

This study evaluates the influence of logistics communications on the investment activity of enterprises in the context of capital movement. The issue of developing an effective toolkit for performing such an assessment was resolved.

The grouping of types of logistic communications used for the movement of capital was carried out according to a number of characteristics. A model for evaluating logistic communications, which are used for the movement of capital, has been developed. Modeling of the process of determining the investment potential of companies was carried out. A method for assessing the influence of logistic communications on the investment activity of enterprises is proposed.

An evaluation of logistic communications, which are used for the movement of capital, was carried out for a sample of enterprises. It was established that the average values of the integral level of the properties of the information transmitted by these communications are: for completeness – 0.302; for accuracy – 0.313; for relevance – 0.348; in this case, for all the listed properties – 0.032. At the same time, with an increase in the specified level, the realization of the investment potential of enterprises increases and their investment activity increases.

The peculiarity of the developed toolkit is that its application makes it possible to obtain accurate and comprehensive results of evaluating the impact of logistics communications on the investment activity of enterprises in the context of capital movement. The proposed toolkit could be used by enterprises of all types of economic activity when assessing their existing investment potential and when designing logistic communications, which are used to transmit the information necessary to realize the specified potential. This could help increase the economic efficiency of companies' investment activities

Keywords: logistic communication, capital movement, investment potential, investment activity, information support

UDC 330.322.54:338.18.78:658

DOI: 10.15587/1729-4061.2024.304257

DEVELOPMENT OF TOOLS FOR ASSESSING THE IMPACT OF LOGISTICS COMMUNICATIONS ON INVESTMENT ACTIVITIES OF ENTERPRISES IN THE CONTEXT OF CAPITAL MOVEMENT

Viktoriiia Prokhorova

Doctor of Economic Sciences, Professor*

Olexandr Yemelyanov

Corresponding author

Doctor of Economic Sciences, Professor**

E-mail: oleksandr.y.yemelianov@lpnu.ua

Orest Koleshchuk

Doctor of Economic Sciences, Associate Professor**

Olga Mnykh

Doctor of Economic Sciences, Professor

Department of Marketing and Logistics***

Yuliia Us

PhD, Professor*

*Department of Economics and Management

Ukrainian Engineering Pedagogics Academy

Universytets'ka str., 16, Kharkiv, Ukraine, 61003

Department of Business Economics and Investment*

***Lviv Polytechnic National University

S. Bandery str., 12, Lviv, Ukraine, 79013

Received date 01.03.2024

How to Cite: Prokhorova, V., Yemelyanov, O., Koleshchuk, O., Mnykh, O., Us, Y. (2024). Development of tools for assessing the impact

Accepted date 14.05.2024

of logistics communications on investment activities of enterprises in the context of capital movement. Eastern-European Journal of

Published date 28.06.2024

Enterprise Technologies, 3 (13 (129)), 34–45. <https://doi.org/10.15587/1729-4061.2024.304257>

1. Introduction

One of the most important factors of economic growth is investment in the development of enterprises. Therefore, the intensification of the investment activity of companies is the key to improving the macroeconomic indicators of countries, especially those of them that are characterized by low rates of economic growth. The need for investments in enterprises of those countries in which significant destruction of production and infrastructure facilities occurred as a result of natural disasters, military operations, and other cataclysms is even more urgent. Such countries include, in particular, Ukraine, which lost a significant part of its capital as a result of large-scale military operations. The restoration of this

capital will require significant investments, and one of the main tasks is the development of effective mechanisms for their attraction.

Thus, in a number of countries, in particular in Ukraine, there is a problem of insufficient amounts of investments, which are currently invested in their economy, primarily in the activities of manufacturing enterprises. This problem is reflected, in particular, in the low level of investment activity of many companies, which does not allow them to properly reveal and realize their investment potential. The increase in the mentioned activity requires the intensification of the movement of financial resources, which are used to invest in the activities of business entities. This movement concerns both the flows of funds within enterprises, for example, in

the case of self-financing of investment activities, and the flows between enterprises and those entities of the external environment that can provide the necessary amounts of financing. We are talking, first of all, about credit institutions and investors whose funds or property may be part of the authorized capital of enterprises – recipients of investments. Since in all these cases there will be a movement of capital, the described processes should be considered from the standpoint of a logistical approach.

If the processes of providing the enterprise with the necessary investments are considered from the point of view of logistics, it is necessary that logistics communications correspond to capital movement operations. In other words, the movement of capital must be preceded by the movement of information, on the basis of which planning and regulation of investment processes of enterprise development will take place. At the same time, the circle of subjects among whom the specified information will circulate may not be limited to enterprises – recipients of investments, their potential investors, and credit institutions. Various investment infrastructure institutions, including consulting and engineering firms, project institutes, construction organizations, etc., may belong to these subjects. After all, in the case of self-financing by enterprises of their investment programs, the flow of information within companies, in particular between their owners and employees of management units, should be properly organized.

Therefore, considering the information support to investment activities of enterprises, it is possible to highlight a significant number of relevant types of logistic communications of capital movement. At the same time, the effective organization of these communications is one of the main conditions for the full realization of investment opportunities available to enterprises. At the same time, improving the organization of logistical communications, necessary for the movement of capital, requires an assessment of the existing level of quality of these communications. Such an assessment should include, first of all, the analysis of the properties of the specified communications and the establishment of the influence of these properties on the volume of investment activities of those enterprises for investing capital in which these communications function.

Therefore, studies on the development of tools for evaluating the impact of logistics communications on the realization of investment potential and investment activity of enterprises in the context of capital movement are relevant.

2. Literature review and problem statement

Incurring investment costs by enterprises requires the availability of the appropriate amount of information, on the basis of which it is possible to conduct an investment analysis with subsequent adoption and implementation of investment decisions. As noted by many researchers, in particular the authors of work [1], information support plays an extremely important role in the management of enterprise activities. This also applies to the management of investment activities of companies. In particular, scientists have convincingly proven the importance of information support for innovation implementation processes by enterprises [2]. In the scientific literature, special attention is paid to the role of information in the development and adoption of decisions on the acquisition of various types of property [3]. At the same time, the

authors of the three above scientific works did not set and, accordingly, did not solve the task of establishing a clear list of data needed for the development of investment projects of enterprises. In part, this task for the case of resource-saving investment projects was solved in [4]. In particular, it was established that the availability of sufficiently complete and accurate data on the internal and external environment of enterprises is a necessary condition for the successful implementation of resource conservation measures. However, in work [4], the main attention was paid to the consideration of the risk factor, paying insufficient attention to the structuring and systematization of the information that is necessary for the effective management of investment activities of companies. More fully, the task of structuring and systematizing information necessary for managing investment projects of enterprises, for the case of projects of energy-saving technological changes, is solved in [5, 6]. However, the authors of works [5, 6] did not pay attention to the issue of assessing the impact of information support of investment activities on the effectiveness and scope of this activity. At the same time, the influence of information support to investment activity on its effectiveness was considered in many other scientific publications. Thus, in [7], the role of accounting information in making effective investment decisions was assessed. At the same time, it was established in [8] that improving the quality of reported data can lead to an increase in investor confidence, a decrease in the cost of capital, and an increase in the transparency of the investment environment. It is also worth noting the influence of information on the level of investment risk, as noted, in particular, by the authors of work [9]. However, in the three works reviewed above, which consider the role of information in the management of investment activities of enterprises, insufficient attention was paid to the assessment of the impact of the quality of information support on the speed of investment decision-making. However, the stated task was partially solved in works [10] and [11]. At the same time, as noted in [10, 11], the lack of necessary information is one of the causes of organizational and technological inertia, which often has a negative impact on the pace of modernization of production at enterprises.

The importance of information support to investment activities of enterprises for forecasting the consequences of their implementation of investment programs and projects was studied in a number of other works. In particular, researchers assessed the influence of information support on the innovative capabilities of companies [12]. The importance of information support to the investment activities of enterprises to ensure the implementation of their development strategies has also been proven [13]. In addition, it was established in [14] that proper information support to investment projects is one of the conditions under which the implementation of these projects would have a positive impact on the financial stability of economic entities. At the same time, all types of information that directly or indirectly determine the results of investments in enterprises are important for forecasting these results. In particular, as the authors of work [15] show, such information should also include information about the activities of competitors.

The four works cited above considered mainly the economic aspects of information support to the investment activities of companies, which is determined by the general direction of research conducted by the authors of those works. At the same time, considering the problem of informa-

tion support to investment activities of enterprises, a number of scientists investigated the technological aspects of solving this problem. In particular, the researchers suggested using digital innovations in the capital management system [16] for this purpose and replacing the batch processing of the components of the investment process with online processing [17]. It is also proposed to model information flows generated by an investment project during the entire period of time from the moment of the birth of an investment idea and the selection of investment proposals to the moment of evaluating the results of project implementation [18]. At the same time, as the authors of work [19] rightly point out, the ability to process and analyze large volumes of data is important in the formation of information arrays. However, due to their mainly technical nature, insufficient attention was paid to the logistical aspects of organizing information support to investment activities in the above four works.

The role of logistics in ensuring the functioning of the economy was considered, in particular, in [20], but mainly material flows were considered, while information flows remained outside the scope of the study. It is obvious that management of the investment process at enterprises is impossible without proper organization of the flow of relevant information. For this purpose, effective logistics communications must be created that will meet a number of diverse requirements. In particular, the availability, accuracy, and flexibility of logistics information systems are attributed to the specified requirements by scientists [21]. In addition, researchers note the importance of the integration of information and communication technologies and increasing the efficiency of communication systems [22, 23]. Researchers also put forward such requirements for logistics information systems as compliance with the rules of information security and reliability of information [24, 25]. However, in the listed works, the technical requirements for the relevant communication systems were mainly considered.

At the same time, the scientific literature also includes works in which communication systems are considered from the point of view of their role in ensuring the implementation of economic activity. At the same time, scientists attribute an important role to the ability of logistics information systems to ensure communication between various subjects of economic processes [26] and the novelty of applied information technologies [27]. Also worth noting is work [28], in which the requirement to ensure the end-to-end movement of information is submitted. However, the satisfaction of all these requirements requires, among other things, a significant level of competences of the personnel of enterprises. The authors of the mentioned publications did not investigate this circumstance fully enough, which may be due to the fact that the issue of personnel competencies does not directly relate to the functioning of information and communication technologies. At the same time, an in-depth study of these issues was carried out in [29, 30]. However, works [29, 30] do not solve the task of assessing the influence of certain parameters of logistics communications on the investment activities of enterprises. Accordingly, researchers have paid insufficient attention to the evaluation of logistic communications for the movement of capital. This, in turn, makes it impossible to establish the influence of the specified communications on the investment activity of companies, in particular on the level of their investment activity.

So, the scientific literature includes many works that tackle the information support to investment activities of

companies. On the other hand, scientists have carried out a number of studies on the issue of organization and technological support to the flow of information both within enterprises and between enterprises and other participants of economic activity. At the same time, the problem of evaluating the impact of logistics communications on the realization of investment potential and investment activity of enterprises in the context of capital movement remains unresolved.

3. The aim and objectives of the study

The goal is the formation of theoretical and methodological approaches to the evaluation of logistic communications used for the movement of capital and establishing the influence of these communications on the level of realization of the investment potential of enterprises and on the degree of their investment activity. This will make it possible to identify reserves for the activation of investment activities of business entities on the basis of improving its information support.

To achieve the goal, the following tasks were set:

- to group the types of logistic communications used for the movement of capital;
- to build a model for evaluating logistic communications, which are used for the movement of capital, based on the analysis of the quality of information transmitted through the relevant channels;
- to develop a procedure for evaluating the impact of logistics communications on indicators of investment activity of companies;
- based on a sample of Ukrainian enterprises, to evaluate the logistics communications used for the movement of capital, as well as to analyze the impact of logistics communications on the level of realization of the investment potential of enterprises and the degree of their investment activity.

4. The study materials and methods

The object of our study is the investment activity of enterprises in the context of capital movement. The subject of the study is the assessment of the impact of logistic communications on the investment activity of enterprises in the context of capital movement. It is hypothesized that this effect is statistically significant.

The theoretical basis of this study was the works that consider the information support to the functioning of economic entities, the management of their investment activities and the formation of logistic communications of enterprises.

During the empirical analysis, the materials of accounting, statistical and management records of a number of industrial enterprises were collected and processed. In addition to company reporting, the results of a questionnaire survey were used to obtain input information.

Various methods of scientific knowledge were used in the research process. In particular, economic-mathematical modeling was applied when developing a model for evaluating logistic communications, which are used for the movement of capital. The need to carry out such modeling is due to the need to obtain a quantitative assessment of logistics communications, taking into account the main factors influencing it.

When determining the types of logistic communications used for the movement of capital, methods of grouping and generalization are used. The use of these methods made it possible to highlight the relevant classification features and establish the main types of logistics communications within each of these features.

In order to develop a methodical approach to determining the investment potential of enterprises, an optimization method was used. The expediency of using this method is determined by the fact that the value of the investment potential of companies should acquire its best value.

The methods of economic analysis and technical and economic calculations were applied when performing empirical studies of logistic communications. A questionnaire survey method was used to conduct a survey of the owners and managers of the investigated enterprises regarding the level of information support to their investment activities. The apparatus of mathematical statistics was used to process the obtained results, in particular, one-factor variance analysis [31].

Graphical and tabular methods were used to visually display the research results.

The abstract-logical method was used in the discussion of our results and when drawing conclusions from the performed research. This made it possible to determine the most significant results of the study, to establish the reasons that led to these results, and to identify directions for further investigation of the issues under consideration.

5. Results of studying the toolkit for evaluating the impact of logistic communications on investment activity

5.1. Grouping of types of logistic communications used for the movement of capital

Since the implementation of logistics activity ensures the organization of the movement of various flows, in particular the flow of materials, goods and capital, the specified activity should also provide for the transfer and exchange of information between its participants. In particular, this concerns the exchange of information between persons who provide material and financial resources and persons who receive them. It is also often necessary to exchange infor-

mation between employees within those organizations that participate in the movement of relevant flows. Therefore, the organization of logistics activities requires the presence of proper logistics communications. These communications should be understood as processes of transmission and exchange of information organized in space and time between persons involved in logistics activities.

When enterprises carry out investment activities, information flows along a number of logistic communications. Some of these communications are within enterprises. First of all, this concerns communications between enterprise specialists who are responsible for developing investment activity plans, company owners who must make final investment decisions based on these developments, and managers who will implement these decisions. With regard to external logistics communications, they provide two-way information flow between enterprises and three main types of other subjects of the investment process, as shown in Fig. 1. At the same time, there may be a need to create logistical communications between these entities, for example, between construction organizations and credit institutions (when lending for the construction of construction objects). Communication between consulting firms and potential investors (in order to inform these investors about the most investment-attractive enterprises) and other types of external logistics communications are also possible.

Therefore, there is a significant number of types of logistic communications that are used for the purpose of providing information on the movement of capital. These communications can be grouped by the content of the information being transmitted; relation to enterprises; duration of operation; frequency of use; entities that provide information; subjects who receive information (Fig. 2).

Table 1 provides a detailed description of those types of logistics communications that are given the greatest attention in this study.

As can be seen from the data given in Table 1, of the six investigated types of communications, two are internal, and four are external. At the same time, both internal communications and the first of the external communications are the most widespread in the practice of investment activity enterprises.

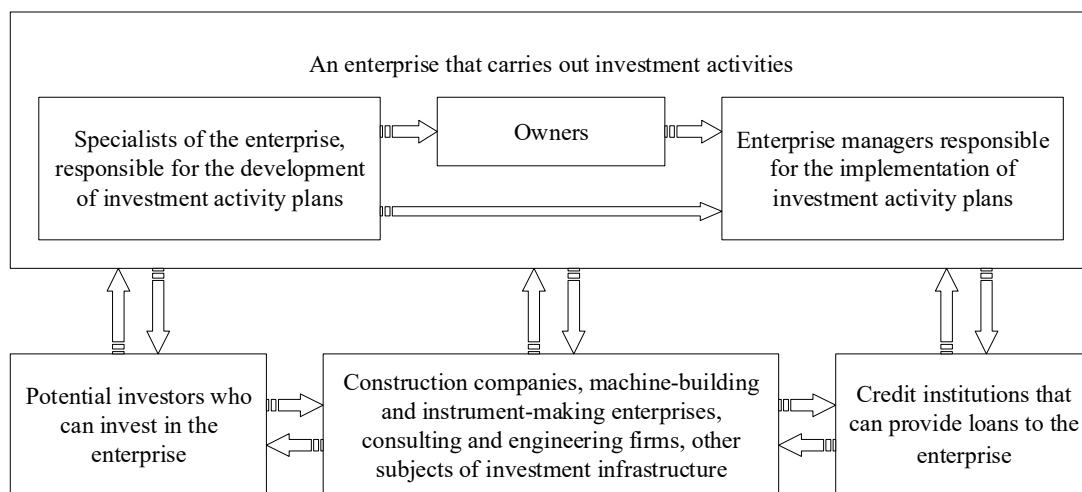


Fig. 1. Scheme of information flow among participants of the investment process

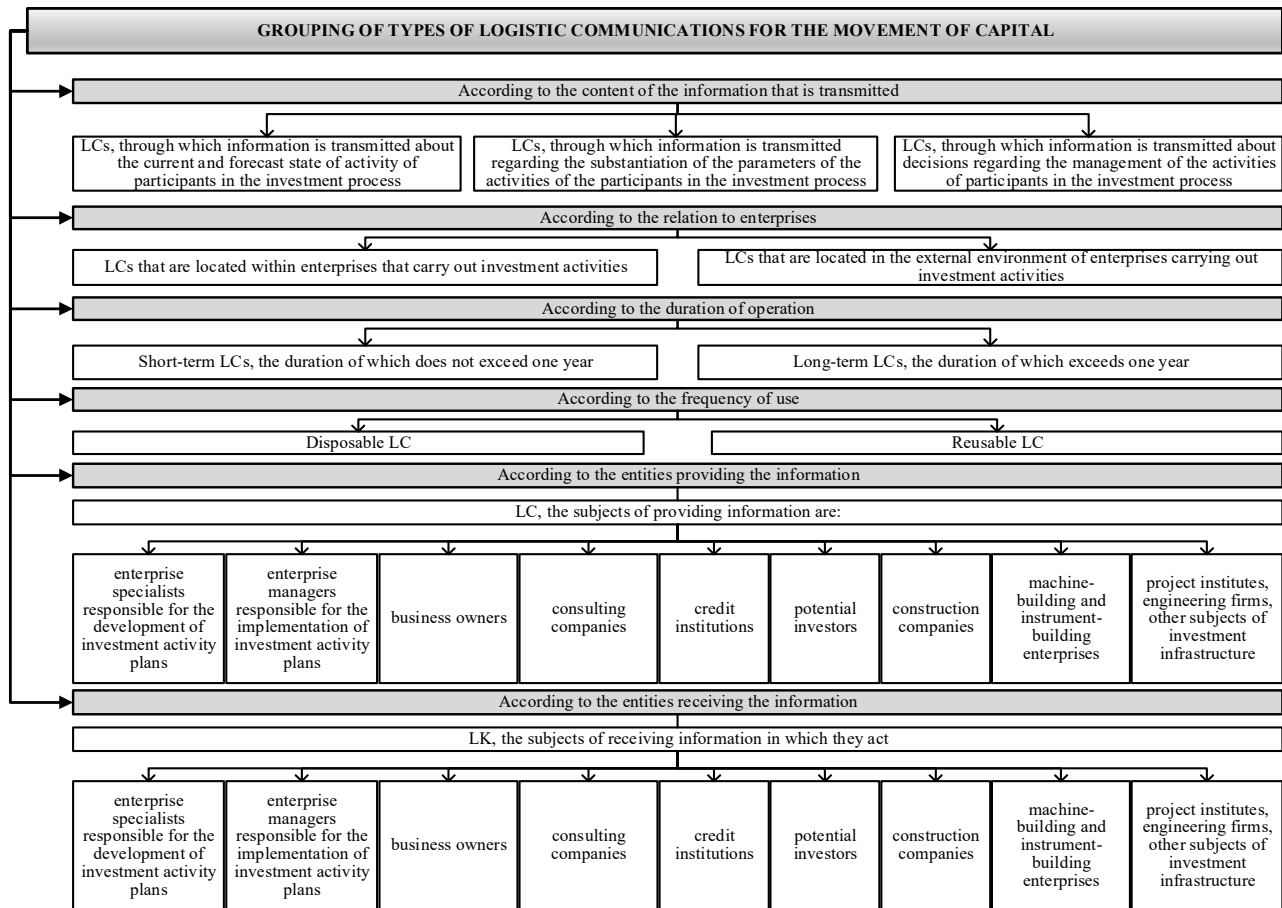


Fig. 2. Grouping of types of logistic communications for the movement of capital

Table 1

Characteristics of individual logistic communications used for the movement of capital

Types of logistic communications in relation to enterprises	Senders of information	Recipients of information	Brief content of information flows	Designation of communications
Logistics communications that are located inside enterprises that carry out investment activities	Specialists of enterprises responsible for the development of investment activity plans	Enterprise managers responsible for the implementation of investment activity plans; business owners	Proposals regarding the parameters of management decisions to be adopted by managers and owners of enterprises	C.1.1
	Business owners	Enterprise managers responsible for the implementation of investment activity plans	Parameters of investment decisions adopted by enterprise owners	C.1.2
Logistics communications that are located in the external environment of enterprises carrying out investment activities	Enterprises	Credit institutions	Data on the basis of which credit institutions assess the solvency of enterprises and make decisions on granting them loans	C.2.1
	Enterprises	Potential investors	Data on the basis of which potential investors assess the investment attractiveness of enterprises and make decisions on investing in their activities	C.2.2
	Enterprises	Consulting firms	Information on the basis of which consulting firms develop their proposals for further investment activities of enterprises	C.2.3
	Consulting firms	Enterprises	Proposals regarding further investment activities of enterprises	C.2.4

5. 2. Model of assessment of logistic communications, which are used for the movement of capital

When evaluating this or that logistic communication, it is necessary to assess the level of quality of information, the movement of which takes place on the corresponding commu-

nication. In particular, it is worth highlighting three properties of information for which the evaluation procedure should be performed, namely, its completeness, accuracy, and relevance. At the same time, the specified assessment can be performed in points, according to the three-point scales given in Table 2.

Table 2

The proposed point assessment of the properties of information that is transmitted through relevant logistics communications

Information quality levels	Completeness of information		Accuracy of information		Relevance of information	
	Characteristic	Points	Characteristic	Points	Characteristic	Points
Low	The information is presented only according to some of its components	1	The data are very close to reality	1	The data are very outdated	1
Average	Information is presented by a significant number of its components	2	The data are close enough to reality	2	The data are relatively relevant to the current situation	2
High	Information is presented by all or almost all of its components	3	The data completely or almost completely correspond to reality	3	The data are completely or almost completely relevant to the current situation	3

Since the effect of the three properties of information listed above on the overall level of its quality is multiplicative, the specified level can be estimated using the following formula:

$$L_j = \prod_{k=1}^3 (l_{jk} / l_{mk}), \tag{1}$$

where L_j is the general level of information quality for the j -th logistic communication, fraction of a unit; l_{jk} – the actual level of the k -th property according to the j -th logistic communication, points; l_{mk} is the maximum possible level of the k -th property according to the j -th logistic communication, points.

In turn, the integral level of quality of the entire set of logistics communications of a certain enterprise, which are used for the purpose of information support of its investment activities, can be calculated using the following formula:

$$L = \sum_{j=1}^D L_j \cdot \beta_j, \tag{2}$$

where L is the integral level of quality of the entire set of logistics communications of a certain enterprise, which are used for the purpose of information support of its investment activity, unit share; D is the number of logistic communications under consideration; β_j is the coefficient of significance of the j -th logistic communication, fraction of a unit.

As follows from formulas (1) and (2), the value of indicator (2) cannot exceed unity. At the same time, the closer this value is to unity, the higher is the integral level of quality of the entire set of studied logistics communications of a certain enterprise.

Having evaluated the integral quality level of the six logistic communications described in Table 2, it is possible to establish the influence of this level on indicators characterizing the investment activity of enterprises. At the same time, worth highlighting are the following two indicators:

1) indicator of the level of utilization of the investment potential of enterprises. The value of the specified potential can be calculated by determining the optimal amount of investment, which is currently advisable to invest in a certain enterprise. Then the level of use of the company's investment potential can be calculated as the ratio of the actual amount of investments invested in the company during the reporting period to the estimated amount of its investment potential;

2) indicator of the degree of investment activity of the enterprise. It is advisable to calculate this indicator by comparing

the actual volumes of investments invested in the enterprise during the reporting period with the total value of the enterprise's assets at the beginning of the reporting period.

5. 3. Procedure for evaluating the impact of logistic communications on indicators of investment activity of enterprises

Regarding the determination of the investment potential of enterprises, in the case of applying the optimization approach for this purpose, the procedure for such determination requires the preliminary establishment of optimization criteria and the construction of a system of restrictions. With regard to the specified criterion, it can be the maximum possible amount of excess profit of the enterprise from investing capital in it. This amount is the difference between the expected increase in the net profit of the current owners of the company and the product of the amount of its own funds invested as investments in the activities of this company by the rate of return on these investments. The specified norm is the minimum acceptable level of investment profitability for the owners of the enterprise, for which they will agree to invest funds. At the same time, it is necessary to take into account the possibility of financing investment projects of the enterprise at the expense of three types of sources of funds, namely, own, borrowed and borrowed. The second of the listed types of investment sources can be taken into account by subtracting from the expected financial results for projects the amount of financial costs for servicing loans taken to finance these projects. If we consider the involved sources of financing the company's investment projects, then receiving funds from these sources will mean that the current owners of the company will lose a certain share of its authorized capital in favor of third parties who will participate in the financing of the projects. This share will be determined by two factors: the size of the authorized capital of the enterprise available at the time of the implementation of the projects and the amount of their financing at the expense of the involved sources of funds.

If we consider the main limitations that must be taken into account when building a model for assessing the investment potential of enterprises, then the specified limitations must relate, first of all, to the maximum possible volumes of project financing for each type of sources of such financing. So, it is possible to distinguish three such limitations:

- restrictions on the maximum possible amount of financing of the enterprise's investment program at the expense of its own sources of funds. This limitation is determined by the total amount of the company's own funds and the share of these funds accepted for the company's owners in the implementation of its investment activities;

- restrictions on the maximum possible amount of financing of the enterprise's investment program at the expense of loan sources of funds. This limitation is determined by the amount of loan capital that the company can additionally obtain, while ensuring the appropriate level of its financial stability [14];

– restrictions on the maximum possible amount of financing of the enterprise’s investment program at the expense of the involved sources of funds. This limitation is determined, first of all, by the share of its authorized capital acceptable to the current owners of the enterprise, which will belong to the new co-owners of the company.

Taking into account the above, the model for assessing the investment potential of the enterprise should contain:

1) the objective function describing the expected excess profit that the current owners of the enterprise will receive from the implementation of the planned investment program:

$$P = \left(\sum_{i=1}^N I_i \cdot x_i \cdot p_i - \sum_{i=1}^N I_i \cdot x_i \cdot \alpha_{2i} \cdot c \right) \times \times O \cdot (1-t) / \left(\sum_{i=1}^N I_i \cdot x_i \cdot \alpha_{3i} + O \right) - r \cdot \sum_{i=1}^N I_i \cdot x_i \cdot \alpha_{1i} \rightarrow \max; \quad (3)$$

2) limitation on the total amount of funding of the enterprise’s investment program at the expense of own, borrowed, and borrowed funds, respectively:

$$\sum_{i=1}^N I_i \cdot x_i \cdot \alpha_{1i} \leq A_1; \quad (4)$$

$$\sum_{i=1}^N I_i \cdot x_i \cdot \alpha_{2i} \leq A_2; \quad (5)$$

$$\sum_{i=1}^N I_i \cdot x_i \cdot \alpha_{3i} \leq A_3; \quad (6)$$

3) the condition of equality of the sum of all shares of the financing of each project at the expense of own, borrowed, and attracted funds:

$$\alpha_{1i} + \alpha_{2i} + \alpha_{3i} = 1, \quad 1 \leq i \leq N; \quad (7)$$

4) the condition for parameters x_i to acquire one of two values, namely zero (if the i -th project is rejected) or one (if a decision is made about the feasibility and possibility of implementing the i -th project):

$$x_i \in \{0,1\}, \quad (8)$$

where P is the expected excess profit that the current owners of the enterprise will receive from the implementation of the planned investment program; N – number of investment projects under consideration; I_i – the required amount of investment in the implementation of the i -th project; p_i – expected return on investment in the i -th project (by profit before interest and taxes), unit share; $\alpha_{2i}, \alpha_{3i}, \alpha_{1i}$ – shares of the total volume of financing of the i -th project at the expense of borrowed, attracted, and own funds, respectively, share of the unit; c – credit interest rate, fraction of a unit; O – current value of the authorized capital of the

enterprise; t – income tax rate, unit shares; r – rate of return on investments, unit shares; A_1, A_2, A_3 – limitations on the volume of financing of the enterprise’s investment program, respectively, at the expense of own, attracted, and borrowed funds.

Having determined the investment potential of a number of enterprises, which are characterized by different integral levels of the studied logistics communications, using the model (3) to (8), it is possible to assess the impact of this level on the two indicators of investment activity of companies described above. The general sequence of the process of such assessment is shown in Fig. 3.

As can be seen from the scheme in Fig. 3, the specified sequence provides for the division of the studied enterprises into groups based on the integral level of quality of logistic communications used for the movement of capital. This makes it possible to assess the statistical significance of the dependence between the level of quality of logistic communications used for the movement of capital and the level of investment potential utilization and the degree of investment activity averaged by groups of enterprises.

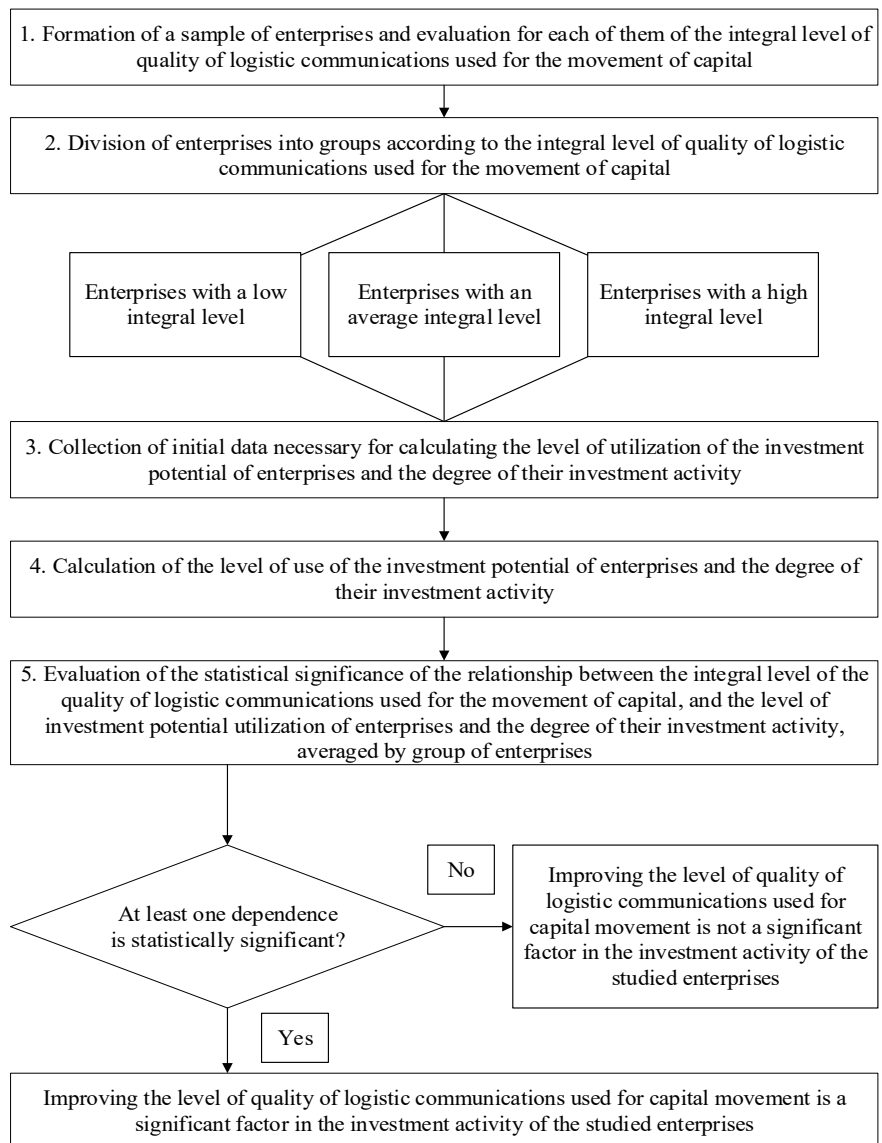


Fig. 3. The order of assessing the impact of the integral level of the quality of logistic communications, used for the movement of capital, on the use of investment potential and investment activity of enterprises

5. 4. Evaluation of logistic communications based on a sample of Ukrainian enterprises

In order to test the theoretical and methodological approaches presented above to the evaluation of logistic communications used for the movement of capital, a sample of 42 woodworking enterprises in the western region of Ukraine was formed. The main evaluation procedures related to data as of the beginning of 2022. At the same time, the actual values of the volumes of investments invested in the studied enterprises were taken according to the data of 2021. An analysis of the reporting was carried out and a survey of the specialists of these enterprises was carried out in relation to the six logistic communications given in Table 2 above. That made it possible to assess the level of quality of information support for each of these communications.

At the same time, it was established that the first three logistics communications (C.1.1, C.1.2, and C.2.1) are present in the investment activities of all the investigated enterprises. At the same time, communication C.2.2 was applied only at eight enterprises, and communications C.2.3 and C.2.4 – only at three.

Using the scales for evaluating the level of information support, given in Table 2, the distribution of the studied enterprises was carried out according to the level of individual properties of the information transmitted through the relevant logistic communications. The results of such distribution are given in Tables 3, 4. As can be seen from the data presented in these tables, according to all three properties of information in the vast majority of enterprises, their level is low and average. At the same time, the level of relevance of the information transmitted by the investigated logistics channels is higher than the level of its completeness in a significant number of enterprises. The last conclusion is confirmed by the data on the averaged results of the assessment of the properties of the information transmitted through the relevant logistics communications, based on a sample of the investigated enterprises. These data are given in Table 5. From these data, in particular, it follows that the averaged for the studied enterprises, the generalized level of individual properties of information for each of the logistics communications does not exceed 20 % of the maximum possible value. Therefore, the specified level is low, and most of the investigated enterprises have reservations regarding its increase.

The results of the survey of experts showed that, in their opinion, all six investigated communications are approximately equivalent. Taking this into account, using formula (2), an assessment of the integral level of information quality was carried out (that is, at the same time for all investigated logistic communications). At the same time, it was taken

into account that the last three communications are specific to only a limited number of the enterprises under consideration.

The data presented in the last row of Table 5 show the values of the integral level of the quality of information, which is transmitted in the process of functioning of logistics communications, averaged over the studied enterprises. These values are: for completeness of information – 0.302; for accuracy of information – 0.313; for relevance of information – 0.348; at the same time, for all the listed properties of information – 0.032.

Having assessed the investment potential of the studied enterprises according to the model proposed above, an indicator of the level of realization of this potential was calculated for each of them. The level of investment activity of these enterprises was also calculated according to the above-described approach to such assessment. As evidenced by the data given in Table 6, for the vast majority of studied business entities, the level of realization of their investment potential varies from 0.2 to 0.5, and the degree of investment activity – from 0.033 to 0.167.

In order to assess the influence of the quality of logistics communications on the level of realization of the investment potential of enterprises and the degree of their investment activity, the method of dispersion analysis was used. As follows from the data given in Table 7, with an increase in the integral level of the quality of logistic communications used for capital movement, the average values of both of the above-mentioned indicators for the studied enterprises increase. At the same time, these dependences are statistically significant since the actual value of the *F*-criterion exceeds its critical value with a significance level of $\alpha=0.05$ for all groups of enterprises.

Thus, the improvement of logistic communications for the movement of capital will contribute to the growth of the volume of investment activities of those enterprises in which the level of quality of these communications is low.

Table 3

Distribution of the studied enterprises according to the level of individual properties of information transmitted through relevant logistic communications, units

Designation of logistics communications	Completeness of information			Accuracy of information			Relevance of information		
	Low	Medium	High	Low	Medium	High	Low	Medium	High
C.1.1	23	11	8	21	14	7	15	16	11
C.1.2	22	12	8	20	13	9	17	13	12
C.2.1	25	10	7	22	11	9	15	17	10
C.2.2	4	3	1	4	3	1	3	3	2
C.2.3	1	2	0	1	2	0	1	2	0
C.2.4	1	2	0	1	2	0	1	2	0

Table 4

Distribution of the studied enterprises according to the level of individual properties of the information transmitted through the relevant logistic communications, percentages in the total number of enterprises

Designation of logistics communications	Completeness of information			Accuracy of information			Relevance of information		
	Low	Medium	High	Low	Medium	High	Low	Medium	High
C.1.1	54.76	26.19	19.05	50.00	33.33	16.67	35.71	38.10	26.19
C.1.2	52.38	28.57	19.05	47.62	30.95	21.43	40.48	30.95	28.57
C.2.1	59.52	23.81	16.67	52.38	26.19	21.43	35.71	40.48	23.81
C.2.2	50.00	37.50	12.50	50.00	37.50	12.50	37.50	37.50	25.00
C.2.3	33.33	66.67	0.00	33.33	66.67	0.00	33.33	66.67	0.00
C.2.4	33.33	66.67	0.00	33.33	66.67	0.00	33.33	66.67	0.00

Table 5

Averaged results of evaluating the properties of the information transmitted through the relevant logistic communications, according to a sample of the investigated enterprises

Designation of logistics communications	Level of individual properties of information averaged for the studied enterprises			The generalized level of individual properties of information averaged for the studied enterprises
	Completeness of information	Accuracy of information	Relevance of information	
C.1.1	0.548	0.556	0.635	0.188
C.1.2	0.556	0.579	0.627	0.196
C.2.1	0.524	0.563	0.627	0.179
C.2.2	0.542	0.542	0.625	0.178
C.2.3	0.556	0.556	0.556	0.167
C.2.4	0.556	0.556	0.556	0.167
Total for all communications	0.302	0.313	0.348	0.032

Table 6

Distribution of the studied enterprises by the level of realization of their investment potential and by the degree of investment activity

Distribution of the studied enterprises by the level of realization of their investment potential			Distribution of the studied enterprises by the degree of investment activity		
Lower limit of the range of indicator values, fractions of one	Upper limit of the range of metric values, fractions of one	Number of companies with indicator values that fall into the range, units	Lower limit of the range of indicator values, fractions of one	Upper limit of the range of metric values, fractions of one	Number of companies with indicator values that fall into the range, units
–	0.1	3	–	0.033	4
0.1	0.2	6	0.033	0.067	8
0.2	0.3	8	0.067	0.100	9
0.3	0.4	10	0.100	0.133	10
0.4	0.5	9	0.133	0.167	7
0.5	0.6	4	0.167	0.200	3
0.6	–	2	0.200	–	1

Table 7

Initial data and results of assessing the impact of the quality of logistics communications on the level of realization of the investment potential of enterprises and the degree of their investment activity

Dependent variables	Metric names	The value of indicators by groups of enterprises, divided by the integral level of quality of logistics communications used for the movement of capital		
		Low integral quality level (less than 0.02)	Intermediate integral quality level (from 0.2 to 0.05)	High integral quality level (greater than 0.05)
1. The level of realization of the investment potential of enterprises	1. 1. Number of enterprises	20	14	8
	1. 2. Average values of the dependent variable, fractions of one	0.233	0.427	0.534
	1. 3. Actual <i>F</i> -test values	5.24	6.03	5.65
2. The degree of investment activity of enterprises	2. 1. Number of enterprises	20	14	8
	2. 2. Average values of the dependent variable, fractions of one	0.053	0.109	0.181
	2. 3. Actual <i>F</i> -test values	5.92	5.61	6.48

6. Discussion of the developed toolkit for assessing the impact of logistics communications on investment activity

Our research showed that the quality of logistic communications, which are used to organize the process of capital movement, has a significant positive impact on the investment activity of enterprises. At the same time, it is important to form a whole set of logistic communications, first of all, those of their types, the grouping of which is presented above in Fig. 2. Another condition for the effective functioning of these communications is the appropriate level of quality of information support, which is carried out with their help.

Management of this level requires its preliminary evaluation, which can be carried out using the proposed model, represented in the form of formulas (1) and (2).

The model for assessing the investment potential of enterprises, developed in the course of the research, also deserves special attention. The use of expressions (3) to (8) when conducting such an assessment will provide an opportunity to establish the optimal amount of investment that should be invested in the development of a certain enterprise. On the other hand, the specified model is the basis for the developed method of assessing the impact of the integral quality level of logistics communications, used for

capital movement, on the use of investment potential and investment activity of enterprises. The specified method, the description of which is shown in Fig. 3, is an effective tool for establishing the influence of logistics communications on indicators of investment activity of companies. This effectiveness was fully demonstrated in the process of approbation of the specified tool on a sample of 42 woodworking enterprises of the western region of Ukraine.

Therefore, the proposed toolkit makes it possible to assess the level of quality of logistic communications used for the movement of capital, to establish the value of the investment potential of enterprises, and to analyze the impact of these communications on indicators of investment activity of companies. At the same time, a positive feature of the developed toolkit is that its application makes it possible to obtain accurate and comprehensive results in the context of the issue of capital movement. The proposed toolkit can be used by enterprises of all types of economic activity when assessing their existing investment potential and when designing logistic communications, which are used to transmit the information necessary to realize the specified potential. This will help increase the economic efficiency of companies' investment activities.

Although considerable attention has been paid in scientific literature to the importance of information support to economic activity, the role of logistics communications in the context of capital movement is not fully defined. Likewise, in works that consider various aspects of information support for the implementation of investment projects, little attention is paid to the problem of information movement between various participants in the investment process. Accordingly, the toolkit developed in this study, due to its positive characteristics described above, makes it possible to evaluate logistic communications that are used for the movement of capital, which is not done in other scientific publications.

Taking into account the above, the developed toolkit sufficiently covers the problem of evaluating the impact of logistic communications, used for capital movement, on the investment activities of enterprises. This is achieved due to the fact that the use of such a toolkit makes it possible to perform the specified assessment completely and with due accuracy. Therefore, the information obtained as a result of the use of the specified toolkit makes it possible to assess in detail how significant the influence of logistic communications used for capital movement is on the investment activity of economic entities.

At the same time, this study has certain limitations. In particular, a point-based evaluation of the properties of the information transmitted through the relevant logistics communications proposed in Table 2 is somewhat subjective. Also worth noting is the possibility of using criteria indicators other than excess profit to assess the investment potential of companies. In particular, such an indicator can be the market value of enterprises.

In addition, it is necessary to note a certain shortcoming of the proposed model for assessing the investment potential of enterprises, which limits the accuracy of the results obtained as a result of the application of this model. The noted drawback is that the amounts of financial restrictions that appear in the mentioned model are fixed, that is, the possibility of their certain flexibility is not taken into account.

Therefore, further research should, among other things, provide for the generalization of the proposed model for assessing the investment potential of enterprises in the case of flexible restrictions on the amount of financing of investment projects. In this case, the number of restrictions will partially depend on the profitability and riskiness of the projects being implemented. Taking into account this circumstance will make it possible to increase the accuracy of the assessment of the investment opportunities of enterprises.

7. Conclusions

1. The existence of a significant number of types of logistic communications, which are used for the purpose of providing information on the movement of capital, has been established. In particular, these communications can be grouped by the content of the information being transmitted; relation to enterprises; duration of operation; frequency of use; entities that provide information; subjects who receive information.

2. A model of integral assessment of the quality of logistic communications, which are used for the movement of capital, is proposed. It is shown that when analyzing one or another logistical communication, it is necessary, first of all, to assess the level of quality of information, the movement of which occurs according to the corresponding communication. In particular, worth highlighting are three properties of information for which the evaluation procedure should be performed, namely, its completeness, accuracy, and relevance. At the same time, the specified evaluation can be performed in points, according to the proposed three-point scales.

3. A procedure for evaluating the impact of logistics communications on indicators of investment activity of companies, in particular on the level of utilization of their investment potential, has been devised. The specified procedure provides for the division of the studied enterprises into groups based on the integral level of quality of logistic communications used for the movement of capital. This makes it possible to assess the statistical significance of the dependence between the level of quality of logistic communications used for the movement of capital and the level of investment potential utilization and the degree of investment activity averaged by groups of enterprises. With regard to determining the size of the investment potential of enterprises, for this purpose it is proposed to apply an optimization approach based on the establishment of a preliminary criterion for optimization and the construction of a system of restrictions.

4. An evaluation of logistic communications used for capital movement was carried out, and the influence of these communications on the investment activity of companies based on a sample of 42 woodworking enterprises in the western region of Ukraine was established. It was established that the average values of the integral level of the quality of the transmitted information are as follows: for completeness of information – 0.302; for accuracy of information – 0.313; for relevance of information – 0.348; at the same time, for all the listed properties of information – 0.032. In this case, with an increase in the integral level of the quality of logistic communications used for the movement of capital, the average values of the level of realization of the investment po-

tential of the enterprises and the degree of their investment activity increase for the studied enterprises. Therefore, the improvement of logistic communications for the movement of capital will contribute to the growth of the volume of investment activities of those enterprises in which the level of quality of these communications is not high.

Conflicts of interest

The authors declare that they have no conflicts of interest in relation to the current study, including financial, personal, authorship, or any other, that could affect the study and the results reported in this paper.

Funding

The study was conducted without financial support.

Data availability

All data are available in the main text of the manuscript.

Use of artificial intelligence

The authors confirm that they did not use artificial intelligence technologies when creating the current work.

References

- Prajogo, D., Toy, J., Bhattacharya, A., Oke, A., Cheng, T. C. E. (2018). The relationships between information management, process management and operational performance: Internal and external contexts. *International Journal of Production Economics*, 199, 95–103. <https://doi.org/10.1016/j.ijpe.2018.02.019>
- Chukhray, N., Mrykhina, O., Izonin, I. (2022). Holistic Approach to R&D Products' Evaluation for Commercialization under Open Innovations. *Journal of Open Innovation: Technology, Market, and Complexity*, 8 (1), 9. <https://doi.org/10.3390/joitmc8010009>
- Nanayakkara, S. (2020). Real estate investment information system using data mining from web data. *International Conference on Real Estate Management and Valuation (ICREMV):2020*, 44–48. Available at: <http://journals.sjp.ac.lk/index.php/icremv/article/view/4944>
- Lesinskyi, V., Yemelyanov, O., Zarytska, O., Symak, A., Koleshchuk, O. (2018). Substantiation of projects that account for risk in the resource-saving technological changes at enterprises. *Eastern-European Journal of Enterprise Technologies*, 6 (1 (96)), 6–16. <https://doi.org/10.15587/1729-4061.2018.149942>
- Yemelyanov, O., Petrushka, I., Zahoretska, O., Petrushka, K., Havryliak, A. (2023). Information support for managing energy-saving technological changes at enterprises. *Procedia Computer Science*, 217, 258–267. <https://doi.org/10.1016/j.procs.2022.12.221>
- Petrushka, I., Yemelyanov, O., Petrushka, T., Koleshchuk, O., Reznik, N. (2020). Influence of energy-saving technology changes on the agro-industrial enterprises innovativeness in terms of digitalization. *International Journal of Advanced Science and Technology*, 29, 2489–2496. Available at: <http://sersc.org/journals/index.php/IJAST/article/view/14749>
- Hodari, J. (2021). Assessment Of The Role Of Accounting Information On Effective Investment Decision - The Case Of Banque Populaire Du Rwanda Atasmara. *European Journal of Management and Marketing Studies*, 6 (3). <https://doi.org/10.46827/ejmms.v6i3.1135>
- Moridu, I. (2023). The Impact of Financial Statement Quality on Investment Decision Making: A descriptive study of the Banking Sector in West Java. *The ES Accounting And Finance*, 1 (03), 169–175. <https://doi.org/10.58812/esaf.v1i03.109>
- Jerico, M. I., Utami, W. (2021). The Effect Of Profitability, Capital Structure, And Forward-Looking Information On Investment Risk. *Journal Of Life Economics*, 8 (2), 147–156. <https://doi.org/10.15637/jlecon.8.2.01>
- Lesinskyi, V., Yemelyanov, O., Zarytska, O., Petrushka, T., Myroshchenko, N. (2022). Designing a toolset for assessing the organizational and technological inertia of energy consumption processes at enterprises. *Eastern-European Journal of Enterprise Technologies*, 6 (13 (120)), 29–40. <https://doi.org/10.15587/1729-4061.2022.267231>
- Yemelyanov, O., Petrushka, K., Koleshchuk, O., Petrushka, T., Luchyt, L. (2023). Assessment of Information Support for Management of Organizational and Technological Inertia of Energy Consumption Processes at Enterprises. *2023 13th International Conference on Advanced Computer Information Technologies (ACIT)*. <https://doi.org/10.1109/acit58437.2023.10275393>
- Mikalef, P., Boura, M., Lekakos, G., Krogstie, J. (2020). The role of information governance in big data analytics driven innovation. *Information & Management*, 57 (7), 103361. <https://doi.org/10.1016/j.im.2020.103361>
- Voynarenko, M., Cherep, A., Gonchar, O., Cherep, A., Krylov, D., Oleynikova, L. (2019). Information Provision For Forecasting Strategies Innovative Activities Of Enterprises. *2019 9th International Conference on Advanced Computer Information Technologies (ACIT)*. <https://doi.org/10.1109/acitt.2019.8780030>
- Al Sharari, F., Yemelyanov, O., Dziurakh, Y., Sokil, O., Danylovyh, O. (2022). The energy-saving projects' impact on the level of an enterprise's financial stability. *Economic Annals-XXI*, 195 (1-2), 36–49. <https://doi.org/10.21003/ea.v195-04>
- Bernard, D., Blackburne, T., Thornock, J. (2020). Information flows among rivals and corporate investment. *Journal of Financial Economics*, 136 (3), 760–779. <https://doi.org/10.1016/j.jfineco.2019.11.008>
- Bhatia, A., Chandani, A., Divekar, R., Mehta, M., Vijay, N. (2021). Digital innovation in wealth management landscape: the moderating role of robo advisors in behavioural biases and investment decision-making. *International Journal of Innovation Science*, 14 (3/4), 693–712. <https://doi.org/10.1108/ijis-10-2020-0245>
- Paskaramoorthy, A. B., Gebbie, T. J., van Zyl, T. L. (2020). A framework for online investment decisions. *Investment Analysts Journal*, 49 (3), 215–231. <https://doi.org/10.1080/10293523.2020.1806460>

18. Iershova, N., Lynnyk, O. (2021). Information And Accounting Support For Investment Analysis Of Business For Management Decision Making In Industry 4.0. *Bulletin of the National Technical University "Kharkiv Polytechnic Institute" (Economic Sciences)*, 1, 25–31. <https://doi.org/10.20998/2519-4461.2021.1.25>
19. Smiesova, V., Pylypenko, A., Ivanova, M., Karpenko, R. (2019). Economic and Institutional Conditions for Implementation of Economic Interests in the Countries of the World. *Montenegrin Journal of Economics*, 15 (4), 75–86. <https://doi.org/10.14254/1800-5845/2019.15-4.6>
20. Yemelyanov, O., Petrushka, T., Lesyk, L., Havryliak, A., Yanevych, N., Kurylo, O. et al. (2023). Assessing the Sustainability of the Consumption of Agricultural Products with Regard to a Possible Reduction in Its Imports: The Case of Countries That Import Corn and Wheat. *Sustainability*, 15 (12), 9761. <https://doi.org/10.3390/su15129761>
21. Kubasakova, I., Kampf, R., Stopka, O. (2014). Logistics Information and Communication Technology. *Communications - Scientific Letters of the University of Zilina*, 16 (2), 9–13. <https://doi.org/10.26552/com.c.2014.2.9-13>
22. Zhang, J., Wu, Y. (2020). Providing multilingual logistics communication in COVID-19 disaster relief. *Multilingua*, 39 (5), 517–528. <https://doi.org/10.1515/multi-2020-0110>
23. Muhammad, M., Saahar@Saabar, S., Hasan, H., Fiah, A. F. M., Nor, A. M. (2014). Effective Communication Systems for Malaysian Logistics Industry. *Procedia - Social and Behavioral Sciences*, 130, 204–215. <https://doi.org/10.1016/j.sbspro.2014.04.025>
24. Pedriali, D., Arima, C. H., Piacente, F. J. (2020). Segurança da informação na Logística 4.0: um estudo bibliométrico. *Research, Society and Development*, 9 (2), e38921949. <https://doi.org/10.33448/rsd-v9i2.1949>
25. Dayarathna, D. I. L., Hewage, U. (2019). Factors Affecting the Level of Effectiveness of Communication Tools Used in Sri Lankan Export Apparel Supply Chains. 2019 Moratuwa Engineering Research Conference (MERCon). <https://doi.org/10.1109/mercon.2019.8818780>
26. Sallnäs, U., Björklund, M. (2020). Consumers' influence on the greening of distribution – exploring the communication between logistics service providers, e-tailers and consumers. *International Journal of Retail & Distribution Management*, 48 (11), 1177–1193. <https://doi.org/10.1108/ijrdm-07-2019-0213>
27. Comi, A., Russo, F. (2022). Emerging Information and Communication Technologies: the Challenges for the Dynamic Freight Management in City Logistics. *Frontiers in Future Transportation*, 3. <https://doi.org/10.3389/ffutr.2022.887307>
28. Horzela, A., Kolinski, A., Domanski, R., Osmolski, W. (2018). Analysis Of Use Of Communication Standards On The Implementation Of Distribution Processes In Fourth Party Logistics (4PL). 2018: Proceedings of The 18th International Scientific Conference Business Logistics in Modern Management, 299–315. Available at: <https://hrcaak.srce.hr/ojs/index.php/plum/article/view/7894>
29. Pylypenko, Y., Pylypenko, H., Prokhorova, V. V., Mnykh, O. B., Dubiei, Yu. V. (2021). Transition to a new paradigm of human capital development in the dynamic environment of the knowledge economy. *Naukovyi Visnyk Natsionalnoho Hirnychoho Universytetu*, 6, 170–176. <https://doi.org/10.33271/nvngu/2021-6/170>
30. Pylypenko, Y., Prokhorova, V., Halkiv, L., Koleshchuk, O., Dubiei, Y. (2022). Innovative intellectual capital in the system of factors of technical and technological development. *Naukovyi Visnyk Natsionalnoho Hirnychoho Universytetu*, 6, 181–186. <https://doi.org/10.33271/nvngu/2022-6/181>
31. Kim, T. K. (2017). Understanding one-way ANOVA using conceptual figures. *Korean Journal of Anesthesiology*, 70 (1), 22. <https://doi.org/10.4097/kjae.2017.70.1.22>