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# ECONOMIC SUBSTANTIATION OF OUTSOURCING THE INFORMATION TECHNOLOGIES AND LOGISTIC SERVICES IN THE INTELLECTUAL AND INNOVATIVE ACTIVITIES OF AN ENTERPRISE

**Petro Pererva**

*Corresponding author*

Doctor of Economic Sciences, Professor, Head of Department\*

E-mail: pgpererva@gmail.com

**Volodymyr Kuchynskyi**

PhD, Associate Professor\*

**Tetiana Kobieliava**

Doctor of Economic Sciences, Professor\*

**Andriy Kosenko**

PhD, Associate Professor, Professor\*

**Olga Maslak**

Doctor of Economic Sciences, Professor, Head of Department

Department of Economics

Kremenchuk Mykhailo Ostrohradskyi National University

Pershotravneva str., 20

Kremenchuk, Ukraine, 39600

\*Department of Innovative Entrepreneurship Management and

International Economic Relations

National Technical University "Kharkiv Polytechnic Institute"

Kirpychova str., 2, Kharkiv, Ukraine, 61002

*It has been proven that modern information and logistic technologies are the most important resource of the post-industrial society. It was proved that not every enterprise has a possibility to ensure its information and logistic activities using its own capabilities, so the possibilities of using outsourcing systems are becoming especially relevant. General features of outsourcing of information technologies and logistic services were determined. The most important of them include the mandatory existence of interaction between a supplier and a customer regarding the business processes of an enterprise. It was substantiated that several important types of outsourcing are used in the area of intellectual innovation activities of enterprises: complete and partial outsourcing, outsourcing of a joint type, outsourcing of the intermediate type, outsourcing of intellectual and innovative type.*

*The method for synthesis of indicators of economic efficiency of outsourcing of information and logistic services of direct and indirect action for the economic evaluation of its effectiveness was proposed. This approach makes it possible to fully evaluate the benefits of outsourcing in comparison with the variant when they are implemented by an enterprise using its own capabilities. The basis of the proposed method is the ratio of indicators that reproduce the advantages obtained due to outsourcing. The implementation of this method makes it possible to ensure an important relationship between the process of development of information or logistic service and the required quality.*

*Studies conducted at the enterprises of the Kharkiv industrial region showed that only three out of eight studied enterprises have economic grounds for using outsourcing. From the economic point of view, it is more expedient for other enterprises to carry out information (logistic) provision of their activities using their own resources*

*Keywords: outsourcing, information technology, logistic services, innovation activity, economic effectiveness, indicators*

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## 1. Introduction

The intellectual and innovative sphere of activity of modern industrial enterprises includes not only the creation, distribution, and use of new goods. The ways of organizing industrial production, effective implementation of innovation activities in all types of business processes of an enterprise are extremely important.

Industrial enterprises try to organize with maximum efficiency all their production and commercial activities, including intellectual and innovative. Under modern conditions of the high level of market competition, enterprises need to constantly introduce innovative support for existing and gaining new competitive advantages, to preserve the consumer preferences. Under such conditions, the use of new innovative forms of organization of production and commer-

cial activities, which undoubtedly include outsourcing, is sufficiently justified [1–3]. Its advantages for an industrial enterprise are obvious, there are quite a few examples of outsourcing [4, 5], and the existing trends directly indicate that in the near future this organizational form of activity can become widespread.

It is necessary to agree with the statement that for the intellectual and innovative activities of an enterprise, outsourcing is practically the only opportunity to concentrate all available resources on achieving commercial goals [6]. It should be noted that at the industrial enterprise at initial stage of its intellectual and innovative activities, they are limited, as a rule. Quite often, in the practical activities of industrial enterprises, the provision of legal, patent, marketing, accounting, logistics, IT services, financing search services, etc. is outsourced at first. The corresponding audit of the economic feasibility of delegation of certain types of services to outsourcing (third-party organizations) is gradually carried out at the further stages of the development of an enterprise [7, 8]. Based on these provisions, it should be assumed that the economic evaluation of outsourcing services is extremely important for the effective operation of an industrial enterprise. That is why the problem of forming scientific and methodological recommendations on the economic justification of the use of outsourcing of information technologies in the intellectual and innovative activities of industrial enterprises is an important and relevant topic that urgently needs further development and improvement.

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## 2. Literature review and problem statement

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The author of paper [9] proposes to use indicators of reducing the costs of information services transferred to IT outsourcing as a criterion for the effectiveness of outsourcing of information technologies. In particular, they include costs of the production areas occupied by the information departments of an enterprise; production facilities; reduction of the number of personnel employed in the information departments of an industrial enterprise. It is recommended to consider the ratio of costs of own production of an information product and the costs of purchasing the same information products from an outsourcer as an integrated criterion for the effectiveness of IT outsourcing. If the ratio is more than unity, outsourcing is beneficial. The proposed IT outsourcing assessment mechanism is effective only at the stage of its design. It is quite difficult to assess existing outsourcing relationships according to this method, their adaptation for these purposes can lead to significant errors and inaccuracies.

For practical use, researchers of the effectiveness of logistic outsourcing offer more general methodological recommendations that do not take into consideration the production characteristics of an enterprise [10]. The authors propose to evaluate the effectiveness of outsourcing using criteria for the level of realization of the potential of the existing system of logistic services for consumers and the quality and timeliness of rendering logistics services under the outsourcing contract. The results of the evaluation of all these criteria are multiplied and the authors receive an integrated criterion for the effectiveness of the organization of logistic service of a customer enterprise. At the same time, the methodological recommendations proposed by these researchers make it possible to determine the effectiveness of

organizing the outsourcing process in general. Their use will be expedient only at certain stages of an innovative project, such as “implementation of logistical outsourcing” and “evaluation of the effectiveness of logistic outsourcing”.

A number of researchers propose another mechanism for the economic evaluation of outsourcing, considering it as a mechanism for disintegrating business processes. For example, according to methodological recommendations for measuring the effect of disintegration, paper [11] compares the additional effect. The authors of paper [11] compare the additional effect obtained from the implementation of an innovative project (transition to logistic outsourcing), with the cost of its practical implementation, and in research [12], an innovative project is considered successful if the difference between additional economic outcome and costs for its achievement is positive. However, there are no specific proposals for determining the size of the compared indicators in these studies.

It is considered in paper [13] that the economic assessment of outsourcing will consist of a number of main and additional effects. The main components include a decrease in specific costs of production, a decrease in the amount of related working assets, a reduction of logistic costs, an increase in liquidity, and some others. Additional components of the effect are provided by focusing on the main business activities of an enterprise, its faster reaction to changes occurring in the macro-environment. In particular, this is a reduction in the information or logistic personnel of an enterprise, guarantees of responsibility for the results of its work, etc. The methodological recommendations on the economic assessment of logistic outsourcing proposed by the authors have mainly a narrow specialization and characterize the operation of transport enterprises only. This is manifested, for example, in the choice of evaluation indicators, assessment of changes in logistic costs, in terms of rendering transport services.

Other researchers into outsourcing economic assessment are mostly limited to studying partial indicators, based on which it is possible to directly assess the effectiveness of outsourcing. In particular, paper [14] uses characteristics and indicators traditional for outsourcing: an increase in product quality, a decrease in its cost, optimization of the number of personnel of an enterprise. Particular attention to ensuring the rhythmicity of product deliveries, reducing the cost of R & D is paid in paper [15]. Paper [16] focuses on the processes of creation and commercialization of intellectual property objects. Without denying the importance and significance of these processes, we note that functions that are directly the subject of outsourcing relationships are more important to evaluate the effectiveness of outsourcing.

The considered mechanisms of economic evaluation of outsourcing of information and logistic technologies have a number of disadvantages and are excessively focused on the industrial specifics of enterprises. They mainly involve an assessment of the rationality of outsourcing information and logistic technologies in terms of technical and economic characteristics and indicators. However, the indicators that determine the quality of organizing the processes of designing information and logistic technologies and the transfer of information and logistic functions to a third-party organization (an outsourcer) were not represented to the full [7]. These factors are typical of the final stages of innovative projects in the field of outsourcing of information and logistic services. In addition, the risks of information and logistic

support and the consequences of using information [12] and logistic [15] technologies for all outsourcing participants at all stages of an innovative project are fully taken into consideration. The considered characteristics and indicators to some extent reflect the results of only the operational activities of an enterprise in the short term. Their impact on the amount of income in the future is almost impossible to determine, and it is quite difficult to substantiate for potential investors the expediency of organizational development of the information and logistics sphere of an enterprise with their use.

However, though outsourcing is widespread in European enterprises, it is still a relatively new phenomenon. In Ukrainian economic science, the concept of outsourcing has appeared relatively recently, so many problems and tasks related to it are not sufficiently studied. The main reason for this situation is the lack of fundamental scientific, theoretical and practical developments in the information and logistic sphere, which can encourage top management of industrial enterprises to take active actions in the field of using outsourcing of information and logistic services.

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### 3. The aim and objectives of the study

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The purpose of this study is to form scientific and methodological provisions and practical recommendations to determine organizational and economic dominants, which become one of the main driving forces to ensure effective information and logistical support of intellectual and innovative activities of an industrial enterprise. This provides a real opportunity to put the results into practice, to regulate and manage information and logistic technologies, in particular, in the area of using outsourcing of information and logistic services.

To achieve the set goal, the following tasks were to be performed:

- to consider approaches to the interpretation of outsourcing of information and logistic technologies as an economic category;
- to study the formation of a system of indicators of economic effect when using information and logistic technologies in the intellectual and innovative sphere;
- to devise the methods for calculating the indicators of economic assessment of the use of information and logistic technologies of an enterprise applying its resources and using outsourcing relations;
- to conduct practical approbation of the developed proposals on the example of enterprises of Kharkiv industrial region.

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### 4. Materials and methods of research

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The research was conducted using the methods of systemic analysis, structural approach, induction and deduction, observation, and comparison. These methods were used to form the concept of outsourcing as an economic category and in the formation of a system of indicators of economic evaluation of outsourcing of information and logistic services.

Based on the theoretical concepts, an analysis of the possibility of applying them in the practice of industrial enter-

prises in the area of their intellectual and innovative activity was carried out. In particular, factor analysis was used to form an integrated indicator of the economic efficiency of outsourcing of information and logistic services.

Sequential consideration of the components of economic efficiency of outsourcing of information and logistic services and their economic and mathematical modeling were proposed as the research methodology. This approach can be used in assessing the impact of outsourcing of information and logistic services on the economic outcomes of intellectual and innovative activities of industrial enterprises.

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## 5. Results of research and development of the methods for the economic evaluation of outsourcing at industrial enterprises

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### 5.1. Studying the outsourcing of information and logistic services as an economic category

The intellectual and innovative activity of industrial enterprises is based on the use of modern scientific and technical developments. Along with the economics of knowledge and intellectual potential, the most important resource of post-industrial society – modern information and logistic technologies – is determined. The use of innovative ideas, systems, methods, equipment, machines urgently requires advanced management technologies and organizational tools and the use of modern information and logistic systems. Not every enterprise has the possibility to independently ensure its information or logistic activities using its own capacities, so the possibilities of using the system of information and logistic outsourcing are becoming particularly relevant.

Outsourcing is called by many entrepreneurs “the phenomenon of the twentieth century”, in particular, “the greatest business discovery of recent times”, because only since the early 90s of the XX century, this definition has entered the practice of business activities and has become a fairly widespread [9, 12].

The emergence of outsourcing is largely related to the development of information systems and technologies. A large number of scientists associate the origin of outsourcing with the date of foundation of the company “Electronic Data System” (1962), specializing in information support of outsourcing [10, 15]. Since the late 80s of the last century, outsourcing began to develop actively, becoming the object of attention of the world’s largest corporations. Over time, outsourcing began to be identified not only with computer technologies and intellectual and innovative activities, but also with the implementation of separate business processes and functions (accounting, production, logistics (transport), consulting, legal, etc.). In the practice of industrial enterprises, outsourcing is now rightly a modern highly effective concept for managing business activities.

Significant achievements of the STP in recent times, mainly associated with the rapid development of the IT-sphere and intellectual and innovative activities, caused noticeable changes in the nature of modern economic processes. The key role of information and logistic technologies in the operation of industrial enterprises determines the need for continuous development and actualization of information and logistical components of intellectual and

innovative activities of an enterprise. The total efficiency of an enterprise depends on the availability of innovative tools for managing information and logistic processes. In the context of increasing costs for the introduction of modern information and logistic technologies, the outsourcing practice takes on a special role. Outsourcing of services in the area of information and logistic technologies ensures a high degree of production optimization, high-quality management taking into consideration the specifics of a particular enterprise. Namely, it enables accessing the latest developments and promotion of the development of intellectual and innovative activities, the introduction of innovations, as well as the growth of flexibility and formation of competitive advantages.

Despite the wide scope of using the definition of “a service in the area of information and logistics technologies”, its definition in the scientific literature is not currently established. There exist research into the definition of information or logistic technology proposed by well-known international research institutes, which include the International Organization for Standardization (ISO) and the Information Technology Infrastructure Library (ITIL). Based on these studies, it was concluded that the common point of all available definitions of outsourcing of information and logistic technologies is the mandatory existence of the interaction between a supplier and a customer regarding the business processes of an enterprise based on the use of information technologies.

The conducted studies make it possible to conclude that the most common type of outsourcing is IT outsourcing. Outsourcing of information technologies in modern scientific research is separated as an independent type of outsourcing since the origin and further development of the concept of outsourcing are associated with its appearance. It is proposed to define IT outsourcing as a transfer of the functions of support of information systems to external management.

Some most important types of outsourcing are used in the area of intellectual and innovative activity of industrial enterprises: full and partial (selective) outsourcing, outsourcing of a joint (common) type, outsourcing of intermediate type, outsourcing of intellectual and innovative (transformation) type. The most general characteristics of these types of outsourcing are shown in Fig. 1.

It should be noted that transformation outsourcing is the basic one in providing information support to the intellectual and innovative activities of an industrial enterprise. This conclusion is proved by the availability of possibilities of transformation outsourcing to develop new (innovative) products, using the existing intellectual potential of both an outsourcer and an outsourcee.

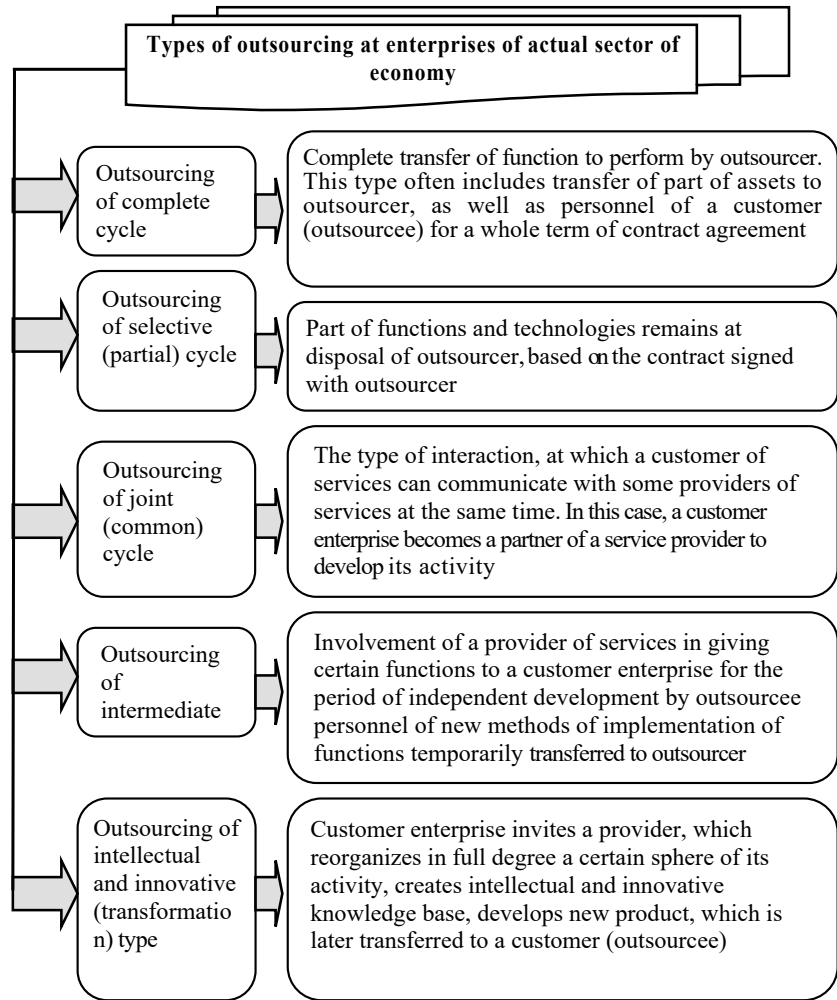


Fig. 1. Classification of types of outsourcing at industrial enterprises in the area of intellectual and innovative activity and their brief description.

Source: systematized by authors using [9, 13, 17]

### 5. 2. Formation of a system of indicators of economic assessment of outsourcing of information and logistic services

The effectiveness of outsourcing of information and logistic services includes both the subject of its implementation and its customers. However, the effectiveness of the same service has different cost and production economic significance for a customer of service and for its producer. Currently, existing methods for the economic evaluation of outsourcing need to be improved. For example, an outsourcer considers the implementation of this service effective, while the level of effectiveness of using the same service for different consumers (outsourcee) may vary significantly due to the existence of many criteria for the effectiveness of this service for its customers.

The results of the conducted study indicate that the existing methods do not make it possible to sufficiently assess the effectiveness of outsourcing of information and logistic services. Their attention is focused on certain conditions and indicators of outsourcing effectiveness. The evaluation of separate indicators characterizes specific aspects of the activity of an enterprise, but they do not give a complete idea of the feasibility of outsourcing of information and logistic services, the effectiveness of using the procedure of delegating information and logistic tasks.



The proposed method of synthesis of indicators of the effectiveness of outsourcing of information and logistic services expands the scope of evaluation of the effectiveness of outsourcing services and makes it possible to evaluate the benefits of outsourcing. The use of this method makes it possible to ensure an important relation between the process of development of information or logistic service and the necessary quality, for which a new procedure for deciding on the use of outsourcing of information and logistic services was developed (Fig. 2).

The proposed procedure enables a company to make an economically grounded decision on the use of outsourcing services, taking into consideration the effectiveness of the outsourcing agreement when achieving the required quality of information (logistic) services. The proposed procedure makes it possible to compare the level of quality and costs of outsourcing in the area of intellectual and innovative activities, and to form the strategy for innovative development of an enterprise, taking into consideration the possibilities of using advanced information and logistic technologies. The practical implementation of the proposed procedure for economic justification of outsourcing of information and logistic services (Fig. 2) involves the formation and calculation of a number of indicators of the effectiveness of services used at an enterprise. These indicators should comprehensively reproduce the economic feasibility of creating and using information and logistic technologies applying their capabilities or using outsourcing services.

Paper [17], which explores the indicators of the effect of using outsourcing, supports a multi-criteria method in general. But it is recommended to get rid of its shortcomings by making calcula-

tions of the effect for each effect-forming factor, rather than determining the overall economic effect. This can be either direct economic effect (directly related to the performance of a specific function or a business process) or indirect (not related to this function directly). The classification of the factors of direct and indirect economic evaluation of outsourcing is given in Table 1.

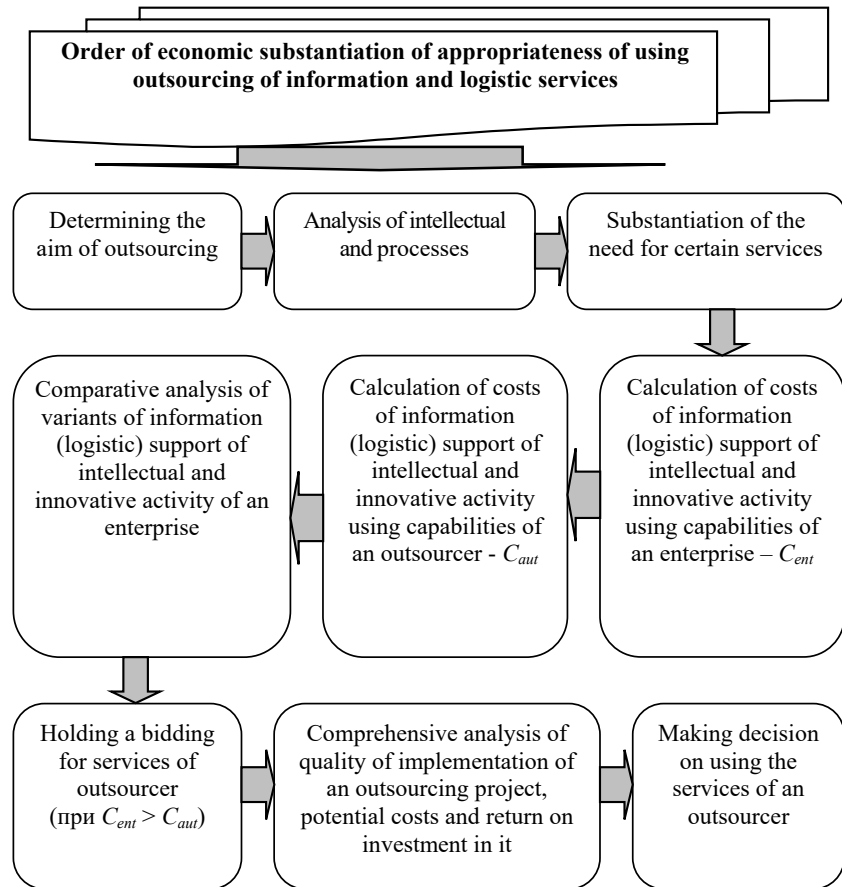


Fig. 2. The procedure of deciding on outsourcing information (logistic) technologies

Table 1

Classification of the factors of economic estimation of outsourcing

Factors of economic estimation	Types of costs or incomes in the implementation of information (logistic) function using own capabilities of outsourcee	Types of costs or incomes in the implementation of information (logistical) functions by an outsourcer
1	2	3
Factors of direct economic estimation		
Costs of transaction group	Costs of organization, preparation, management, and completion of performance of information (logistic) functions in the intellectual and innovative sphere using own capabilities of an industrial enterprise	– costs for the organization of the bidding and selection of an outsourcer, making an agreement, control, and management of relations with an outsourcer; – release of surplus personnel; – organization of sale of surplus assets; – potential losses associated with the inability of an outsourcer inability to perform its direct functions
Costs of transformation group	Current costs for the performance of information (logistic) functions using own capabilities of an enterprise	Payment for services of an outsourcer
Flows of investment to information (logistic) area	Purchase of assets necessary for the performance of information (logistic) functions using own capabilities of an enterprise	– costs of forming specific assets necessary for interaction with an outsourcer; – effect of the sale of information (logistic) assets that will not be necessary for outsourcing
Effect of improving the quality and/or volumes of product sale	Revenues from the sale of finished products in the performance of information (logistic) functions using own capabilities of an enterprise	Revenues from the sale of additional volume of finished products obtained through outsourcing and/or from an increase in the quality of finished products

1	2	3
Factors of indirect economic estimation		
Tax amount	Decrease (increase) in taxes (on available assets, salary, etc.) and other mandatory payments	Decrease (increase) in taxes paid by a customer in the performance of information (logistical) functions on its own
Increase in the effect of using information (logistic) assets	Income from assets in the performance of information (logistical) functions using own capabilities	Increase in revenue from the available volume of assets when transferring information (logistical) function to outsourcing (for example, when leasing vacated premises)
Change of indirect costs of the transaction group	Costs of managing an enterprise in the performance of information (logistical) functions using own capabilities	Costs of managing an enterprise in the performance of information (logistic) functions using own capabilities of an outsourcer

Source: Compiled by the authors based on [13, 15]

It is possible to formulate this statement in a slightly different way: direct effect refers directly to the process or the function (or their totality) that are transferred to outsourcing, while indirect effect refers to an enterprise in general. Of course, this division cannot be always distinct, but it is important to keep it in mind. In turn, direct and indirect effects can be decomposed into separate elements, which we showed in Table 1. This kind of division makes it possible, firstly, to identify more specific areas of effect formation; secondly, to ensure full consideration of its components.

### 5. 3. Development of the methods for calculating indicators of economic evaluation of outsourcing of information and logistic services

Methodical recommendations on economic evaluation of indicators of using outsourcing are offered. Economic assessment includes determining the level of effectiveness of using the methodology for comparing indicators of an outsourcing model according to certain criteria, as well as using analysis of additional non-traditional indicators of strategic evaluation. The latter include improvement of the quality of manufactured products, development of new markets and expansion of existing ones, development of innovative products, an increase in sales volumes, etc., which fully meets the strategic goal set by an enterprise.

There are a lot of indicators of economic evaluation of outsourcing of information and logistic services. We showed some of them in Table 1. It does not make sense to analyze all of them in one study since their set largely depends on a specific production situation, the material state of a customer, the production capabilities of an outsourcer, and so on. But the most important of these indicators should be considered in more detail.

The basis of the proposed method is the ratio of indicators that most characterize and reproduce the benefits that were obtained through the use of outsourcing of information and logistic services. It is proposed to include the following indicators in this group:

1. Integrated coefficient of costs for the organization, preparation, management, and performance of information (logistic) functions in the intellectual and innovative sphere –  $IK_{aut}$ , which is determined by the ratio of costs for executing the works using own capabilities of an enterprise to total costs of performing (acquiring) the same works by an outsourcer  $\sum_{j=1}^m C_j^{aut}$ :

$$IK_{aut} = \frac{\sum_{i=1}^n C_i^{ent}}{\sum_{j=1}^m C_j^{aut}}, \quad (1)$$

where  $n$  is the number of types of costs for the implementation of the  $i$ -th type of work or services using the company's own information (logistic) capabilities;  $m$  is the number of types of costs made to purchase the  $j$ -th type of work or services from an outsourcer.

2. Comprehensive indicator of the quality of products manufactured or developed as a result of intellectual and innovative activity –  $CI_{aut}$ , which is determined by the ratio of the total level of quality without the use of outsourcing services  $\sum_{i=1}^n QI_i^{ent}$  and with them  $\sum_{j=1}^m QI_j^{aut}$ . It is proposed to determine quality assessment by independent experts or focus groups:

$$CI_{aut} = \frac{\sum_{i=1}^n QI_i^{ent}}{\sum_{j=1}^m QI_j^{aut}}, \quad (2)$$

where  $n$  is the number of  $i$ -th types of quality indicators acquired using the enterprise's own information (logistical) capabilities;  $m$  is the number of  $j$ -th quality indicators acquired when using outsourcing works or services.

3. Coefficient of the volume of market sales of manufactured products  $PS_{aut}$ , which is determined by the ratio of sales volumes after purchasing outsourcing services and without them. At the same time, innovative types of products that are produced using the intellectual potential of an enterprise are of particular importance:

$$PS_{aut} = \left[ \frac{\sum_{i=1}^n PS_i^{aut}}{\sum_{j=1}^m PS_j^{ent}} \right], \quad (3)$$

where  $n$  is the number of the  $i$ -th types of products of an enterprise sold using the works or services of an outsourcer;  $m$  is the number of the  $j$ -th types of products of an enterprise, sold using the enterprise's own information (logistic) capabilities.

4. Coefficient of the volume of market sales of innovative products created and produced using the intellectual potential of an enterprise –  $PS_{aut}^{inn}$ , which is determined by the ra-

ratio of sales volumes of innovative products after purchasing outsourcing services and without them:

$$PS_{aut}^{inn} = \left[ \frac{\sum_{i=1}^n PS_{inn_i}^{aut}}{\sum_{j=1}^m PS_{inn_j}^{ent}} \right], \tag{4}$$

where  $n$  is the number of  $i$ -th types of innovative products of an enterprise created and sold using works or services of an outsourcer;  $m$  is the number of the  $j$ -th types of innovative products of an enterprise, created and sold using own information (logistical) capabilities of an industrial enterprise.

A positive decision to outsource the entire information (logistic) system of an enterprise or its part is made at an enterprise if each of the indicators  $IK_{aut}$ ,  $CI_{aut}$ ,  $PS_{aut}$ ,  $PS_{aut}^{inn}$  exceeds the value of unity. But this state of indicators is to some extent ideal for an outsourcer, in this case, the acceptance of its services for an enterprise practically does not cast doubt.

The situation when some of the indicators exceed the value of unity and some do not exceed it is more realistic. In this case, it is recommended to use the integrated value of the indicator of economic feasibility of outsourcing of information and logistic services for this enterprise  $I_{aut}$  using the following dependence:

$$I_{aut} = IK_{aut} \gamma_{IK} + CI_{aut} \gamma_{CI} + PS_{aut} \gamma_{PS} + PS_{aut}^{inn} \gamma_{inn}, \tag{5}$$

where  $\gamma_{IK}$ ,  $\gamma_{CI}$ ,  $\gamma_{PS}$ ,  $\gamma_{inn}$  are weights of  $IK_{aut}$ ,  $CI_{aut}$ ,  $PS_{aut}$ ,  $PS_{aut}^{inn}$ , respectively, for a certain enterprise in the economic assessment of outsourcing services.

### 5. 4. Practical approbation of developed proposals on the example of enterprises in Kharkiv industrial region

The conducted research suggests that not all enterprises have the need and possibilities both to ensure independently their activities, and to contact the outsourcing services, as evidenced by data from Table 2.

Results of economic assessment of information (logistic) services of outsourcers at industrial enterprises of Kharkiv industrial region

Enterprise	Partial indicators of economic assessment								$I_{aut}$	Conclusion
	$IK_{aut}$	$\gamma_{IK}$	$CI_{aut}$	$\gamma_{CI}$	$PS_{aut}$	$\gamma_{PS}$	$PS_{aut}^{inn}$	$\gamma_{inn}$		
PJSC «KTP»	1.00	0.52	1.05	0.23	0.95	0.14	0.93	0.11	0.99	Independently
DP «FED»	1.13	0.46	1.02	0.18	1.00	0.17	0.96	0.19	1.04	Outsourcing
DP «KNEP»	1.00	0.61	0.98	0.12	1.02	1.16	0.95	0.11	0.99	Independently
PAT «Avtoromat»	1.10	0.44	1.04	0.16	1.04	0.19	1.01	0.21	1.02	Outsourcing
PAT «Ukrelectromash»	0.88	0.56	1.00	0.11	1.00	0.15	0.90	0.18	0.91	Independently
JSC «Turboatom»	1.00	0.41	1.02	0.27	1.00	0.12	0.88	0.20	0.98	Independently
PAT «Khartoron»	1.18	0.39	1.05	0.21	1.02	0.18	1.00	0.22	1.08	Outsourcing
JSC «Electromachine»	0.91	0.49	0.96	0.15	0.93	0.19	0.94	0.17	0.92	Independently

It follows from the data in Table 2 that only three out of eight explored enterprises have economic grounds for outsourcing. From the economic point of view, it is more expe-

cient for other enterprises to carry out information (logistic) support of their intellectual and innovative activities using their own capabilities.

The conducted research made it possible to separate the most important segments of the market of information and logistic technologies. They include, in particular, costs of vehicles, computing equipment, outsourcing, software, personnel training, other costs (Table 3).

Table 3

Dynamics of the structure of costs of industrial enterprises for information and logistic support of intellectual and innovative activities (% %)

Types of costs	DP «FED»		PAT «Avtoromat»		PAT «Khartoron»	
	2016	2020	2016	2020	2016	2020
For computing equipment	42	19	38	13	36	10
For vehicles	19	22	16	12	14	11
For outsourcing	16	18	18	28	22	28
For software	12	26	17	33	19	41
For personnel training	1	2	2	3	2	4
Other costs	10	13	9	10	7	6
Total	100	100	100	100	100	100

The research was carried out at industrial enterprises that use the services of third-party organizations in the information and logistics sphere (outsourcing) of their activities. Enterprises were selected according to the results of the study presented in Table 3.

### 6. Discussion of results of studying the impact of outsourcing on indicators of enterprise performance

The obtained results of the study on the economic substantiation of the feasibility of using outsourcing of information and logistic services in the intellectual and innovative sphere of the activity of an enterprise clearly indicate the importance and necessity of this direction of scientific research.

Table 2

An important result of the conducted research is the substantiation of outsourcing of information (logistical) technologies as an economic category. The division of IT outsourcing into separate sub-types and the introduction of intellectually innovative outsourcing into scientific circulation enable industrial enterprises to take a more balanced approach to the choice of an outsourcer and the preparation of an order for its services. On the other hand, outsourcers also have the opportunity to classify in more detail their services in the area of information technology, which can significantly expand their scope in profitable segments of IT outsourcing.

The proposed procedure for deciding on outsourcing of information (logistic) technologies will be undoubtedly useful for industrial enterprises (Fig. 2). Without its use, the effectiveness of an outsourcing agreement will not be high enough, which may lead to a mistaken decision to outsource information (logistic) services. In this direction, a system

of factors of direct and indirect economic evaluation of outsourcing is quite important (Table 1). The use of the developed factors makes it possible to get rid of the shortcomings of the multicriterial method by calculating the effect for each effect-forming factor.

The proposed methods for calculating indicators of economic evaluation of outsourcing of information and logistics services are interesting and useful for industrial enterprises. The proposed dependences (1) to (5) are based on the ratio of indicators that most characterize and reproduce the benefits that were obtained through the use of outsourcing of information and logistics services.

The separation of the economic factor in the study of the results of industrial and commercial activities of industrial enterprises becomes the basis for the formation of management decisions on the use of outsourcing of information and logistics services in various spheres of an enterprise, in particular, in the intellectual and innovative area. It is also interesting that at some enterprises outsourcing of information and logistics services impairs the indicators of intellectual and innovative activity of an enterprise (Table 3). This state in most cases is explained by the fact that innovative developments demand sufficiently original information and logistic technologies, which are more possible and accessible to an enterprise itself rather than to an outsourcer.

It should be noted that, according to the research data, the costs of software tools, personnel training, and outsourcing are steadily increasing from year to year, while costs of purchasing computer equipment decrease essentially.

The identified trends in the cost structure (Table 3) are associated with the saturation of the information (logistic) market with the appropriate equipment, and with the appearance of innovative technologies and forms of providing information (logistic) services. They include, in particular, information (logistical) outsourcing, long-term rental of software (transport) software, remote information services, etc. Most representatives of the top management of industrial enterprises try to meet the requirements of their business to enhance the effectiveness of the development and use of information (logistic) technologies. To do this, they primarily rely on the introduction of specialized software and logistic software and finalizing it for the specific needs of their enterprise.

However, the level of penetration of information (logistic) technologies in various industries and segments of the information (logistics) market differs significantly. Information technologies are actively being implemented in the governing bodies, in the areas of communication and telecommunication, in the banking sector, in oil and gas industrial complexes, in retail trade (supermarket chains) [1]. This is due to the complexity of business processes of enterprises of these sectors of the economy, the need for their automation, and increased requirements for information protection. However, there is no assessment of their impact on global

information transformations at industrial enterprises, although this is the direction of research that has the potential for further analytical actions of researchers.

The test of the results of the study suggests that not all enterprises can apply to an outsourcer for services, some of them can carry out information (logistic) work using their own resources with greater effectiveness (Table 2). To conduct such testing using the results of the conducted study, there is no need to use special programs or special skills of employees of the corresponding services. The proposed methodological developments are to some extent available for practical use by operating staff of economic services at industrial enterprises.

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## 7. Conclusions

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1. Theoretical and methodological issues of outsourcing as an economic category were considered. Outsourcing of information technologies was separated as an independent type of outsourcing since the origin and further development of the concept of outsourcing are associated with its appearance. The classification of the most important types of outsourcing was substantiated. It was proposed to introduce outsourcing of intellectual-innovative (transformation) type into scientific circulation.

2. We formed the system of indicators, taking into consideration which fully reproduces the level of economic effect when using information and logistic technologies in the intellectual and innovative sphere. These can be indicators of both direct actions (the outsourcing effect is directly related to the execution of a specific function or a business process), and of indirect action (the outsourcing effect is not directly related to this function).

3. To calculate the indicators of economic evaluation of the use of outsourcing of information and logistic technologies, the method of synthesis of indicators of economic effectiveness was proposed. This method significantly expands the scope of economic assessment of the feasibility of using outsourcing services and makes it possible to more accurately and objectively assess its benefits when outsourcing information and logistic services.

4. The use of the proposed methodological recommendations in the practice of industrial and commercial activities of industrial enterprises makes it possible to ensure an important relation between the processes of development, distribution, and use of information and logistic technologies and their necessary quality. The conducted studies at the enterprises of the Kharkiv industrial region showed that only three out of eight examined enterprises have economic grounds for outsourcing. From the economic point of view, it is more expedient for other enterprises to provide information (logistical) support of their activities using their own capabilities.

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