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## **Problems of the choice of information logistics systems**

### **Problemy wyboru systemów logistycznych informacji**

**Abstract.** Information logistics is currently developing at a rapid pace, thanks to mass computerization, the development of information technology, the growing Internet network. The role of information and computer support for logistics management can not be overestimated. The current state of logistics is largely determined by the rapid development and introduction of logistics in all areas of business of information and computer technology. Implementation of most logistics concepts would be impossible without the use of high-speed computers, local computer networks, telecommunications systems and software. At the heart of the process of managing material flows is the processing of information. The information system is an essential component of the logistics structure, linking it together and serving to coordinate the supply, production and marketing. The importance of the information logistics process is so important that many experts distinguish information logistics as an independent phenomenon in business and management of information flows and resources.

**Key words:** information logistics systems, business environment of the enterprise, criterias of choice, selection algorithm

**Synopsis.** Logistyka informacji obecnie rozwija się w szybkim tempie dzięki masowej komputeryzacji, rozwojowi technologii informacyjnych, rosnącej sieci internetowej. Nie można przecenić roli informacji i wsparcia komputerowego w zarządzaniu logistyką. Obecny stan logistyki jest w dużym stopniu uzależniony od szybkiego rozwoju i wprowadzenia logistyki we wszystkich dziedzinach biznesu i informatyki. Wdrażanie większości koncepcji logistycznych byłoby niemożliwe bez użycia szybkich komputerów, lokalnych sieci komputerowych, systemów telekomunikacyjnych oraz informacji i oprogramowania. W centrum procesu zarządzania przepływami materialnymi jest przetwarzanie informacji. System informacyjny jest istotnym składnikiem struktury logistycznej, łączy ją ze sobą i służy do koordynacji dostaw, produkcji i marketingu. Znaczenie procesu logistycznego i informacyjnego jest tak ważne, że wielu specjalistów odróżnia logistykę informacyjną jako niezależną wartość w biznesie i zarządza przepływami informacji i zasobami.

**Słowa kluczowe:** systemy logistyki informacji, otoczenie biznesu przedsiębiorstwa, kryterium wyboru, algorytm selekcji

## **Introduction**

The role of information technology in the work of modern commercial enterprises is continuously increasing. Logistics is a very dynamic discipline, quickly expanding. New solutions have emerged, with the growing role of networking technologies (many firms use information, which could be a source of growth its value) or adaptation of the logistics company to individual customer needs [Wojciechowski 2010].

Along with the traditional directions of its development, related to the automation of the enterprise's processes [Klepacki 2016], the use of new information technologies is typical for modern commercial enterprises. Successful business management is based on effective work with information, therefore, information logistics and information logistical systems are widely used by various enterprises. Informational logistics is the link between supply, production and marketing of the enterprise and is engaged in the organization of a data stream that accompanies the material flow in the process of its movement. The task of information logistics is to deliver the necessary and timely information to the management system of the enterprise and from it. Information-based logistics systems, as a rule, are automated systems for managing logistics processes. In this regard, the rapid development of modern information technologies (software, computer equipment, cloud services) contributes to the intensive introduction of information logistics systems in the business processes of enterprises. In this article, we looked at the main information logistics systems and the problems faced by enterprises in their choice. We also proposed a mechanism for selecting and evaluating the introduction of information logistics systems into the business processes of the enterprise.

## **Setting task**

The main purpose of the article is to outline the essence and basic principles formation of a mechanism for selecting, implementing and using information logistics systems in the activities of enterprises in terms of adaptation to adverse changes in the external and internal environment.

## **Purpose and research methodology**

The modern enterprise organizes production on the basis of investments coming through the banking system. In the process of production, goods or services are created. In the process of selling goods or services as a result of inflation and other unfavorable factors, losses are possible. The revenues received from the sale of goods or services cover investments and losses and allow the allocation of funds to expand production. When the market is saturated with goods or services, losses increase, production ceases to be effective. This prompts the enterprise to look for new markets, develop new projects, launch new products or services.

In the conditions of the world economic crisis, the main task of business in the coming years is survival, not development. This requires optimizing the company's internal

business processes in a specific external environment. The following resources of the enterprise are subject to optimization:

- financial;
- technical and economic;
- staffing;
- legal;
- intellectual;
- information;
- security.

The choice of information logistics systems used for enterprise management is significantly influenced by the external and internal environment of the enterprise.

The external business environment of the enterprise is information about the economic, social, political and other environments operating outside the enterprise, and the relations of the enterprise with these environments. The main components of the external environment are:

- the state of the world economy;
- the state of the national economy;
- the state of the industrial markets;
- the state of markets for certain types of goods and services.

The external environment of the enterprise determines its customers, suppliers, competitors, co-executors.

The internal business environment of the enterprise is a set of economic relations in the process of the enterprise's production activity. Indices of the internal business environment of the enterprise are the company's finances, the organization of production processes, the quality of products, the strategy of enterprise development.

All these factors influence the choice of strategic and tactical plans of the enterprise, operational management and marketing research and, as a consequence, the choice of information systems for enterprise management.

The enterprise information system includes separate information subsystems. These include [Tsimayeu and Goncharova 2014]:

- settlements with suppliers;
- settlements with customers;
- inventory management;
- production;
- customer relationship management;
- calculations with the personnel;
- administration, etc.

The enterprise can automate the presented business processes separately or in a complex way. In the latter case, the logistics information system is called integrated. The integrated information system includes a set of interrelated components designed to organize business processes and organize information flows through document circulation. A large company currently can use more than 50 different information systems. These are Enterprise Resource Planning (ERP), Business Intelligence (BI) systems, data warehouses, data centers, data transmission systems, server solutions, information networks and their infrastructure, mobile solutions, etc. [Gavrilov 2011].

In the world practice, the following classification of information systems is used:

**1. Material Requirements Planning – MRP.** The main goal of the MRP standard is to minimize production costs through efficient management of production resources. The input components for this standard are:

- description of materials and components necessary for the production of the final product;
- specification of products – a list of parts, their number;
- production plan – allocation of time for production of the required batch of finished products for the planned period.

The output of this standard is, the plan of orders and changes to the plan of orders. The first determines how much of each material, parts, components must be ordered in each considered period of time during the planning period. It is a guide for working with suppliers and defines a production program for in-house component production. The second reflects changes in the plan due to the cancellation, change or delays in deliveries.

**2. Capacity Requirements Planning – CRP.** It solves the problem of loading production capacities and taking into account the resource constraints of production. Thanks to this standard, a calendar plan of the enterprise's demand for production capacities is formed.

**3. Manufactory Resource Planning – MRP II.** This standard is focused on the effective management of all production resources of the enterprise. It allows you to carry out business planning, planning sales, production, the formation of a calendar plan for production, planning requirements for materials, capacities. It provides support for execution plans for production facilities and materials. The standard is characterized by hierarchy, integration, interactivity.

Hierarchy implies the presence of components of different levels of enterprise management – from the top, planning sales, to the management of the shop.

Integration implies the integration in the standard of various functions, such as production planning, supply, sales, cost accounting, plan execution, demand management, inventory management.

Interactivity is provided by the modeling block, which allows you to play different situations and answer the question “what will happen if” for both individual structures and the entire enterprise.

**4. Enterprise Resource Planning – ERP.** ERP means a set of integrated applications that allow you to create a single environment for automation of planning, accounting, control and analysis of all the main business processes of the enterprise: production, finance, personnel, supply, sales, storage, storage, maintenance and other.

A number of ERP-systems also includes support systems for sales and service management (SSM), supply chain management systems (SCM), product data (PDM), customer relationship management (CRM) systems.

ERP-systems allow to solve the following tasks:

- organize effective planning of all financial and economic activities of the enterprise;
- make the business transparent and attractive to investors;
- reduce risks and increase profits through prompt decision-making, an intuitive system of management, delineation of access in accordance with the positions of employees, increasing security due to this;

- reduce the loss of working time due to effective planning, avoid duplication of data by different services, organize an unhindered exchange of data between departments.

**5. Customer Synchronized Resource Planning – CSRP.** The CSRP system includes a complete cycle – from the design of the future product, taking into account the requirements of the customer before the warranty and after sales service. The essence of CSRP is to integrate the buyer into the enterprise management system. In this case, not the sales department, but the buyer places an order for the manufacture of products, he is responsible for the correctness of its execution and, if necessary, monitors the compliance with the terms of production and delivery. The enterprise can very accurately track the trends in demand for its products.

**6. Customer relationship management – CRM.** The CRM system is designed to manage the relationship of the enterprise with customers. The main business processes managed by such systems: establishment and maintenance of contacts, sales management, marketing, resource management, analytics, administration. CRM-system includes a database of clients, as well as a number of techniques that allow you to systematize data and regulate the procedure for working with them.

CRM-systems are divided into:

- Universal information systems. With the help of these systems, the relationship between the enterprise and its clients becomes more efficient, the costs for attracting new customers and retaining old customers are reduced. A single database will provide full understanding and transparency.
- Specialized information systems. The specialized include CRM-systems, focused on a specific industry of industry. They are intended mainly for the management of service enterprises, audit and insurance.
- Modules in the structure of large ERP-systems. For example, the CRM system is the establishment and maintenance of contacts as one of the components of an ERP system in a large corporation.

**7. Supply Chain Management – SCM.** This kind of systems are used by companies aimed at forming such a distribution network, in which the necessary goods will be delivered to the right place at the right time with the least costs. The SCM system is widely and effectively used in conjunction with ERP and with CRM systems [Gattorna 2008].

**8. Continuous Acquisition and Life-cycle Support – CALS.** The system is intended for the design and production of high-tech and science-intensive products, consisting in the use of computer technology and information technology at all stages of the life cycle of the product.

The system uses uniform methods of process management and ensures the interaction of all participants of this cycle: customers of products, suppliers and manufacturers of products, maintenance and repair personnel.

**9. Enterprise Resource and Relationship Processing – ERP II.** The ERP II system is designed to manage the resources and external relations of the enterprise. ERP II is formed from the CSRP system and the SCM module, product design systems and after-sales service. This system is widely used to automate the enterprises of machine building and instrument making, the production of vehicles, metalworking and other industries with a high share of the costs of design and technological preparation of production.

**10. Corporate Performance Management – CPM.** Analytical systems of the CPM class are used to support decision-making mainly by large and medium-sized enterprises. They are used for analytical processing of data and on the basis of analysis allow to develop measures to optimize existing processes, to plan further operation of the enterprise. Automate the processes of budgeting and planning, they are used to create reports, analyze, develop and monitor the implementation of strategic goals of the company. Analytical information systems are implemented either in the form of separate information systems, or ERP-system.

All these systems in various forms provide automation of business processes of enterprises and reduce the complexity of internal business processes, as well as increase the effectiveness of interaction between enterprises. Modern information logistics systems can cover 95–97% of all business processes of the enterprise. As a result, business standardization, faster and more accurate application of all business processes, increasing the efficiency of workflow, integration of the expanded functions are achieved [Brusakova and Chertovsky 2007].

If you need to make a choice between MRP II and the ERP system, you should take into account the specificity of each of these systems of these classes. The latter is more universal, while the first, developed for a specific type of production, can more closely take into account the specifics and needs of a particular production. For example, systems for continuous production (pharmaceuticals, food industry) and discrete (piece-by-piece) production, service organization, banks [Godin 2002].

Thus, the following factors influence the decision of the company to introduce the information logistics system:

- high cost of purchasing and installing software;
- duration and labor input of the system;
- large costs for training maintenance personnel, operation and maintenance of the system.

Also, the information logistical systems implemented by enterprises must meet certain requirements. Such as: functional completeness of the system; localization to the domestic operating conditions of the enterprise; reliable information protection; presence of remote access and work in distributed networks; availability of tools for adapting and maintaining the system; providing data exchange between different software products; possibility of integration and consolidation of information, data, applications; availability of special means of analyzing the state of the system during operation.

## Results

The variety of information logistics systems and requirements imposed on them complicates the process of selecting and implementing these systems in the business processes of the enterprise. As a result of our research, we have proposed the main elements for which it is necessary to pay attention to the process of selecting and implementing information logistics systems.

**Criteria of choice.** Information systems used to manage the operation of the enterprise, it is accepted to subdivide according to a number of characteristics. These signs

can be used to select an information system for managing the enterprise as the selection criteria (Table 1).

Table 1. Criteria for choosing information logistics systems

Tabela 1. Kryteria wyboru losistycznych systemów informacyjnych

Criteria groups	Example
Technical	<ul style="list-style-type: none"> <li>– technical architecture,</li> <li>– variant of execution (local, cloudy, mixed),</li> <li>– ability to integrate with other software products.</li> </ul>
Operating	<ul style="list-style-type: none"> <li>– the number of simultaneous users in the system,</li> <li>– functionality and integration,</li> <li>– opportunity to support corporate governance,</li> <li>– the ability to support operational, tactical and operational control.</li> </ul>
Economic	<ul style="list-style-type: none"> <li>– the cost of acquisition, implementation,</li> <li>– expenses for maintenance and training of personnel.</li> </ul>
Safety criteria	<ul style="list-style-type: none"> <li>– reliability of functioning,</li> <li>– save the data and information,</li> <li>– ensuring confidentiality.</li> </ul>

Source: own elaboration.

**Method of choice.** Based on the criteria and taking into account the basic requirements, the owner (manager) of the enterprise chooses the necessary information-logistic systems. There are several ways to choose them:

1. Expert and specialized consulting firms. These firms are more detailed about the developers and suppliers who offer software and technical solutions in the field of information logistics systems. However, they do not have information about the specifics of business processes in the enterprise to the customer.
2. Independent selection of the owner (manager) of the enterprise. The opposite situation in comparison with the first method. Transparency of business processes, but low awareness of the information technology market in the field of logistics.
3. Combined method. The combination of an independent choice with the recommendations of a consulting firm.

Each of the presented ways of choosing information logistics systems has advantages and disadvantages. However, in our opinion, the combined method allows eliminating a number of shortcomings and difficulties in the selection and implementation of information logistics systems.

**Algorithm of choice.** We propose an algorithm for selecting information logistics systems based on requirements, criteria and methods of selection, considered earlier. Namely:

1. Identify the purpose of implementation. The main goal of business is to increase profits. In this case, the introduction of modern information logistics systems contributes to a reduction in logistics costs, which allows, other things being equal, to increase profits. Goals can be realized in the short term, and in the long term.
2. Select the main tasks that need to be solved and identify the main costs that will be optimized in accordance with the purpose of implementing information logistics systems.

3. To determine the list of criteria for the evaluation of information logistics systems and their suppliers.
4. On the basis of goals, objectives and selection criteria, evaluate and select the necessary (optimal) software products and their suppliers in the market of information logistics systems.

After choosing the type of information logistics system, the stage of implementation and operation of this product in the business processes of the company follows.

**Efficiency mark.** In our view, the implementation phase should begin with an economic and management evaluation that can be carried out in the business plan of the investment project. The business plan, based on a comparison of the calculated costs and revenues, will provide preliminary information on the economic efficiency and payback periods of the introduction of the information logistics system. The business plan allows you to pre-determine the range of problems and risks in the implementation and use of the information logistics system, as well as the degree of their impact on the enterprise.

In addition, an important point is to evaluate the effectiveness of the information logistics system in the process of its use. Monitoring of the influence of the information logistics system used on business processes and the financial result of the enterprise is dictated by the variability of the external environment, which requires constant improvement of the system. This is confirmed by the rapid development of standard information logistics systems in the world [Zhuravskiy 2009].

The main attention when evaluating the implementation and use of the information logistics system in the enterprise, in our opinion, should be given to the comparison of the two groups of factors presented in Table 2.

Table 2. Estimated factors

Tabela 2. Szacowane czynniki

Cost factors	Benefits factors
<ul style="list-style-type: none"> <li>– Costs for the acquisition.</li> <li>– Costs for implementation and configuration.</li> <li>– The cost of staff training.</li> <li>– Maintenance costs.</li> <li>– Costs of security.</li> </ul>	<ul style="list-style-type: none"> <li>– Reduction of logistics costs.</li> <li>– Reducing production costs.</li> <li>– Reduction of managerial and administrative costs.</li> <li>– Increase in labor productivity.</li> <li>– Increase in the turnover of capital.</li> <li>– Increase in the speed and accuracy of management decisions.</li> </ul>

Source: own elaboration.

## Summary and conclusions

1. As a result of research into the scope and classification of information logistics systems, we identified the problems and the main factors affecting the implementation of these systems in the business processes of the enterprise.
2. In order to reduce the barriers to the introduction and use of information logistics systems in the activities of enterprises, we proposed the main criteria for their selection of these systems.



3. Based on the criteria and taking into account the basic requirements, we propose ways of selecting the necessary information logistics systems.
4. The article also considers the algorithm for choosing an information logistic system. In this algorithm, the final stage is the economic and management evaluation of the implementation and use of the information logistics system in the business processes of the enterprise.

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