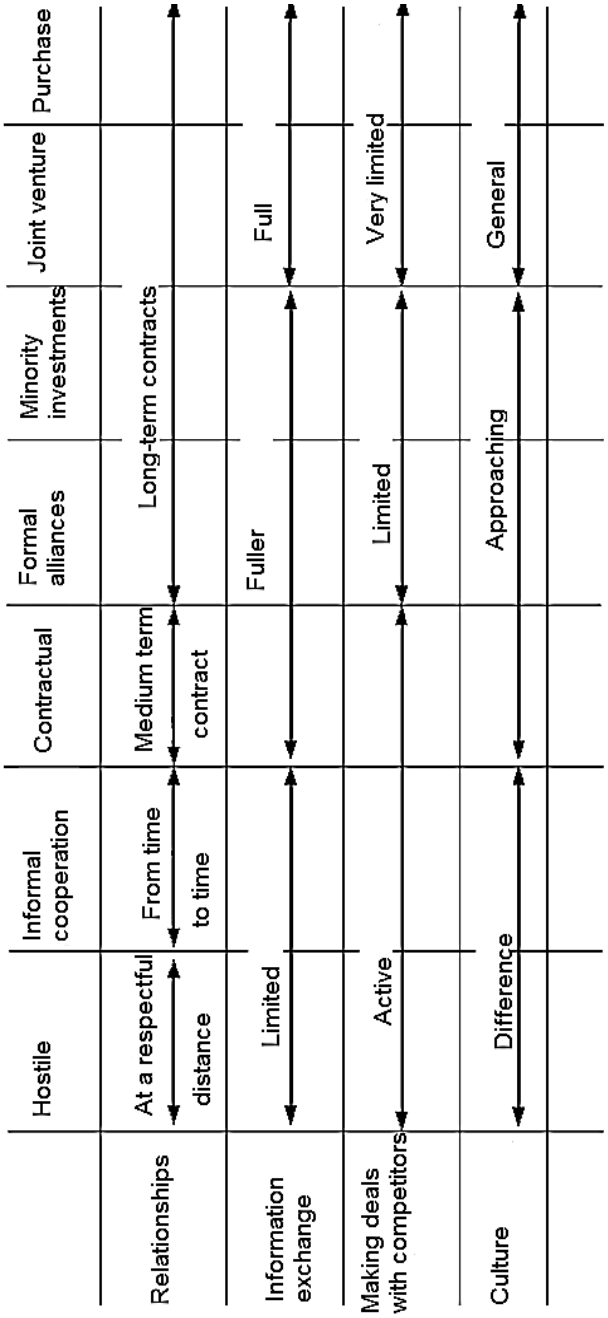


Fig. 6.3. Form of relationships. Characteristics of options for cooperation in the LC

7. STRATEGY AND PLANNING IN LOGISTICS

Planning is a common control function included in the control ring (Fig. 7.1). Planning of logistic activities is a systematic process of seeking opportunities to act, predicting the consequences of these actions, developing a logistics project, developing management decisions, specific activities and deadlines for achieving them in the future.

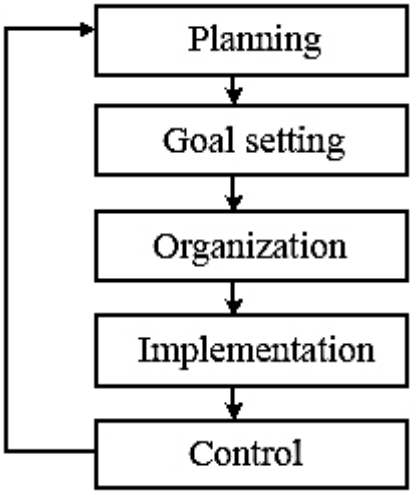


Fig. 7.1. Control Ring

Types, principles, methods of planning are discussed in detail in the literature on management and economics of the enterprise (organization), therefore, in this tutorial we will only consider those issues that are important for understanding the specifics of logistics planning. Figure 7.2 shows the classification of planning types for some of the possible features. Each of the types of planning by time and by detail specifies and creates prerequisites for the implementation of higher-level plans.

The content of planning types for functional areas will be discussed in the second part of this training manual "Basics of logistics. Functional areas of logistics management ".

For the organization of effective planning in the enterprise there should be a planning system, i.e. ordered structure of individual types of planning. The main requirements for such a system are:

- documentary support. To agree on planned calculations and control the implementation of plans, it is important that their main parts are documented.
- standardization. The documentation should be produced in accordance with certain standards;
- organization. An organizational regimen is required that, on the one hand, would streamline plan development activities, and on the other hand, ensure the flexibility of the planning system, the possibility of improvisation and adaptation to changing conditions;
- accuracy. It is necessary to clearly and reasonably determine the accuracy of measuring the characteristics of planning objects;

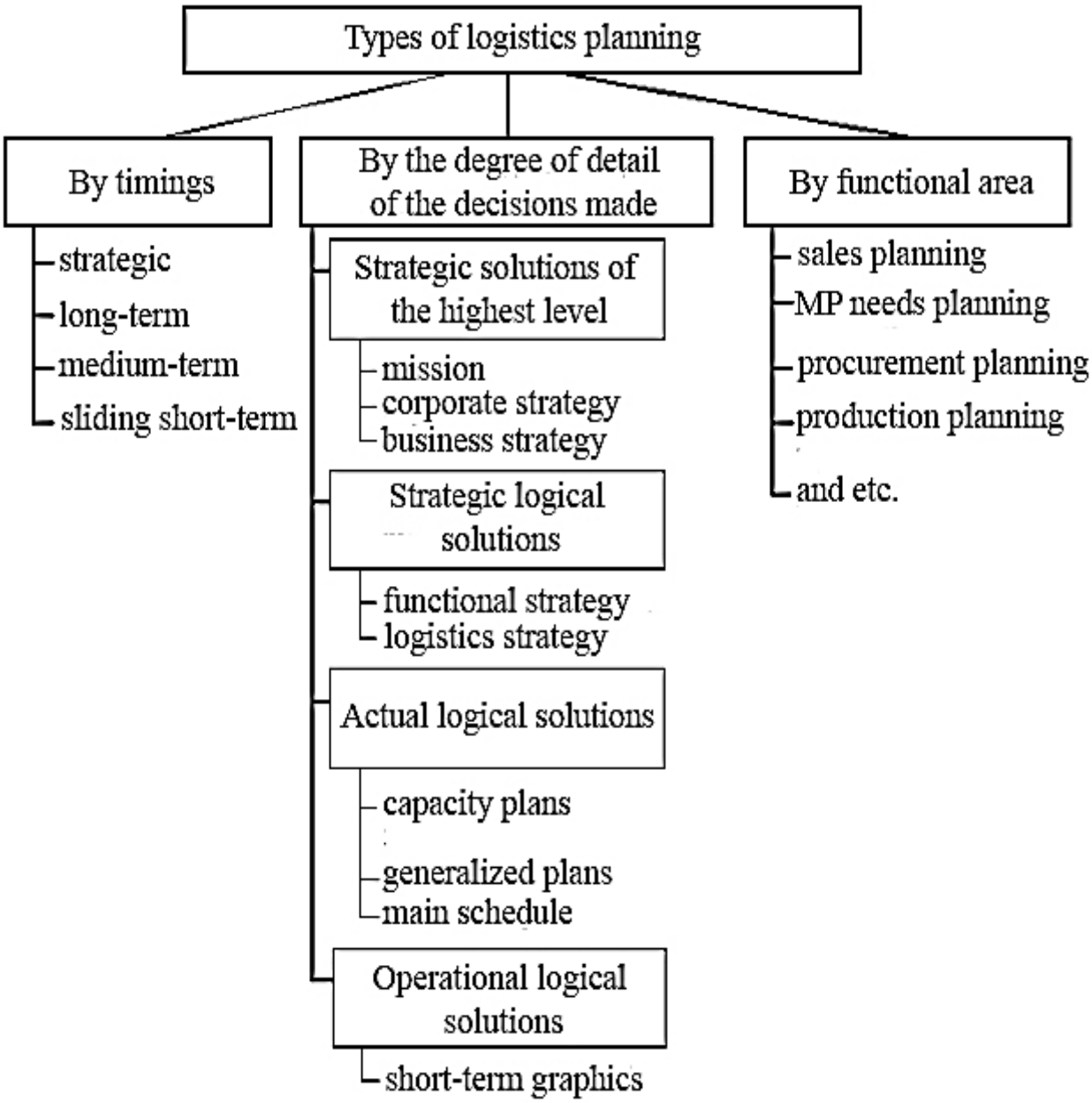


Fig. 7.2. Classification of planning types in logistics

- consistency. All private plans of the planning system should be coordinated both between different levels of planning (the integration of plans), and within the same level (coordination of plans). It is necessary to coordinate goals, forecasts, activities, means, actions of responsible persons, the degree of necessity, urgency, hierarchy, consistency, flexibility, etc .;

- continuity, flexibility and cyclicity. Continuity is that when some plans are already developed and implemented, others are being developed or refined, some plans are being developed in parallel. Flexibility lies in the fact that the possibility of ambiguous conditions and revision of plans taking into account them is taken into account. Cyclicity consists in a systematic review, refinement, correction, taking into account changed circumstances, the goals, tasks, activities of the same plans as they approach the time periods for their implementation;

- completeness; coverage of all aspects of the enterprise, including logistics activities.

Before planning begins, it is necessary to clearly define:

- the object of planning (what is planned);
- the subject of planning (who plans);
- planning horizon (for how long);
- planning tools (with the help of which to plan: financial means, computer facilities);
- planning methodology (how to plan);
- coordination of plans (which, with whom and on what terms).

The most common methods used to develop plans include the following: negotiations, adjustment of previous plans, various intuitive methods, graphical methods, computation using spreadsheets, simulation modeling, expert systems, mathematical models (mathematical programming, network planning, etc.).

The results of the implementation of plans should be monitored. Logistic control is an orderly and ideally continuous process of processing logistic data to identify discrepancies between the planned and actual values of logistic indicators, as well as an analysis of these discrepancies in order to identify their causes.

7.1. Strategic logistics planning

7.1.1. The relationship between logistics and corporate strategies

All decisions, depending on the degree of their importance for the organization are divided into three types:

1. Strategic decisions - the most important, setting the overall direction of the organization, have a long-term impact, require large resources and are considered the most risky.

2. Tactical solutions are related to the implementation of the strategy in the medium-term plan, are worked out at a more detailed level, require less resources and involve a certain risk.

3. Operational decisions are most developed and concern types of activity for the near future; they require rather limited resources, and the risk is small.

There are several types of strategic solutions (Fig. 7.3).

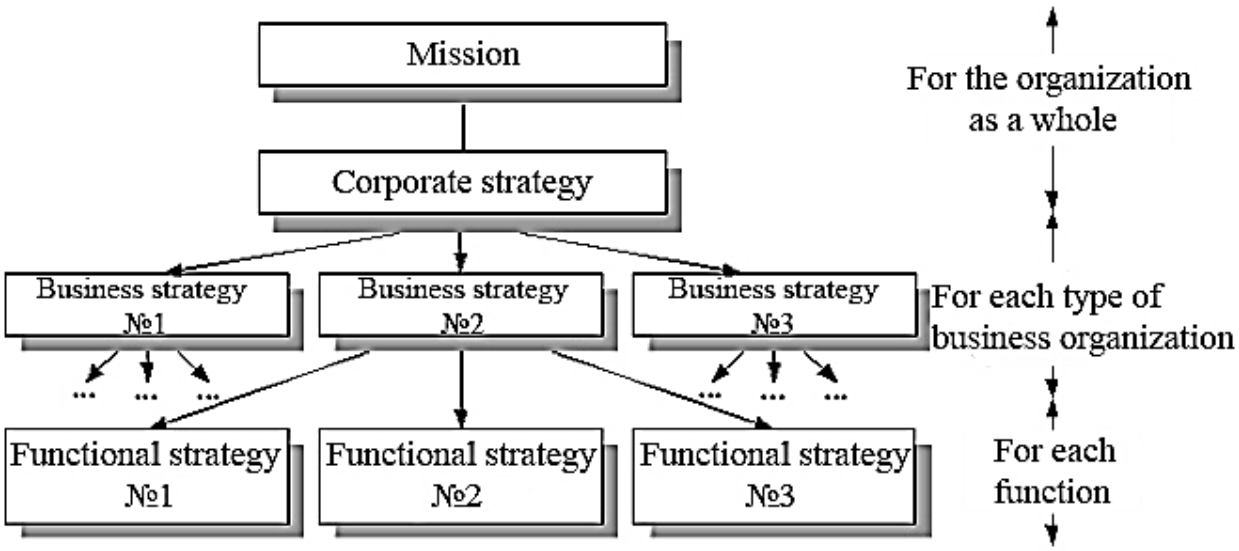


Fig. 7.3. Types of strategic decisions

Mission - a statement that indicates the overall objectives of the organization as a whole. The corporate strategy shows how a corporation that carries out diversified activities plans to realize its mission. Business strategy shows how each type of business within the framework of diversified activities will contribute to the corporate strategy. Functional strategies describe the strategic direction of each function (in particular, the logistics) that is implemented in the organization. Thus, higher-level strategies set the goals and overall direction of the organization, and functional strategies show how they can be implemented.

All long-term solutions related to logistics determine the logistics strategy. The logistical strategy of the organization consists of all strategic decisions, receptions, plans and the culture connected with management of a chain of deliveries and allows to realize the already developed strategy of the enterprise as a whole. There are situations when the level of development of logistics at a particular enterprise has a significant impact on the formation of the overall strategy of the enterprise.

Example

The American company of global express transport UPS (United Parcel Service Inc.), being confident that it has effective logistics, has developed a business strategy aimed at providing customers with the highest level of services in the delivery of goods, information and capital. Thus, logistics on the one hand has contributed to the formation of the business strategy, and on the other hand it allows to realize it by very fast delivery of the goods practically to any point of the globe. For example, the existence of a whole customs department that "works" only with UPS goods, as well as the unique technology of "conditional release" of express goods, when the customs clearance begins long before its actual arrival in Russia - the know-how of the company that allowed one of the most difficult problems. The cargo is processed under the temporary customs declaration and is delivered to the consignee the next day.

And only then within the next few days will complete customs clearance, which is guaranteed by UPS. In addition, the company's customers have a convenient opportunity to observe the routes of their shipments and confirmation of delivery via the Internet. Each parcel is marked with a special bar code and is scanned all the way, so it is very easy to trace its journey on the company's website. Today this service around the world, including in Russia, daily enjoys about 4 million people.

Ideally, organizations should do everything as best they can, taking into account low costs, good customer service, fast delivery, flexibility, high technology, etc. In practice this, of course, is unrealistic. Therefore, it is necessary to balance the level of services provided with costs. To do this, you need to choose a specific focus for your logistics strategy, which is the key decision. For example, some organizations rely on the provision of low-cost services, others - on high speed of delivery, the third - on the provision of individual services, etc. The main areas of logistics strategies include the following:

- minimization of logistics costs;
- improving the level of customer service;
- the main attention - time parameters: minimization of the time of delivery of goods or delivery exactly to the time specified by the customer;
- the main focus is on providing services of very high quality;
- the flexibility of the proposed products implies the provision of specialized services or services, taking into account the requirements of specific customers;
- the flexibility of the volume of the proposed products requires special attention to be given to an operational response to a changing demand;
- technology - the desire to develop and use the most advanced technologies in the field of communications, cargo tracking, sorting of packages, product identification, accounting for stock dynamics, etc .;
- location - the desire to provide services, located at the most advantageous places, for example, at bus stops in the centers of cities.

7.1.2. Types of logistics strategies

The most common logistics strategies include a "lean" strategy, a dynamic strategy and strategy based on strategic alliances. Let us consider them in more detail.

Skinny strategy

A "lean" strategy is based on the principle of cost management, that is, the production of the same or comparable products as that of competitors, but more cheaply. The goal of lean logistics is to perform every operation using less than every kind of resources: people, space, supplies, equipment, time,

etc. For this, the "lean" strategy tries to find ways to eliminate the unproductive expenditure of resources.

The first attempts to carry out "lean" operations were made in the manufacturing sector on the initiative of Toyota. The methods used for this led to such high results that they began to be used in other areas of the enterprise and eventually the idea of a lean enterprise arose. A well-known specialist in the field of management, Robert Townsend argues that "in all organizations at least 50% of the resources (people, effort, place, time) are wasted." Toyota identified the following sites in LC, where, most likely, resources may be wasted.

The quality of the supplied resources (raw materials, materials, components, parts, etc.) and SOEs may be too low to satisfy the needs of consumers.

Incorrect level of production or capacity. There is a production of products or capacities that are not currently needed.

Badly debugged process. The presence of unnecessary operations, too complicated or consuming too much time.

Expectation. Operations need to wait for the beginning or completion, the materials - income; equipment - production of repair work.

Moving. Products during operations have to make unnecessary, too long or uncomfortable movements.

Stock. The presence of too large a stock leads to unnecessary complexity and an increase in costs.

A typical approach to implementing a lean strategy is: a detailed analysis of current operations and the subsequent abandonment of operations that do not add value; elimination of stops, simplification of movements; use of more advanced technology to improve efficiency; location of capacities closer to consumers in order to reduce transportation costs; the search for opportunities to obtain economies of scale; elimination of unnecessary links from the supply chain.

It should be borne in mind that lean operations may not work in too dynamic or uncertain conditions. In these cases, a more flexible strategy based on dynamism can be used.

A dynamic strategy

The goal of a dynamic strategy is to provide high quality customer service, responding quickly to the emergence of new or changing previous conditions. There are two aspects of dynamism:

- speed of response to external conditions: dynamic organizations closely and continuously monitor customer requests and respond to them promptly;
- the ability to adjust logistic characteristics to meet the needs of individual consumers.

Organizations using a dynamic strategy are focused on consumers, ie:

- strive to achieve full satisfaction of customers' requests;
- create convenient access for consumers to their organization;

- Flexibly and quickly react to changing requests;

- Design logistics so that it meets the needs of consumers and even exceeds them;

- perform after-sales checks to make sure that consumers are satisfied after the purchase;

- take care of the preparation of future transactions, always keeping in touch with their customers, potential buyers, etc.

Organizations that have satisfied consumers receive important benefits - repeated deals and positive recommendations about themselves to other people and organizations.

At first glance, the goals and characteristics of "lean" and dynamic operations seem contradictory (Table 7.1).

Table 7.1

Comparative characteristics of lean and dynamic logistics

Factor	«Lean» Logistics	Dynamic Logistics
Objective	Effective operations	Flexibility to meet demand
Method	Removing all non-productive areas	Customer satisfaction
Restrictions	Customer service	Expenses
Dynamics of changes	Long-term stability	Dynamic response to changing circumstances
Activity parameters	Productivity, completeness of use	Lead time, level of service
Job	Unified, standardized	Variable, control is carried out more locally
Management	Within the framework of formalized planning cycles	Less structured and implemented by personnel with the necessary authority

But in practice there is no strict distinction between them and organizations need not choose only one strategy to the detriment of the other. For example, if a supplier improves communication with its customers through electronic exchange of data or sells materials through a website, it simultaneously reduces costs and improves the quality of service. In essence, both strategies consider customer satisfaction and low costs to be the dominant directions, but they describe the process of achieving the goal in different ways.

Strategic alliances

The goal of the strategy of forming alliances with suppliers and customers is to increase the efficiency of the supply chain, when all its members work together and collectively benefit from long-term cooperation.

Usually the reasons for using this strategy are the desire to improve customer service, greater flexibility, lower costs, the desire to avoid investments in structures, lack of experience with organizations. Most often partnerships are created between transport companies, other areas of cooperation include warehousing, import / export services, information processing.

The other most common strategies, which focus on more specific aspects of their activities, include the following.

The strategy of differentiation consists in the enterprise's striving for uniqueness, for example, in the system of customer service.

Strategy based on time parameters. In general, these strategies tend to provide faster delivery of products. An example of such a strategy is the "time compression" strategy, which is similar to a "lean" strategy, but focuses on eliminating unnecessary time in the supply chain, i. E. such, during which the value to the product is not added.

Strategies based on environmental protection. For example, in such strategies, the rate may be applied to the production of products using natural ingredients, the production of reusable packaging, packaging, the production of products that do not require special recycling, the multiple processing of materials used, the use of waste, etc.

Strategies for increased productivity. The rate is made to the maximum possible use of available resources. If the "lean" strategy looks for ways to get rid of unnecessary capacities (premises, transport, etc.) and resources, then this strategy will rather agree to leave existing capacities, but will look for ways to effectively use these surpluses (leasing, rendering new services to other organizations and etc.).

Value-added strategies have the goal of adding as much value to the final product as possible. For example, during the distribution of washing machines, the company can arrange the delivery, installation, connection of the machine, training its use, organize the removal of old machines, offer to conclude a service contract, etc.

Strategies for diversification or specialization. These strategies are oriented respectively to the widest or narrowest range of services, the range of products and activities. For example, there are transport companies offering transportation of any cargo: from letter to container. Other transport companies are engaged in the delivery of oil only by tankers or only small packages of cargo.

The focus strategy is characterized by concentrating on meeting the needs of one segment or a specific group of customers, without seeking to cover the entire market. The goal of the strategy is to satisfy the needs of consumers of the chosen target segment better than competitors.

Growth strategies are based on the desire to achieve economies of scale, by expanding the served geographic areas, mastering more activities, increasing market share, and so on.

7.1.3. Development of a logistics strategy

The strategy describes the principal course of action chosen in order to achieve the set goals. When designing a logistics strategy, the starting point is a comprehensive analysis strategies of a higher level (see Fig. 7.3), which enable us to understand how logistics can contribute to its implementation.

In addition, it is necessary to take into account the environment in which the business is conducted, including factors affecting logistics, but which logistics can not manage; a particular competence of the organization, determined by the factors that the organization can manage and which it uses to distinguish itself from others (Fig. 7.4).

The environment in which business is conducted and special competencies show what position the organization currently occupies, and the strategy of a higher level - what it wants to occupy in the future. Then the logistics strategy shows how the organization will move from the current situation to the future.

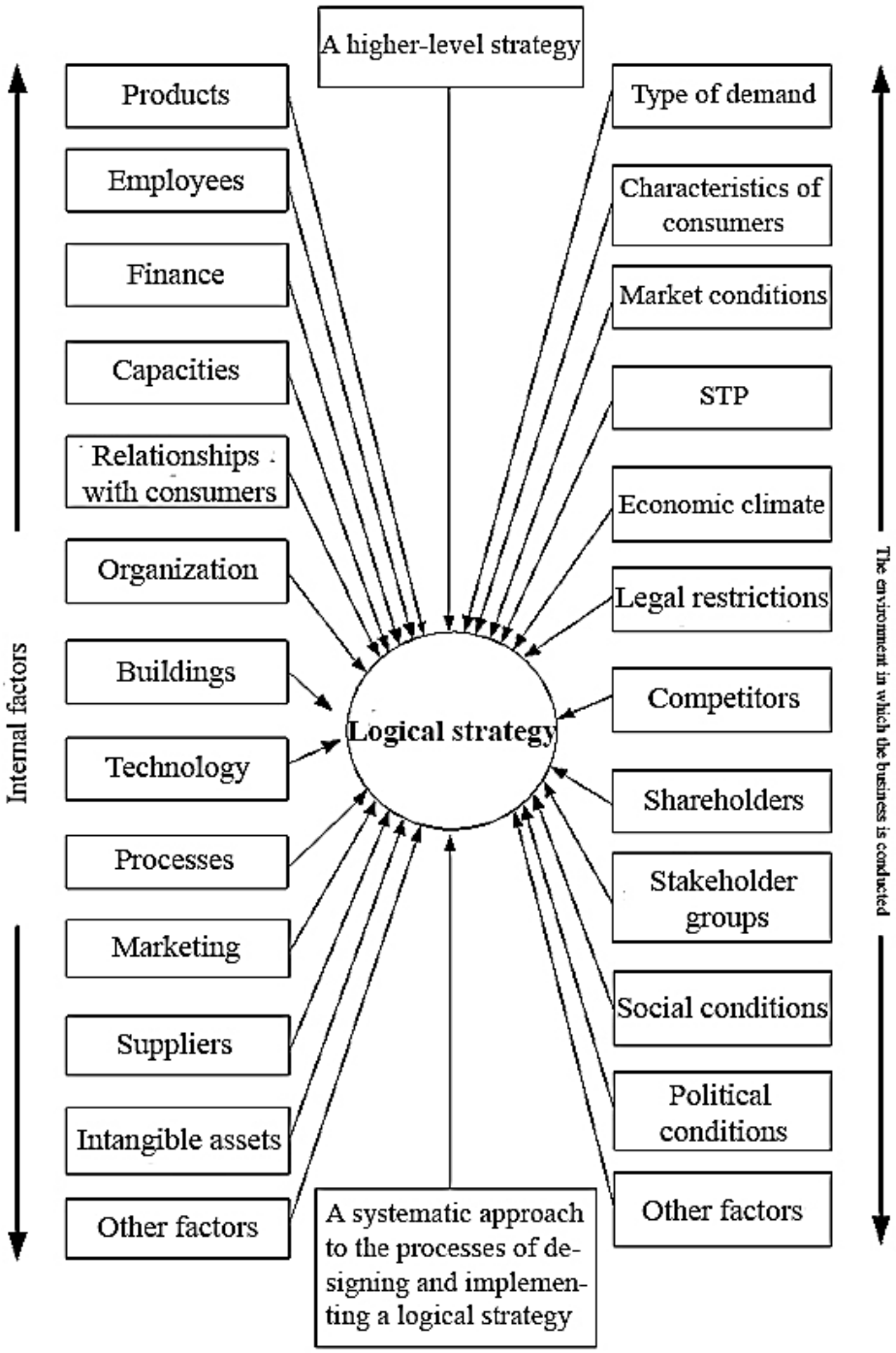


Fig. 7.4. Factors Considered in the Development of a Logistics Strategy

To obtain information about the business environment and special competencies, a so-called logistic audit is used. Its purpose is to collect meaningful information about the existing methods, indicators and conditions for conducting logistics activities. In accordance with the two directions of information search, the logistical audit is divided into the external one, which deals with the logistics environment, and the internal one, which analyzes the way of performing operations inside the organization and identifies areas requiring improvement. This approach is similar to the SWOT analysis, during which

Strengths and weaknesses of the organization, i.e. its internal operations and special competencies;

The opportunities and threats manifested in the environment in which business is conducted.

The key factor in the environment in which business is conducted is the type of demand that determines the choice of "lean" or "dynamic" strategies. So, the "lean" strategy works best in conditions where the demand is stable or, at least, predictable. Dynamic strategy works best in situations of a wide range of products, when it is difficult to accurately predict demand, when it changes dramatically, when operations are carried out to order, for example, mass fulfillment of orders for fashionable products, etc.

Another factor in designing a logistics strategy is the systematic preparation of strategic decisions, i.e., not only at the level of senior management, but with the involvement of specialists who will directly engage in the implementation of the strategy. During the whole process of strategy development, the practical consequences and practical feasibility of implementing any of the decisions made should be considered.

There are various recommendations on the steps to develop a logistics strategy, for example:

1) give priority to those areas of logistics that provide long-term improvement of the competitive position of the enterprise;

2) a frequently changed strategy aimed at using short-term market opportunities, brings fleeting benefits;

3) be cautious, accepting rigid, inflexible strategies that may become obsolete and at the same time deprive the enterprise of the possibility of maneuver;

4) exclude strategies that can lead to success only if the most optimistic forecasts are implemented. Assume that competitors will take retaliatory measures and there may come times with unfavorable market conditions;

5) attack the weak, not the strong points of the competitor, etc.

There is no single, universal method for developing a logistics strategy. Logistic strategy consists of a number of goals, procedures, structures, elements, systems, etc., which are presented in the form of a strategic logistics plan containing the following sections:

1. General summary, which demonstrates the essence of the logistics strategy and shows its relationship with other parts of the organization.

2. The purpose of logistics in the organization, the required performance indicators and ways to measure it.

3. A description of the way in which logistics as a whole can achieve the set goals, the changes that will be made for this, and how they will be managed.

4. A description of how individual logistics functions (supply, transportation, inventory control, cargo handling, etc.) will contribute to the implementation of the plan, the associated changes and the process of integrating all operations.

5. Plans showing the resources needed to implement the strategy.

6. Cost plans and selected financial indicators.

7. A description of how the strategy will affect business in general, especially in terms of the targets of this business, the contribution of the strategy to getting value for consumers and meeting their needs.

7.1.4. Implementation of logistics strategy

Any strategy becomes effective only when it is implemented. For successful implementation of the strategy, it is necessary to take into account in its development that there are two types of strategic decisions: the first sets the rules and objectives to be fulfilled, and the second shows how to achieve these rules in practice. For example, the strategic decision of the company to expand sales is a rule, and the introduction of an additional channel for selling products via the Internet is a concrete means of fulfilling the rule. Thus, the overall objectives of the strategy should be supported by implementation decisions, which are then transformed into more detailed tactical and operational decisions, into concrete actions taken and implemented at lower levels (Fig. 7.5).

So a strategic decision of the second type on the introduction of an additional channel for the sale of products via the Internet leads to the adoption of medium-term tactical decisions on recruitment and training of personnel, the creation and operation of a web page, the organization of delivery of products to consumers, and the organization of electronic payments; on the use of additional warehouses, etc.

These tactical decisions in turn determine the decisions of the operational level associated with the purchase of the relevant equipment, inventory control, forwarding, transportation routes, etc.

Fig. 7.5. Levels of solutions in logistics

In general, the analysis of the logistics strategy leads to the formulation and solution of the following possible issues at the lower levels of management:

Should we change warehouse and transport operations?

Will our approach to planning and scheduling change?

Do we have the necessary resources, if not, can we get them?

Do we have trained personnel, and will we be able to prepare it if necessary?

How will the chosen strategy affect current and potential consumers?

What impact will it have on staff, facilities, organization of activities, technology, etc.?

When moving to implementation of the strategy, it is necessary to consider solutions for each logistic function, from supply to supply. But different authors identify the following most important areas, in which, first and foremost, decisions have to be made.

1. Structure of LC. From an organization's point of view, the supply chain consists, first of all, of several levels of suppliers, which include sources of raw materials, intermediate producers, intermediaries, and secondly, from several levels of consumers moving GPs to end users. Different strategies lead to different types of supply chains, differing in length (number of levels), width

(number of parallel routes), throughput, type of intermediaries, degree of control over logistics, quality of services and costs.

2. Placement of infrastructure elements. After choosing the structure of the LC, it is necessary to find out where it is best to place some elements of the LC, such as industrial enterprises, wholesale enterprises, warehouses, logistics centers, etc. The issue of placement should be considered very carefully, since this decision has a significant and long-term impact on many indicators of future work. In addition, after the construction began to operate, it is usually difficult and very expensive to close or move it to another location.

3. Strategic relationships. Sometimes it is better to engage in logistics yourself, in other cases it is advisable to use the services of specialized structures. This kind of activity is called outsourcing, third party involvement or contract logistics.

4. Organization of auxiliary processes, i.e., those activities that contribute to the effective operation of the LC. These include the organization of equipment maintenance, information processing technologies, electronic data interchange, the use of Internet capabilities, various MP management systems, for example, "just in time", etc. The idea of improving auxiliary processes becomes extremely important in cases where For competitive reasons, competing organizations have equally effective supply chain structures. In this case, competitive advantages can be in the better organization of auxiliary processes.

7.2. Capacity Planning

Plans for the use of capacities make it possible to ensure that, in order to meet the long-term demand, the capacities available to organizations will be sufficient. Under the capacity of an operation is understood its maximum throughput in a given period of time. The power limit means, for example, that an enterprise can produce no more than a certain number of products per week, an airplane can only take on board a limited number of passengers, the university can accept for training not more than a certain number of students, etc.

The power of the supply chain determines the maximum of goods that can be delivered to end-users at a given time. Distinguish design capacity, i.e., the maximum capacity that an organization can develop in ideal conditions of absence of failures, problems, and effective capacity, i.e., the maximum capacity that an organization can develop in real conditions, taking into account temporary failures. When planning supply chains, it is necessary to take into account that the actual power of the supply chain, most often achieved in practice, is lower than the projected and even effective capacity.

The supply chain consists of a number of links having different capacities. Therefore, some of the links that have the lowest power limit the overall throughput of the chain and become a bottleneck in the supply chain (Fig. 7.6).

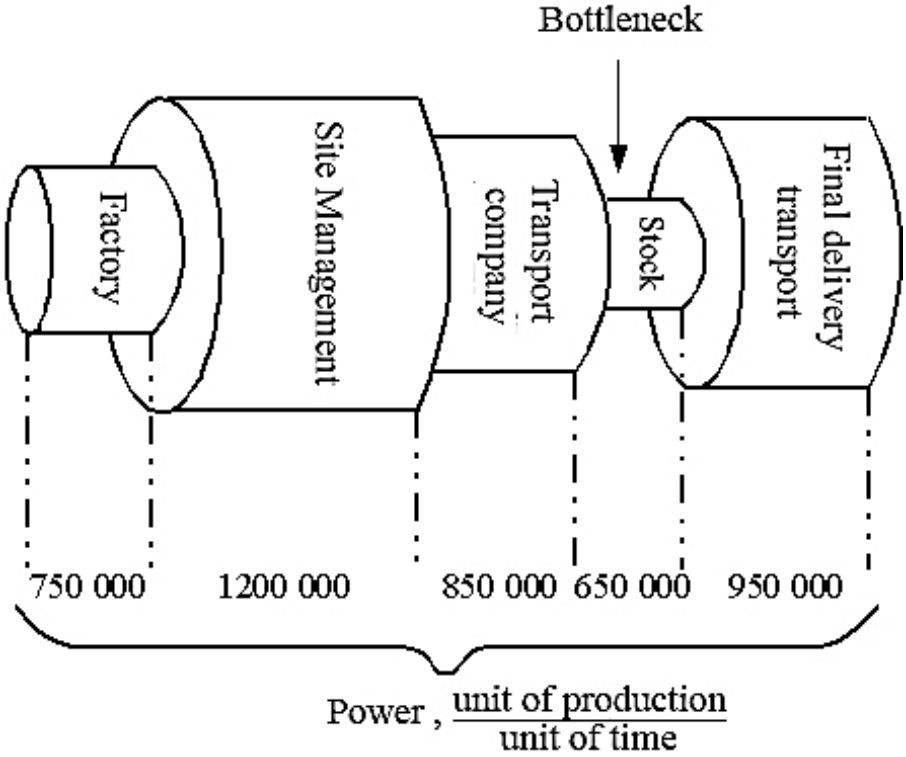


Fig. 7.6. Capacity Limitation in the Supply Chain

Hence, it is possible to increase the capacity of the supply chain only by increasing capacity in a narrow place. In practice, there are cases when due to neglect of this rule, useless decisions are made. For example, a bus station increases the size of waiting rooms, while narrow entry areas limit the number of arriving buses; the airline acquires airplanes of a large size, although the passenger terminals are already overcrowded, etc.

The purpose of capacity planning is to compare the available capacity of individual elements with the demand placed on them. Any discrepancy can be costly. If capacity is lower than demand, bottlenecks restrict the movement of materials, and the quality of customer service is reduced; if the power is higher than the demand level, the organization does not use part of the power, which also leads to inefficient costs. Let's formulate the basic steps of the standard approach to any type of planning, which is called resource requirements planning, for capacity planning:

1) study the demand forecast and determine the required capacity;

2) determine the current capacity;

3) to reveal the difference between the required and the available capacities;

4) to propose alternative options to eliminate this difference;

5) compare plans and choose the best;

6) implement the best option, if necessary, modify the plan;

7) monitor the results.

Capacity planning involves decisions taken at all levels. For example, an enterprise can reduce excess capacity, closing warehouses, manufacturing enterprises, which refers to strategic solutions. At the same time, the capacity can be adjusted by letting free space in the lease, working overtime, transferring part of the work to subcontractors, etc. This is a tactical and operational level solution.

There are two ways of short-term power adjustment:

1) power management to meet existing demand by changing hours of operation, hiring freelancers for peak hours, leasing additional facilities, using reserves to service demand at peak loads, etc .;

2) demand management in order to match existing capacities by changing the price, changing the amount of marketing efforts, limiting the number of served customers, presenting certain requirements to them (age, knowledge level, availability of residence permit, etc.), changing demand by profitable offers during the traditionally low period demand, etc.

7.3. Planning for the location of infrastructure elements

7.3.1. Placement factors

One of the typical problems that organizations face is the choice of a good placement. Accommodation is associated with finding the best geographical locations for the location of the LC elements (factories, warehouses, shops, restaurants, offices, etc.). Decisions on the placement of LC elements are extremely important, since they affect the performance of the organization for many years, i.e. have a long-term character.

If the organization makes a mistake and opens the building in an unsuccessful place, investing considerable funds in it, then it will not be so simple to correct the situation by moving to a new location, it will require large financial, labor, time costs, will lead to loss of time, customers, freezing of capital, reduce competitiveness. If, for example, a plant is built on an unsuccessful place, then it may have problems with suppliers, with quality and distribution of products, costs increase compared to working in a more favorable place. A successful location in itself does not guarantee success in business, but is its prerequisite.

The choice of placements is a hierarchical decision-making process, shown in Fig. 7.7.

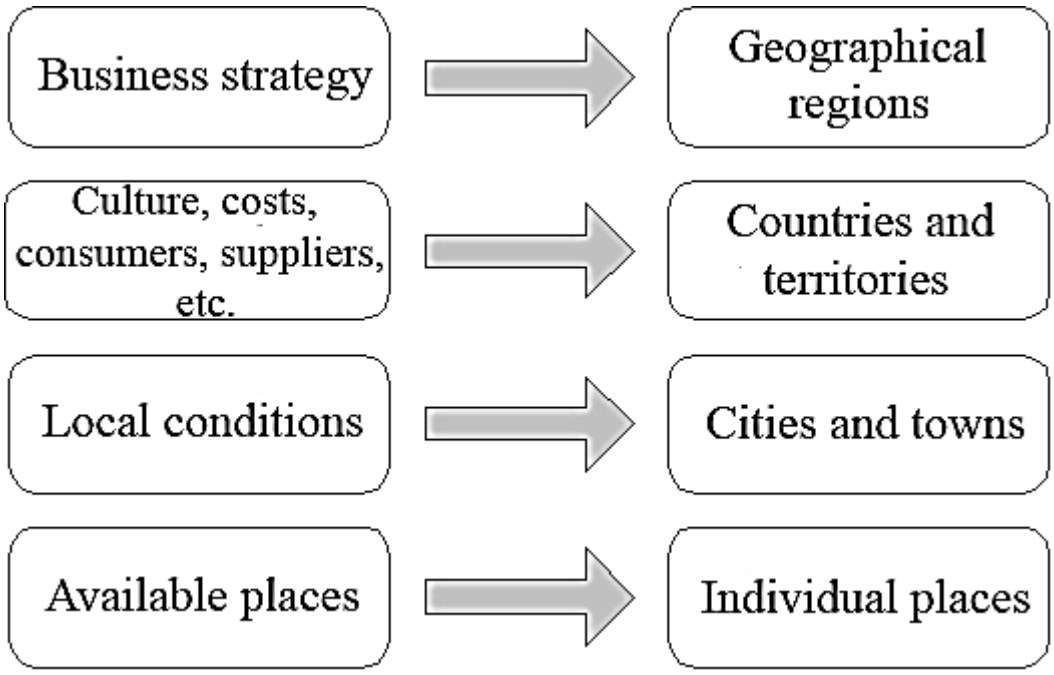


Fig. 7.7. Hierarchy of decisions taken when choosing a placement

When you select placements, consider the following factors:

Placement of customers. Proximity to consumers is important for industrial enterprises in cases of high cost or duration of transportation, as well as for commercial and service enterprises, such as shops, stations, libraries, restaurants, lawyer and notary offices, banks, etc.

Placement of suppliers and materials. It is advantageous for producers to be located near suppliers of materials and places of extraction of raw materials. Especially if the materials are heavy, bulky or perishable. For example, thermal power plants are built near coal mines, cellulose plants - near forests, vegetable processing plants - near agricultural enterprises, etc.

Culture. It is much easier to locate your business, especially in the case of enterprises that distribute their products in a given territory, in regions with similar laws, culture, language, way of life. This concerns, for example, the differences between Western and Eastern, American and European cultures, market and centralized types of economies, etc.

The attitude of the authorities and their plans. National or local authorities can seriously change the attractiveness of the territory by encouraging certain specific sectors, for example, financial or high-tech, or hindering environmentally hazardous production, for example, nuclear, chemical, etc. It is necessary to get acquainted with the peculiarities of local legislation, take into account the possibility of attracting local investments .

Direct and indirect costs. Using this factor it is necessary to take into account that low wages in the region can be accompanied by low productivity or quality, and vice versa. In addition, it is necessary to take into account local taxes, social and pension payments, control of the company's property (for

example, through the control of the local partner in matters of currency exchange and export of profits abroad).

Attitude of the public. In different countries, a different attitude toward methods of ensuring high productivity, for example, high fluidity and absenteeism can be a common occurrence, a different number of workers in the ranks of trade unions, a different attitude to the importance of collective or individual achievements in labor, etc.

Operations. It is necessary to decide whether the company will take into account the local environment and adapt its operations, organization of labor so that they are understood by local employees, or will implement its own work rules to facilitate control and increase productivity.

Size and configuration of the site. A large number of vehicles serving the input and output streams, requires a sufficient area for parking, maneuvering, travel. Their absence can lead to congestion, loss of time and customers. In addition, the office premises, sanitary facilities, guard posts, devices for collection and treatment of waste, etc. should be located on the territory of the enterprise.

Transport accessibility of the area. For example, when placing RCs, preference should be given to sites located on the main (main) routes. It is necessary to analyze the equipment of the territory with other types of transport, including public ones, on which the accessibility of the RC depends both for its own personnel and clients.

Competitors, their number, power, location.

Potential for expansion or implementation of changes.

The situation in the local labor market, the number of employees, their qualifications and productivity.

Political stability.

Natural conditions: climate, terrain, availability and character of water bodies, the possibility of natural disasters.

Exchange rates. Change in exchange rates for some time can turn an attractive place into a disadvantageous one and vice versa.

There is a factor that should not be used when solving the problem of placement, - personal preferences of the manager. Sometimes managers choose the area where they grew up or once they rested. Such a choice is a priori not bad, but it often becomes so, because its main drawback is low reliability due to the lack of an objective analysis of the location.

7.3.2. Methods for selecting placements

The task of locating the RC can be formulated and solved as the search for the optimal solution. There are various mathematical and heuristic methods for solving this problem.

An approach based on an infinite number of options.

In this approach, geometric arguments are used to find the best placement of the elements, while proceeding from the assumption that there are no restrictions when choosing a location. An approach based on an infinite number of options provides:

1) the method of calculating the center of gravity is based on finding a compromise between the costs of delivering materials and the costs of distribution of GPs (Fig. 7.8). The calculation of the coordinates of the center of gravity (X_0 ,Y_0); is made on the basis of the location coordinates (X_i ,Y_i) of each supplier and each customer (i), as well as the expected demand from customers and the volume of expected deliveries from suppliers W_i:

$$X_{0=}\frac{\sum X_i W_i}{\sum W_i}, Y_{0=}\frac{\sum Y_i W_i}{\sum W_i};$$

2) modification of the method of calculating the center of gravity by using actual road distances, not coordinates; use of delivery time or costs instead of distances; use iterative search procedures, when a step-by-step search for the best place is made.

This approach requires a small amount of input data, but has a number of drawbacks, namely: data on future customers are not always accurately known, the location found may not be practical for a number of other criteria.

Approach based on realistic options available

In this approach, it is considered that there are only a small number of really feasible places, and the organization should choose the best from them.

The approach based on the really available options provides:

1) the method of costing, i.e. calculating the estimated total cost variables (depending on the location) on the conduct of activities for each of the options and choosing the cheapest. The disadvantage of the costing method lies in the difficulty of obtaining an accurate forecast of costs and volumes of orders, in an objective change in costs over time;

2) the method of calculating points, which takes into account, first of all, the factors that are important for placement, but which can not always be represented numerically or estimated from the point of view of costs. The most important factors that should be taken into account are determined, for them expert values are determined by numerical factors of importance, after that each location is estimated in points for each factor. For each location, a weighted estimate is calculated, i.e. , and the place with the largest total weighted estimate is chosen. It must be remembered that in different situations the coefficients of importance of the same factors will differ, i.e. The place chosen by the best for an industrial enterprise may be the worst for a service enterprise;

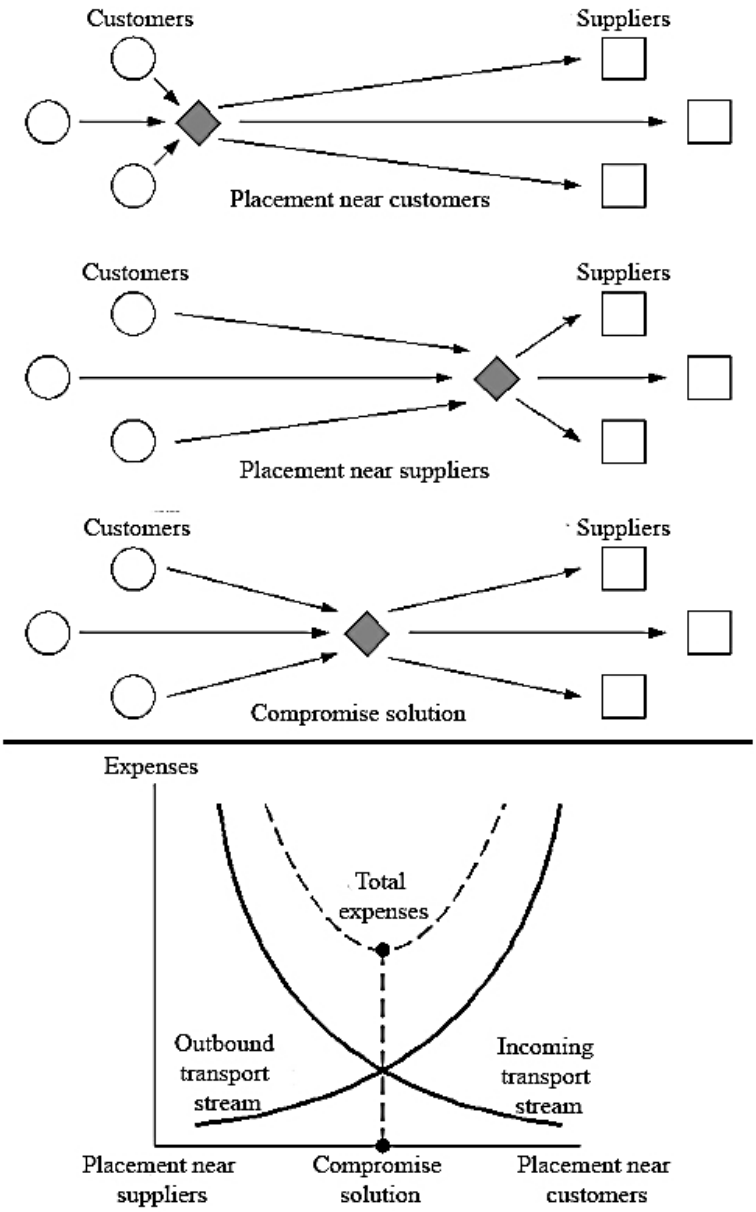


Fig. 7.8. Compromise choice of location

3) network models that use a weighted graph with vertices - cities and edges - roads. This solves either the problem of a single average (search for a variant of the location with a minimum average distance or travel time), or the task of encompassing (searching for a location option that provides the desired or minimum possible time to travel to any city).

Sometimes an approach based on an infinite number of options and an approach based on actually available options are used together. At the same time, the best territory in the first place is located, and then concrete places are compared on the basis of really accessible variants in this territory.

7.4. General and short-term planning

In the foreign and domestic practices of planning, sometimes different terms are used to indicate the level of planning and plans with varying degrees of detail in the decisions made. For example, in the foreign literature, the

following terms are used: generalized schedule, basic schedule, operational decisions, short-term schedule. The following terms are used at Russian manufacturing enterprises: a comprehensive annual plan, a production program, operational planning, an operational production plan, etc. The reader is asked to independently compare the terms used in this manual with similar terms used by Russian enterprises in various fields of activity.Generalized planning refers to the category of tactical solutions, during which the forecast demand and available capacity are converted into graphs by type of activity. At this level of planning, generalized plans and basic schedules are developed. In the generalized plans, the analysis is carried out by groups of activities, for each structure, as a rule, for each month, while the details of the work do not concern planning. So, for example, in a generalized plan, the amount of cargo that will be transported through the logistics center can be indicated, but the breakdown of the total cargo by types of packages or contents will not be made. After drawing up of the generalized plans, the basic schedules are developed that divide the generalized plan into components and show the activities, as a rule, for each week.Let, for example, the transport company forecast the demand for 800 tons of materials that it will deliver next year. In the generalized graphs, it can be indicated that, for example, it is planned to deliver 100 tons in each of the first eight months. Then, in the main chart, the details will be given, for example, two deliveries of 9 tons in the first week, three deliveries of 7 tons in the second week, three deliveries of 11 tons in the third week and two deliveries of 14 tons in the fourth week.

Planning does not end at the stage of drawing up the main schedule, because it is necessary to develop detailed schedules for all types of work, equipment, personnel, materials, facilities and other resources required to perform tasks set in the main schedule. For this, short-term schedules are used. Short-term schedules determine the sequence of performance of activities, resources and time when they must be met. For the example given above with the transport company, in the daily schedule, customers should be listed who will be shipped with cargo, cargo name, parameters, cars, drivers, spare parts, gasoline, etc. on that day.

Since the main schedule specifies the deadlines for completion of work, short-term schedules should take into account these dates. There are two ways to solve this problem:

Reverse scheduling: compilers know when each job needs to be completed. They go from this date back, building all kinds of activities to determine when each work should start, so that in the end the task was solved by the required date.

8. INDICATORS OF LOGISTICS

8.1. Types of indicators of logistics activities

To maintain high competitiveness LC should constantly develop and improve. To do this, you need a way to determine the following:

1) how well the LC is currently operating;

2) in which direction LC should be improved;

3) how successfully the process of LC transformations takes place in the chosen direction.

Answers to all these questions can be obtained by analyzing the indicators of logistic activity, since they reflect in a concise form the state of the functioning of logistics. Indicators can be direct or indirect, absolute or relative. Indirect indicators are often associated with finance, for example, profitability or payback period. On the one hand, financial indicators are easy to determine, look convincing, allow you to compare results, give an overall picture of the current state of drugs, are popular. But they have a number of significant drawbacks: they reflect past results, react slowly to changes, depend on a number of accounting methods, do not take into account important aspects of logistics, do not show specific problems and ways of eliminating them. Direct indicators are more suitable for analyzing the causes of the situation and searching for management decisions. These include: the weight of the delivered cargo, the speed of inventory turnover, the distance of cargo transportation, the number of outstanding orders, the number of violations of delivery conditions, etc.

Absolute figures include single (for example, sales or availability) and total (balance sheet, income and expense figures) indicators. Relative indicators are divided into specific (the ratio of the values of the parameters to the total number of any objects), interrelated (the relationships between different quantities), indices (the ratio of homogeneous quantities with each other, the denominator is the base value).

The most common indicators of supply chain activities are indicators that characterize LC capacity and productivity.

LC power and power factor

The LC power is not a fixed unchanged value, as it may seem at first glance, but really shows the efficiency of the organization of resource use. The fact is that power, firstly, depends on the way resources are used, and secondly, it changes with time. For example, the professionalism or unprofessionalism of managers can increase or decrease the capacity of the enterprise accordingly, with the same resources available. In addition, during the working day the working capacity of employees is reduced, which leads to a decrease in capacity. In this regard, as mentioned earlier, the design, effective and actual capacity is allocated.

In addition to the absolute power value, a capacity utilization factor is used to analyze the efficiency of logistics activities, showing the proportion of the projected capacity actually used. For example, if a fleet of vehicles is designed to deliver 100 tons of materials a week, but actually delivers only 60 tons, then the utilization rate of its capacity is 60 percent.

Performance

This indicator is one of the most widely used. There are several types of productivity:

overall performance - the ratio of total throughput to the total number of resources used. Disadvantages: use of monetary units of measure to compare the numerator and denominator, which leads to dependence on accounting techniques; the difficulty of accurately determining the values for all the components used, especially intangible ones, such as employee qualifications, the state of the environment, the reputation of the firm, etc .; impossibility to identify the most important factors;

partial productivity - the ratio of the total throughput to the number of units of a specific used resource, namely

equipment performance: number of vans; weight of cargo transported by a forklift; the distance the aircraft flew;

labor productivity: the number of deliveries of products per employee; the number of tons transported in one shift; the number of orders shipped per hour of work;

productivity of capital: the number of products stored per each investment unit; the number of deliveries per each unit of capital; the throughput per each ruble invested in equipment;

energy productivity: the number of deliveries per liter of fuel; the volume of stored products per kilowatt-hour of electricity; The added value for each monetary unit expended per unit of energy.

Logistic costs

Logistical costs (costs) - is the sum of all costs associated with the implementation of the LO: the placement of orders for the supply of products, purchase, storage of incoming products, in-house transportation, intermediate storage, storage of GP, shipment, external transportation, as well as staff costs, equipment, premises , warehouse stocks, for the transfer of data on orders, stocks, supplies.

Direct costs can be directly attributed to a product, service, order, or other specific media. Indirect costs can be directly attributed to the carrier only by performing auxiliary calculations.

Adjustable costs are costs that can be managed at the responsibility center (unit level). Unregulated costs are costs that can not be influenced from the center of responsibility, since these costs are regulated at the level of the company as a whole or in the external link (at another enterprise) of the LC.

Productive costs - the cost of work aimed at creating an added value that the consumer wants to have and for which he is willing to pay. The costs of

maintaining logistic activities alone do not create value, but they are necessary, for example, transportation costs, ordering, employee performance checks, and product record keeping. Control costs - the costs of activities aimed at preventing undesirable results of customer service.

Losses - the cost of work that does not yield useful results (simple, waiting). Imputed costs (costs of missed opportunities) characterize lost profits, loss of profits from the fact that resources were used in a certain way, which excluded the use of another possible option. Partial costs are the parts of costs attributable to certain characteristics that are attributable to a certain product, order, scope of activity.

Actual costs are the costs actually incurred for a given object in the period under review with the actual volume of orders performed. Normal costs are the average costs attributable to a given object in the period under consideration with the actual volume of service. Planned costs are the costs calculated for a certain object and a certain period with the planned maintenance program and the specified technology.

Other indicators

For each functional area of logistics, specific indicators are highlighted, for example:

- for procurement logistics - the cost of the order, the cost of purchased materials, the amount of discounts received, the number of transactions per employee, the number of errors, the number of permanent suppliers, supplier reliability, the possibility of unscheduled deliveries, terms of payment for supplies, supplier ratings, quality of delivered products, etc. .

- for transport logistics - reliable delivery, total time and total delivery distance, shipping costs, customer satisfaction, service frequency, number of losses and damages, time for loading and unloading, total relocated weight, number of erroneous deliveries, dimensions and carrying capacity of rolling stock , professionalism of drivers, etc .;

- for warehousing logistics - inventory turnover, average volume of stocks, loading of warehouse space, share of orders satisfied from stocks, share of total demand satisfied from stocks, lead time, errors in order picking; possibility of special storage conditions

8.2. Using indicators of logistics activities

8.2.1. Choice of indicators of logistical activity

There is a huge variety and a number of indicators that you do not have to use all at once. When using indicators to assess the effectiveness of logistics

activities, there arises the problem of inconsistency of different indicators, which can give multidirectional results. For example, if a truck rides faster than usual, the number of kilometers per hour of travel increases, but the number of kilometers per liter of fuel decreases; increasing the degree of warehouse automation increases labor productivity, but reduces the productivity of capital; the increase in the number of employees leads to an increase in the effective capacity, but may reduce the power utilization factor, etc.

To solve this problem, we must remember that measuring performance indicators is not the ultimate goal. The measurements only provide important information for the manager, on the basis of which he must draw a conclusion about the extent to which the supply chain is good at solving the tasks assigned to it. Thus, it is necessary to choose indicators based on the goals and objectives that the organization has set for itself. If, for example, the task was set in the shortest possible time to maximize the speed of advancement of the MP by LC, then managers should measure the speed of the MP and not have to worry about performance; if you set the task - to minimize costs, then you need to use different indicators of costs and less worry about congestion. Sometimes managers ignore this approach, using those indicators that are easier to get or more convenient to use, which were used before or those that represent the work of the manager in a favorable light. This approach can lead to: hasty, poor-quality customer service, if the work is evaluated by the number of clients, and not by the quality of services or, conversely, to large queues and indifference to customers, if the work evaluation is not dependent on the total number of clients served; to the speeding freight or passenger transport, if the work of drivers, respectively, is estimated by the number of deliveries per day or is strictly dependent on the schedule.

In order to really reflect the situation in the supply chain, the indicator should:

- be associated with the objectives of the supply chain;
- focus on significant factors;
- to be really measurable;
- to be objective;
- be associated with current, not past, results;
- be comparable with other organizations and other time slices;
- be understood by all interested parties;
- to impede manipulation in order to obtain distorted data.

8.2.2. Comparison of logistic performance indicators

Indicators of logistics activities help managers:

- to understand how well the set goals are achieved;
- to compare the current indicators of logistics with the past;

- compare logistics in different organizations;
- compare the performance of various parts of the LC;
- make decisions on investments and proposed changes;
- to measure the impact of changes on the supply chain;
- identify areas that require improvement.

The use of indicators, as a rule, makes sense only if they are compared with similar indicators of other enterprises or with the same indicators obtained for another period of time. There are the following ways of comparison:

1) comparison with absolute standards, i.e. ideal results that can be achieved at all;

2) comparison with the targets uses hard-to-reach, but realistic goals to achieve certain values of indicators;

3) comparison with past achievements analyzes the results obtained in the past;

4) comparison with competitors' standards (benchmarking) is based on the indicators of the best competitors in the industry. Benchmarking can be external (comparison of competitors' performance) and internal (comparison of indicators of separate divisions of one organization).

In addition to analyzing the indicators of logistics activities, there is an informal way to identify areas where improvements are needed: a survey of employees most closely related to logistics, a mutual exchange of ideas. In this situation, you can get valuable ideas and specific suggestions.

8.3. Methods for assessing logistics costs and ways to optimize them

8.3.1. Features of accounting costs in logistics

Pass through MT passes through many different divisions, but traditional accounting methods perform costing for individual functional areas, i.e. We only know what the implementation of a function does (Fig. 8.1, a). This does not allow to allocate costs for individual logistical processes, to generate information about the most significant costs and the nature of their interaction with each other.

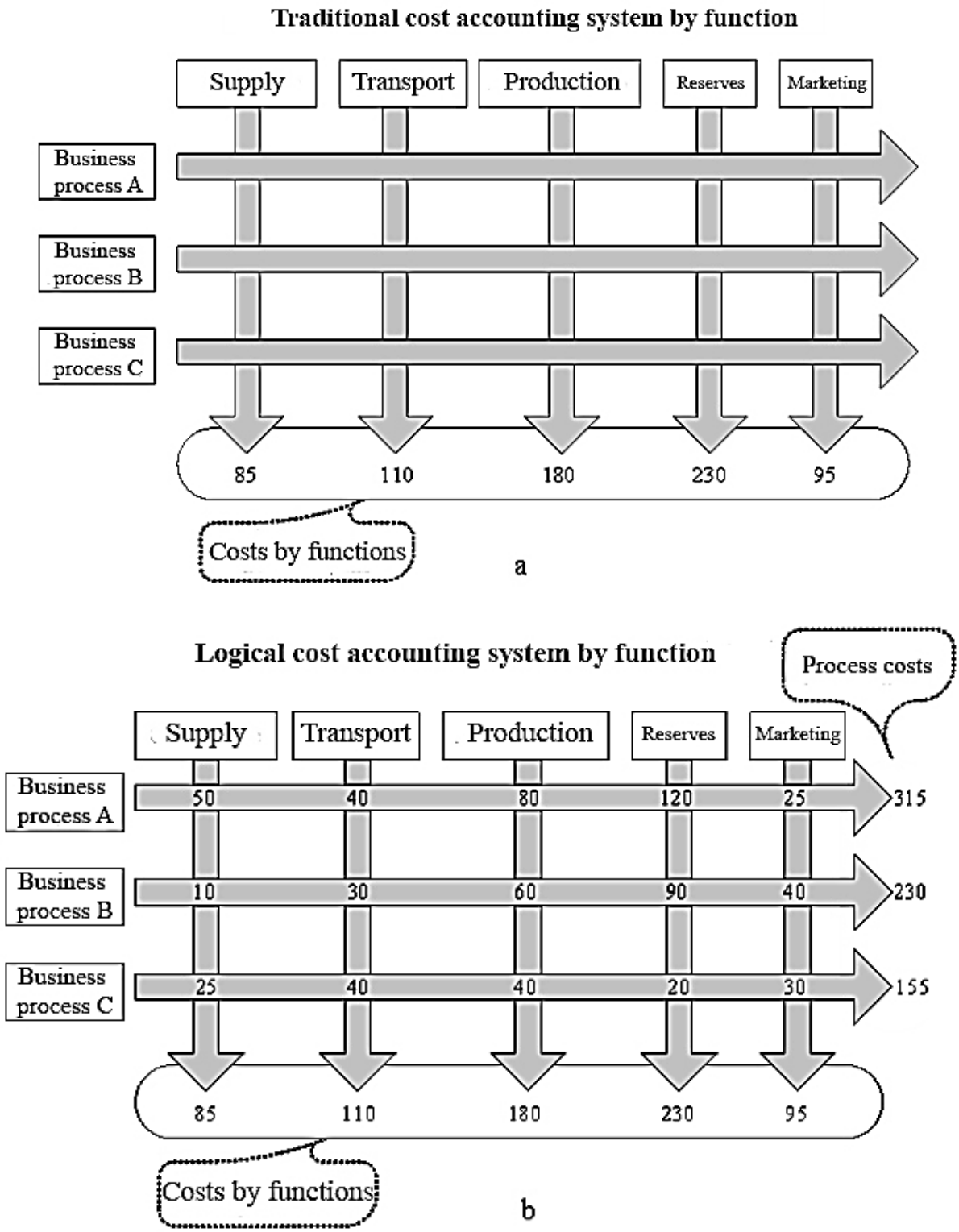


Fig. 8.1. Approaches to the cost accounting system:
a – traditional and logistic; b – logistic

For example, to execute a sales order, you need to perform the following operations: order acceptance, order processing, credit check, document preparation, order picking, shipping, delivery, invoicing. Those. The costs associated with the process of fulfilling the order are composed of a multitude of costs that arise in different spheres and it is difficult to integrate them into a

single item of expenditure in the framework of functional accounting. In addition, traditionally costs are combined into large aggregates, which does not allow for a detailed analysis of the different costs of origin, take into account in detail all the consequences of management decisions. As a result, decisions made in one functional area can lead to unforeseen results in other areas adjacent to it.

Unlike the traditional approach to cost accounting, logistics involves the introduction of operational cost accounting across the entire path of the MP movement. In logistics, the key event, the object of analysis, is the customer's order and the actions to fulfill this order. Calculation of costs should be able to determine whether a particular order brings profit and how to reduce the cost of its implementation. Accounting for process costs provides a clear picture of how the costs associated with servicing the customer are formed, what is the proportion of each of the units in them. Summarizing all costs horizontally, you can determine the costs associated with a particular process, order, service, product, etc. (Fig. 8.2, b).

The focus should be on reducing costs, which occupy the largest shares in the sum of all logistics costs. As practice shows, the main components of logistics costs are transportation and procurement costs (up to 60 %) and costs for maintaining stocks (up to 35 %).

Another feature of logistic costs is a sharp increase in their sensitivity to changes in the quality of work of drugs, as illustrated in Fig. 8.2.

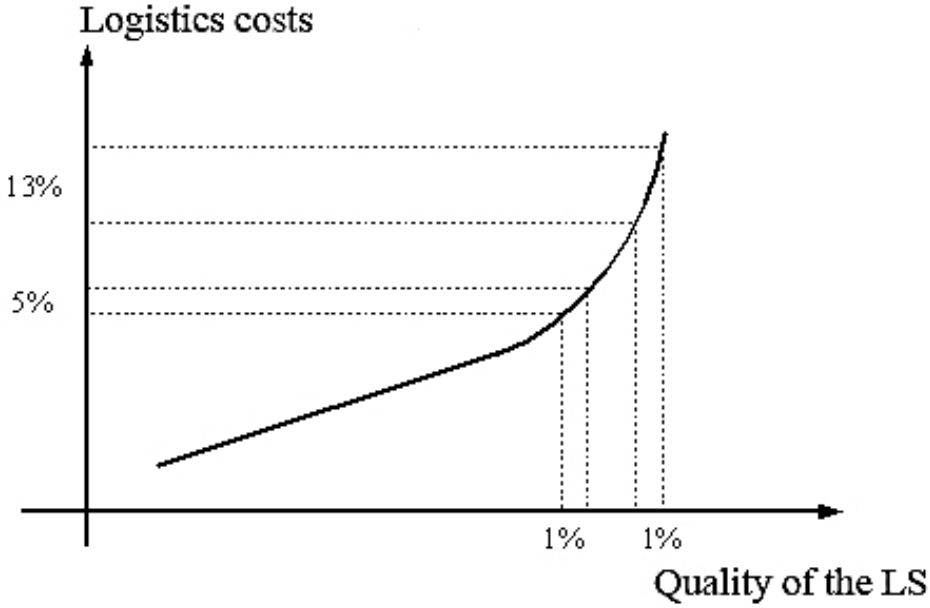


Fig. 8.2. Dependence of logistics costs on the quality of work of drugs

With the increase in the quality of work of drugs to a certain level, logistics costs increase linearly, and then exponentially. For example, if we want to increase the availability of the sales system for deliveries from 78 to 79 %, the cost of maintaining the safety stock will have to be increased by about 5 %. If we decide to increase the availability for deliveries from 98 to 99 % (also by 1 %, but in the field of high quality of work), then this will require an increase in costs by 13 %.Thus, the specificity of accounting for costs in logistics is:

firstly, the need to identify all costs associated with specific logistics processes (the principle of total costs);

secondly, in the grouping of costs not around the units of the enterprise, but around the work and operations that absorb resources.

The system for assessing logistics costs is needed only for logistics managers, who take it as the basis of the PR. No rules or laws require you to submit a process cost accounting in the financial statements. Distinctions of financial reports and reports on logistical costs are presented in Table 8.1.

Table 8.1

Comparison of logistic and financial reporting

Characteristic	Report on logistics costs	Financial report
Members List	Management of the company	Third-party users
Objectives	Optimization of MT, service flow and associated flows	Control of administration, provision of a basis for taxation
Quality criteria	Correspondence to processes, suitability of solutions in the field of logistics	Suitability for audit, compliance with instructions
Time dimension	Past, Present and Future	Past and present
Structure and content	Individual, tailored to each company, solutions, communications	Normalized by law and professional organizations
Degree of detail	Larger	Lesser
Publicity	Can contain information not disclosed to third parties	Contains information open to outside organizations

Requirements for the system of accounting for logistics costs

1. It is necessary to allocate the costs that arise during the implementation of each logistic function (Fig. 8.2, a).

2. It is necessary to keep a record of the costs of logistics processes to identify specific costs associated with one process, but arise in different divisions (Fig. 8.2, b).

3. It is necessary to generate information about the most significant costs.

4. It is necessary to generate information on the nature of the interaction of the most significant costs with each other.

5. It is necessary to determine the changes in costs, expenses caused by the rejection of this process.

6. In accordance with the principle of total costs, it is not enough to control only those costs that are generated within the same enterprise, it is necessary to identify the costs of all LC participants and clarify the mechanism of their formation and mutual conditioning.

8.3.2. Methods of analysis and ways to reduce the level of logistics costs

Rules for analysis of logistics costs1. It is necessary to clearly identify and justify the specific types of costs that should be included in the analysis scheme.

2. Cost centers are defined, that is, functional areas of business where significant costs are concentrated and where a reduction in their level can provide an increase in value added to the consumer.

3. Important points of concentration of costs are identified within each center of their concentration, ie, individual sites within a single cost center.

4. Costs must be attributed to specific factors relevant to the evaluation of alternative actions, and to establish a criterion for decision-making.

5. All costs are considered as a single stream that accompanies a particular business process.

6. Cost should be considered as the amount that the consumer pays, and not as the amount of costs arising within the enterprise as a legal entity.

7. Costs are classified by characteristics and analyzed by some method, they perform cost diagnostics.

8. The process of assessing logistics costs depends on subjective judgments and decisions, since there are no unambiguous rules for determining what costs to include in the analysis and how to distribute them across different media.

Methods of analysis of logistics costs

1. Benchmarking the structure of logistics costs, which is also called a strategic analysis of logistics costs.

2. Cost analysis, which is based on the study of cost elements and aimed at reducing costs.

3. Functional-value analysis, which is based on a thorough study of individual stages of the process of fulfilling customers' orders and ascertaining the possibility of their standardization for the transition to cheaper technologies.

Ways to reduce the level of logistics costs

1. Search and reduction of those types of activities (procedures, work, operations) that do not create added value, by analyzing and reviewing the supply chain.

2. Negotiating with suppliers and buyers to establish lower selling and retail prices, trade markups.

3. Assisting suppliers and buyers in achieving a lower level of costs (customer business development programs, seminars for resellers).

4. Integration of direct and reverse to ensure control over total costs.

5. Search for cheaper resource substitutes.

6. Improving the coordination of the enterprise with suppliers and consumers in the LC, for example, in the timely delivery of products, which reduces the costs of inventory management, storage, warehousing, delivery.

7. Compensation of the growth of costs in one link of the LC by reducing costs in another link.

8. Use of advanced methods of work to increase employee productivity.

9. Improve the use of enterprise resources and more efficient management of factors affecting the level of total costs.

10. Updating the most costly links of the LC in the implementation of investment in business.

9. ORGANIZATION OF LOGISTICS MANAGEMENT AT ENTERPRISE

9.1. Organization of management services in logistics

In Fig. 9.1 presents a traditional version of the management of the MP in the enterprise, the main disadvantage of which is the lack of systematic management. Thus, the links between LOs corresponding to different functional areas are not clearly defined, they are often established not purposefully, but randomly. There is no organization, unification of the LO into a common management function for the enterprise, and there is also no carrier for this function, which must implement it.

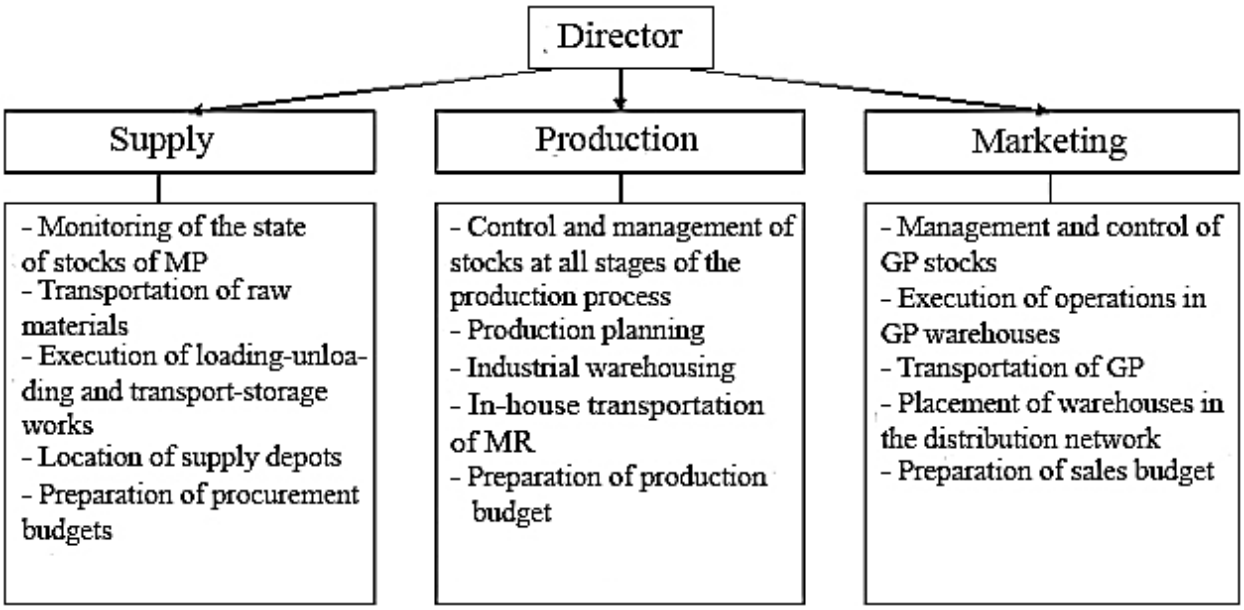


Fig. 9.1. Traditional enterprise management system

As a result, as such, there is no optimization of the through-going MT within the enterprise and the corresponding economic effect, i.e. the traditional system of organization of management MP lacks integrative properties. Since LFs are closely intertwined with other activities in the enterprise, this often leads to the distribution of LF for different services (marketing, supply, marketing, warehousing, production, etc.). At the same time, the immediate goals of these services may not coincide with the goal of rational organization of cross-cutting IP in the enterprise as a whole. Therefore, to effectively solve logistics tasks, it is necessary to create a separate subdivision - a logistics service, which will implement the following main tasks.

The main tasks of the logistics service

1. Development, formation, reorganization of drugs.

2. Development and implementation of the logistics strategy of the enterprise.

3. Internal and external logistics integration:

1) the formation of interactions, harmonious and productive working relations between employees of various functional units that would ensure the achievement of the purpose of drugs, the organization of their joint work;

2) coordination of activities in the functional areas of logistics at the enterprise and in the LC.

4. Management of MP and related flows, from the formation of contractual relations with the supplier and ending with the delivery to the buyer of the GP.

5. Logistics reengineering.

In Fig. 9.2 one of the possible options for implementing a logistics approach to the organization of the management system of the MP is presented.

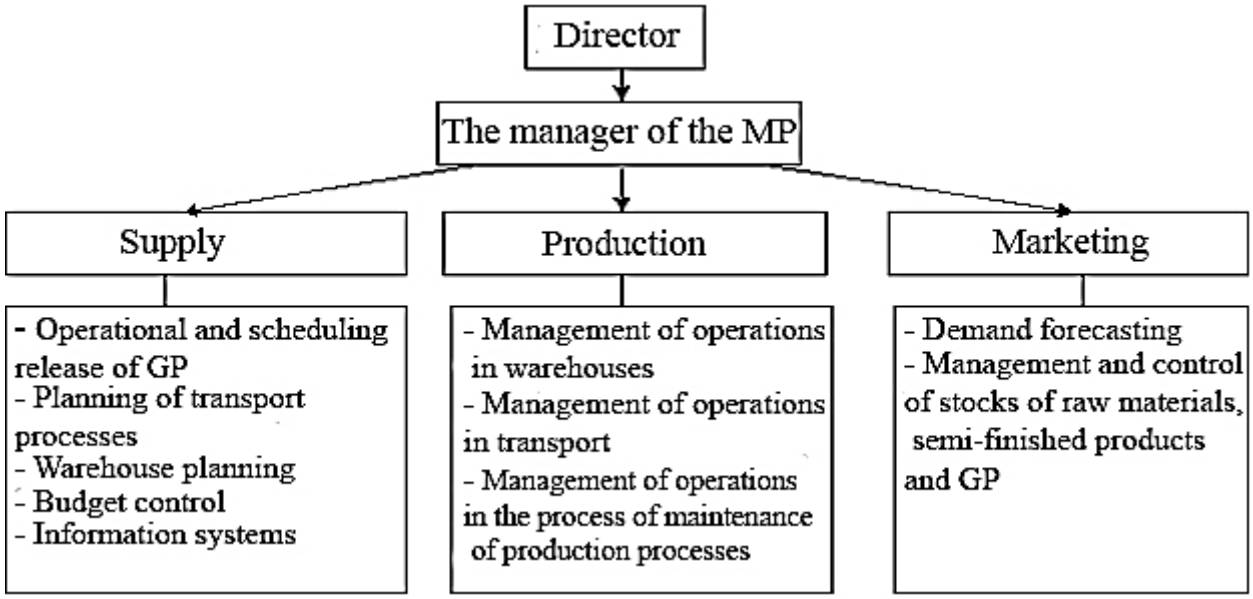


Fig. 9.2. Possible variant of realization of the logistical approach to the organization of the management system of the enterprise in the enterprise

In principle, to build the organizational structure of logistics management in an enterprise, one can use one of the typical management structures: linear, functional, matrix, divisional, etc. In reality, there are a variety of options for organizing logistics services in an enterprise, depending on the scale and specificity of the activities of specific companies (product range, technical complexity, level of costs for functional logistics areas, etc.), on the degree of internal from the market environment.

They differ in the level of internal integration at the enterprise, in the degree of centralization of logistics management, in the organizational structure of the logistics service itself, in the distribution and nature of the powers between it and other units.

Stages of evolution of logistics structures

By analogy with the historical stages of the development of logistics in terms of the level of coverage of the logistics management of various business

areas of enterprises, the evolution of logistics structures in enterprises is also the following three stages.

At the first stage, the main function of logistics is the delivery of the enterprise's products to the retail network. At this stage logistical functions are dispersed between different divisions, but there are tendencies to unite LF into organizational subsystems.

In the second stage, other products are added to the retail network: storage organization in warehouses, stock optimization, customer service, etc. LF not only expand, but also unite the majority of LO, and create systems for the delivery of goods on the orders of the client.

At the third stage, there is a complete unification of all LOs in the enterprise. The set of logistics tasks includes the construction of drugs, participation in production planning and sales forecasting; organization of procurement of MR for the enterprise, organization of deliveries of goods abroad, etc.

Possible organizational structures of the logistics service

1. The matrix structure is typical for large companies in the Anglo-Saxon countries. This is a classic response to the need for integration of all operations related to the MP. The Central Logistics Service is subordinated to several services responsible for a certain stage of the process of physical movement of products. Since the logistics service itself does not have its own operating facilities, its function becomes exclusively coordinating. There is a refinement of the final goals and coordination of the activities of the structures aligned "horizontally" (trade, production, procurement, research) and "vertically" (finance, information, quality control, logistics). The management of each logistic operating unit is accountable to these entities in that part of its activity that relates to them.

2. The second option is more typical for companies in Latin countries and is based on the interaction of "giving orders" and "service providers" units. It also leads to the integration of operations, but it does not create an ambiguous situation, when the same unit has a dual responsibility. The central logistics service receives "orders" from the sales department in the form of sales forecasts, clear indications and indicators of value, profitability. All this logistics service brings to a special list of tasks, specific for each stage of the logistics process. After that, the list of assignments is transferred to "internal representatives of services", i.e. shops, transport units, production units, etc.

3. The third option, less rigid than the previous one, is to establish within the company a clear system of priorities and a set of procedures that are well understood by workers. The function of the logistics service is then limited to internal logistics control: it monitors compliance with the rules for the movement of materials and goods. The role of logistics at this stage is decreasing, but it is perfectly understood by all workers. The work of management at each level is

assessed, including from the point of view of logistics effectiveness, the level of which is preliminary discussed and established on the initiative of the logistics audit service. The choice of this option is associated with the need for special logistics training for the entire staff of the firm. Periodically, in connection with the change in tasks, training sessions should be conducted while maintaining continuity in training and forming new skills based on previous ones.

All these three options can be superimposed on each other or generate many intermediate options.

Organization of interfunctional teamwork

One of the approaches to organizing the work of the logistics service is interfunctional teamwork, in the process of which specialists of various functional divisions of the enterprise collectively work on solving common logistics tasks of the enterprise or LC. Advantages of such work are:

- unification of knowledge, skills, abilities of employees of various divisions of the enterprise;
- Cross-section (vertically and horizontally) mastery of tasks and problems;
- improving the quality of decisions;
- Increase the level of interaction between the specialists of various divisions and the development of team cohesion;
- acceleration of the definition and solution of logistics tasks, etc.

There are the following conditions for efficient operation of interfunctional commands:

- less than 10 members;
- voluntary membership;
- the group is headed by a specialist in logistics;
- the volume of documentation is minimal;
- the head and members of the team share the ideas that constitute the essence of logistic activity;
- the team has clear objectives in the field of logistics;
- before the team specific tasks are set in the field of logistics;
- these goals can only be achieved through teamwork;
- there is a need for every member of the team;
- the activity of each member of the team is subordinated to the objectives of the team;
- the team receives an adequate return on its activities;
- specific types of rewards are provided for the activities of the whole team, and not for individual members.

Requirements for Logistics Specialists

Specialists in logistics should have a systemic mindset and have an idea of the resources of the enterprise. They are divided into tacticians who have good knowledge and work skills (computer literacy, knowledge of information systems, warehouse equipment, vehicles, etc.) and strategists who have high

analytical skills, communication skills, skills in planning, organizing and management.

To effectively solve logistics tasks, the strategist must:

- have access to all types and levels of information;
- to have official powers of the post in hierarchy of management of the enterprise that will allow it to make of the decision, including personnel;
- submit directly to one of the deputy directors or directly to the general director in order to have relative independence from the leaders of other functional divisions of the enterprise;
- have a high personal and professional authority;
- to be a good manager.

9.2. Change management

Any drug is functioning under conditions of constant changes both in the external environment (markets, economic conditions, competitors, technologies, etc.) and inside the drug (employees, goals of activity, products, plans, processes, costs, customers, suppliers, etc.). Changes - this is a normal part of the business, and if the organization does not respond adequately to them, it will inevitably lag behind the more dynamic competitors. It is no coincidence that the three important qualities of logistics include the absence of "fat" ("lean" logistics), integration and dynamism. Unfortunately, the transition to a new way of organizing work is often complex and can take place in several stages:

1. Denial by staff of the need for change as such
2. Protection. Employees justify existing approaches to solving problems and criticize the proposed new ones.
3. Begin the transition from old ways to new ones.
4. Adaptation. Use of new methods and recognition of their profitability.
5. Full implementation of the proposed improvements and confidence in their effectiveness.

When introducing logistic management at the enterprise, difficulties arise related to resistance, both to ordinary employees of functional departments, and their managers. The development of logistics at the enterprise requires a serious approach to staff motivation. Motivation is a necessary condition for the successful formation and development of drugs. Most people do not like change, because for their implementation, great efforts are required, a rejection of old and customary methods; mastering new qualifications, exploring new ways of acting, working out previously unfamiliar procedures, forming new relationships. Employees of functional units resist changes that deprive them of a sense of their own security, for example, when they:

- do not focus on the direction of change;
- forced to take risks on themselves;
- they are afraid of being unnecessary as a result of the changes;

- believe that they will not cope with new duties;
- are not able and / or unwilling to learn new skills and new behavior.

Heads of functional units resist when changes jeopardize their positions and power, i.e. in those cases when:

- their share in the enterprise's income decreases;
- their influence on decision-making is reduced;
- the possibilities of their control over the resources of the enterprise are reduced;
- their reputation is damaged.

Thus, changes need to be managed, understanding which improvements are necessary, being able to convince staff of the need and usefulness of improvements (using the theory of motivation), knowing how to organize the implementation of changes.

One of the important characteristics of changes is the pace of their implementation. For example, the British company Morgan Motor Company produces a Morgan sports car with the basic design of the 1930s and strongly emphasizes its stability. And Intel company operates on the frontiers of advanced technologies and constantly develops new types of products. There are two main approaches to change management.

1. Continuous improvement, which is a stream of relatively small changes that an enterprise can take without major upheavals. At the same time, the risk is significantly reduced, since it is easy to refuse from unsuccessful innovations and return to the previous version.

2. Business process reengineering is a fundamental change in thinking and radical redesign of business processes, which allows to achieve significant improvement of important performance indicators: costs, quality, service level and speed of response. The idea of reengineering is that the organization does not seek opportunities to improve current operations, but begins creating a new process from the very beginning.

The first approach can be compared with minor repairs, tinting an old car, and reengineering is similar in this case buying a new car. Those. if the enterprise has a bad logistics system, then maybe you should not waste time looking for small improvements, but you should develop a new system from the very beginning. Examples of successful use of reengineering are Ford of America (400% increase in productivity), IBM Credit Corporation (100 times increase in output). Although according to statistics, three quarters of the organizations that used reengineering could not achieve the progress they expected.

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