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### **INFORMATION AND ACCOUNTING SUPPORT FOR INVESTMENT ANALYSIS OF BUSINESS FOR MANAGEMENT DECISION MAKING IN INDUSTRY 4.0**

Directions for the development of information and accounting support for investment analysis of business structures for making management decisions in Industry 4.0 are proposed. The key areas of changes in accounting in Industry 4.0 are defined as follows: expanding the display of the scope of the enterprise in the accounting; formation of approaches to the integration of accounting information for reporting; improving the efficiency of accounting, etc. The opportunities provided by the information and accounting platform for the development of the company's investment activities have been analyzed. Conceptual provisions of management accounting for investment analysis in the context of domestic practice are proposed. A model of information flows generated by an investment project during the entire period of time from the inception of an investment idea and the selection of investment proposals to the moment of evaluating the results of the project has been built. Approaches to the formation and disclosure of accounting information on the implementation of investment projects by companies, as well as methodological approaches to the analytical support of the management decision-making process, have been improved. The elements of the accounting policy for management accounting for the investment process have been clarified. As objects of accounting for investment activities, the actual costs of creating investment activities by their types (material and labor costs, depreciation deductions of fixed assets and intangible assets) and the movement of cash and non-cash funds as expenses in the areas of their expenditure are proposed. A methodological approach to the calculation of cash flows and disclosure of elements of accounting policies for management accounting is proposed. The study emphasizes the need to use special software products that automate the processes of accounting for economic activities and tools for studying the accumulated data from the perspectives that are most relevant for the enterprise.

**Keywords:** innovative activity; investment analysis; Accounting; management decision; computer information systems; business management; information

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### **ІНФОРМАЦІЙНО-ОБЛІКОВЕ ЗАБЕЗПЕЧЕННЯ ІНВЕСТИЦІЙНОГО АНАЛІЗУ БІЗНЕС-СТРУКТУР ПРИ ПРИЙНЯТТІ УПРАВЛІНСЬКИХ РІШЕНЬ В ІНДУСТРІЇ 4.0**

Запропоновані напрями розвитку інформаційно-облікового забезпечення інвестиційного аналізу бізнес-структур при прийнятті управлінських рішень в Індустрії 4.0. Визначені ключові напрямки змін в бухгалтерському обліку в Індустрії 4.0, які визначаються розширенням відображення області діяльності підприємства в обліку; формуванням підходів до інтегрування облікової інформації для складання звітності; підвищенням оперативності обліку і ін. Окреслено можливості, які надає інформаційно-облікова платформа для розвитку інвестиційної діяльності компанії. Запропоновані концептуальні положення управлінського обліку для інвестиційного аналізу в умовах вітчизняної практики. Побудована модель інформаційних потоків, що генеруються інвестиційним проектом, протягом усього періоду часу від моменту зародження інвестиційної ідеї та відбору інвестиційних пропозицій до моменту оцінки результатів реалізації проекту. Удосконалені підходи до формування та розкриття облікової інформації про реалізацію інвестиційних проектів компаніями, а також розвинені методичні підходи до аналітичного забезпечення процесу прийняття управлінських рішень. Уточнено елементи облікової політики з управлінського обліку для процесу інвестиційної діяльності. В якості об'єктів обліку інвестиційної діяльності пропонуються фактичні витрати на створення об'єктів інвестиційної діяльності за їх видами (матеріальні і трудові витрати, амортизаційні відрахування основних засобів і нематеріальних активів) і рух готівкових та безготівкових грошових коштів як видатків за напрямками їх витрачання. Запропонований методичний підхід до розрахунку грошових потоків і розкриття елементів облікової політики для управлінського обліку. Наголошується на необхідності використання спеціальних програмних продуктів, що автоматизують процеси обліку господарської діяльності і засобів вивчення накопичених даних в ракурсах, найбільш актуальних для підприємства.

**Ключові слова:** інноваційна активність; інвестиційний аналіз; бухгалтерський облік; управлінське рішення; комп'ютерні інформаційні системи; управління бізнесом; інформація

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### **ИНФОРМАЦИОННО-УЧЕТНОЕ ОБЕСПЕЧЕНИЕ ИНВЕСТИЦИОННОГО АНАЛИЗА БИЗНЕС-СТРУКТУР ПРИ ПРИНЯТИИ УПРАВЛЕНЧЕСКИХ РЕШЕНИЙ В ИНДУСТРИИ 4.0**

Предложены направления развития информационно-учетного обеспечения инвестиционного анализа бизнес-структур при принятии управленческих решений в Индустрии 4.0. Определены ключевые направления изменений в бухгалтерском учете в Индустрии 4.0, которые определяются расширением отображения области деятельности предприятия в учете; формированием подходов к интегрированию учетной информации для составления отчетности; повышением оперативности учета и др. Определены возможности, которые предоставляет информационно-учетная платформа для развития инвестиционной деятельности компании. Предложены концептуальные положения управленческого учета для инвестиционного анализа в условиях отечественной практики. Построена модель информационных потоков, генерируемых инвестиционным проектом, в течение всего периода времени от момента зарождения инвестиционной идеи и отбора инвестиционных предложений до момента оценки результатов реализации проекта. Усовершенствованные подходы к формированию и раскрытию учетной информации о реализации инвестиционных проектов компаниями, а также методические подходы к аналитическому обеспечению процесса принятия управленческих решений. Уточнены элементы учетной политики по управленческому учету для процесса инвестиционной деятельности. В качестве объектов учета инвестиционной деятельности предлагаются фактические затраты на создание объектов инвестиционной деятельности по их видам (материальные и трудовые затраты, амортизационные отчисления основных средств и нематериальных активов) и движение наличных и безналичных денежных средств как расходов по направлениям их расходования. Предложен методический подход к расчету денежных потоков и раскрытия элементов учетной политики для управленческого учета. Подчеркивается необходимость использования специальных программных продуктов, автоматизирующих процессы учета хозяйственной деятельности и средств изучения накопленных данных в ракурсах, наиболее актуальных для предприятия.

**Ключевые слова:** инновационная активность; инвестиционный анализ; бухгалтерский учет; управленческое решение; компьютерные информационные системы; управление бизнесом; информация

**Introduction.** The effectiveness of investment Industry 4.0 is largely determined by the quality of the management decisions that are made in companies in information and analysis methods that are used to process

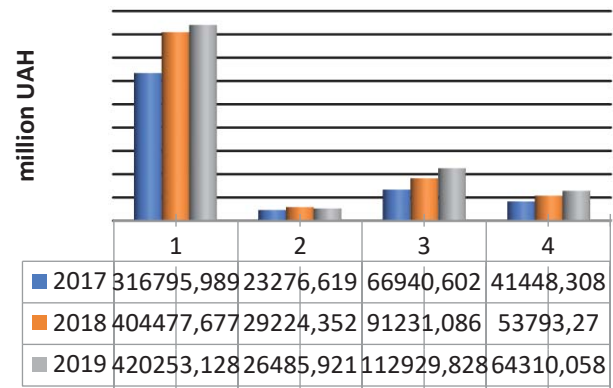
this information. Analysis is a management tool and the quality of its implementation determines the tools, methods and certain requirements for information. The initial information base for investment analysis is the accounting statements of companies. The reporting system reflects data on the property and financial position of the company, the results of economic activities. Investment activity as an accounting object covers investment resources and expenses, investment objects, investment operations and financial results from investment activities (economic effect from investment). That is why the improvement of information and accounting support is one of the key elements for increasing the effectiveness of management decisions on the investment activities of companies.

**Analysis of recent research and publications.** Rethinking the role of accounting and analysis in Industry 4.0 is of particular importance. Scientific works of scientists are devoted to the study of topical problems of accounting, analysis for the management of investment processes. Among them I.V. Berner, M.F. Van Breda, K. Lukka, J.F. Marshall, P. Masse, M.I. Bondar, V.A Deriy, L.M. Kindratska, E.V. Mnikh, N.Yu. Iershova, M. F. Ogiychuk, O.I. Linnik, V.S. Rudnitsky [1-8]. Scientists have identified economic and legal relations in the investment sphere [1, 2, 7], substantiated the relationship between investment and enterprise capital [6, 7], identified the directions and sources of resource support for investment activities [6, 8]. O.I. Linik notes "the introduction of accounting and reporting principles established in international practice should be carried out taking into account the specifics and characteristics of the functioning of domestic entrepreneurship, as well as the current state of the economy" [5]. Therefore, theoretical and methodological approaches to the content, collection, storage and processing of information, its analysis and systematization when making decisions in the investment field require further development.

**Formulation of the objectives of the article.** The purpose of this article is to improve the theoretical and applied aspects of information and accounting support for investment analysis of companies in Industry 4.0.

**Research methods.** For the study, methods of logical generalization, analysis and synthesis, statistical, economic and mathematical methods were used.

**Presentation of the main research material.** The investment activity of companies is a complex and risky business. The results of investment activities have a significant impact on the efficiency of the company's business as a whole. Significant factors that have a negative impact on the investment activity of Ukrainian companies are: insufficient economic efficiency of investment projects, low investment attractiveness of companies, weak government support for investor capital protection, lack of market infrastructure and effective mechanisms for investment and capital return, lack of investment resources, etc. (Fig. 1).



where 1 - acquisition and creation of new assets; 2 - acquisition of assets that were in use; 3 - improvement, improvement, reconstruction, modernization; 4 - overhaul

Fig. 1 - Dynamics of the volume of capital investments in certain areas\*

\*Source: [9]

Interest rate and tax policies of the state have a significant impact on the dynamics of investments. One of the main factors influencing the volume of investments of the company is the cost of their implementation [10]. A significant reason that does not allow the most complete attraction of both external and internal investment resources is incomplete and biased disclosure of information about the investment potential and investment processes in the accounting and financial statements of the company. Recently, the vector of accounting practice in Ukraine is aimed at meeting the needs of investors for complete and reliable information about the company's activities in the field of investment. The underdevelopment of the sphere of financial investment is one of the reasons for using a simplified system for assessing and accounting for financial investments in authorized capital and shares of other economic entities.

The growing role of intangible assets in the activities of companies determines them as a topical investment object (Fig. 2).

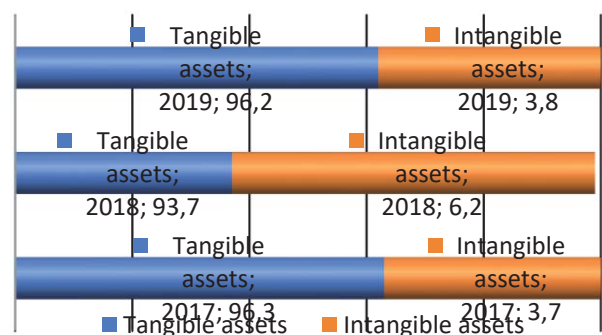


Fig. 2 - The volume of capital investments in tangible and intangible assets in% of the total volume\*

\*Source: [9]

Analysis of the financial statements of foreign companies shows that the value of intangible assets is higher than 15% - 20%. In some innovative and knowledge-intensive companies, the value of intangible

assets is equal to the volume of all movable and immovable property [11]. Analysis of the structure of sources of financing for investments of domestic business units shows that self-financing remains the main form. This confirms the conclusions of prof. M. I. Bondar, that for domestic companies it is important to create favorable conditions in the practice of accumulation, investment, rational formation and use of capital in their own production for further financing of investment activities [12, 13].

The key directions of changes in accounting in Industry 4.0 are determined by us in the expansion of the display of the field of activity of the enterprise in the accounting; formation of approaches to the integration of accounting information for reporting; increasing the efficiency of accounting, etc. For effective management of the company, especially in terms of regulating its own financial resources, the introduction of management accounting is essential. The analysis of scientific works devoted to this problem confirms that the development of the theory and improvement of the practice of management accounting is metaphysically connected with the expansion of the information space of the enterprise [14-16]. Particular attention should be paid to the technology for the formation and accumulation of the necessary information, its storage, transfer to interested users in the process of making managerial decisions on investment activities [14, 16].

Let us analyze more thoroughly the relevance of the introduction of management accounting for the collection and processing of information on the investment activities of companies.

First, a significant part of the information generated during the implementation of a separate investment

project, in terms of its content, cannot be reflected in accounting.

Secondly, investment projects can be implemented within several legal entities, differ in organizational structure, accounting policies, accounting software, etc. This requires the consolidation of data on the investment project, which are not always comparable.

Management accounting for an investment management system is a combination of two components. These are immanent accounting and analysis functions. In other words, management accounting for managing the investment activities of a company combines the functions of collecting, interpreting and analytical processing of information.

On the basis of management accounting information, an effective model of information support for investment activities can be built [17-19]. In this case, the following basic parameters must be observed:

A - types of information - the place of accounting and reporting information in the information support system for investment activities.

B - information users - qualitative parameters focused on stakeholders (owners, investors, founders) (suitability for decision-making, receptivity).

C - purpose of information - qualitative parameters oriented for decision-making (relevance, reliability, comparability).

D - significant restrictions - benefits versus costs, recognition threshold, conservatism (prudence).

The figure shows a model of information flows generated by an investment project during the entire period of time from the inception of an investment idea and the selection of investment proposals until the assessment of the results of the project implementation (Fig. 3).

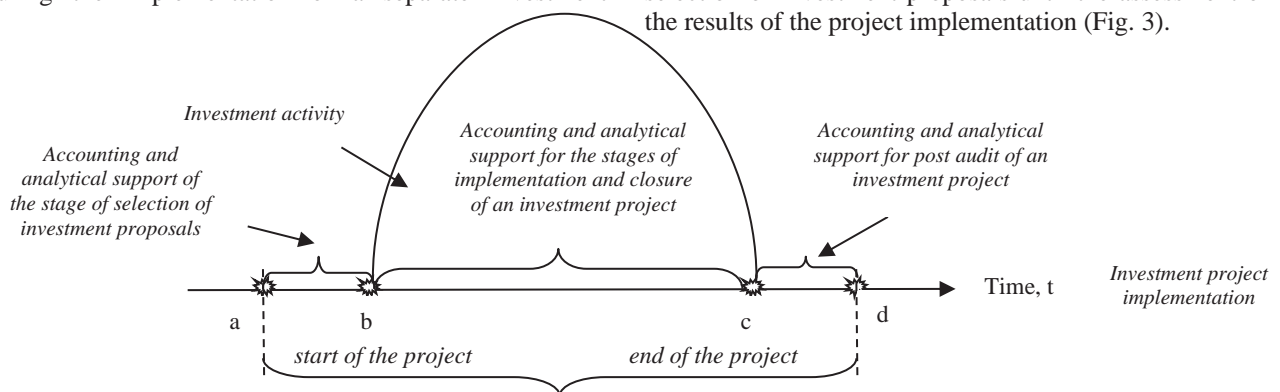


Fig. 3 - Accounting and analytical support for investment project management: time aspect

In Figure 3, you can see that the process of collecting and processing information about an investment project begins before the actual start of its implementation (segment AB), and ends after its closure (segment CD). Segment BC represents the time interval in which the accounting and analytical support of the stage of implementation and closure of the investment project functions. Based on this, the actual time interval of the existence of the accounting and analytical support of the investment project management system is the AD segment. The difference between segment AD and segment BC is explained by the fact that accounting and analytical support

covers the stage of selection of investment proposals and the stage of post-audit of an investment project.

The study of modern project management technologies in the field of investment activity showed that the accounting function and the analysis function coexist as a whole within the framework of the management control system [20, 21]. The unity of these functions is clearly traced at the level of performers, processes and carriers of accounting and analytical information. Important characteristics of these functions are the presence of time boundaries of their existence, different intensity of information generation by them at each stage

of the investment project implementation, as well as the presence of differences between the actual duration of the investment project implementation process and the duration of the process of collecting and processing information about the investment project and the results of its implementation.

Of considerable interest to users is the system of accounting and analytical support for investment management from the standpoint of timely detection of errors in the strategy and tactics of managing the company's investment activities. With the help of the accounting and analytical support system, you can maintain multi-level analytical accounting and receive detailed analytical reports, and for several investment projects at the same time, monitor the dynamics of indicators or compare indicators throughout the entire period of the investment project.

We investigated the elements of an investment activity management system in the context of the possibility of using management accounting data to manage individual work in an investment project of companies. The results confirm that a significant part of the accounting information that can be used for this requires additional analytical detail. However, at the same time, certain difficulties arise in accounting practice. Namely:

- companies can simultaneously implement several investment projects (marketing, personnel development, etc.) This requires double detailing of accounting information by project groups;

- accounting employees, when processing primary documents, will not always be able to identify a particular business transaction in relation to a particular project, project stage or type of project work. This requires re-processing of primary documents by specialists who manage the project;

- a complex hierarchy of companies' projects requires the application of procedures for the distribution of income and expenses between projects.

Such difficulties lead to the need to consider in more detail the elements of accounting policies for management accounting for the process of investment activities.

The main sections of accounting policies for management accounting purposes are:

I. Organizational and technical. The organizational and technical section of the accounting policy for the purposes of management accounting for investment activities covers the composition and relationship of the subjects of management accounting for investment activities, regulatory support for management accounting for investment activities, the allocation of financial responsibility centers, budgeting, the relationship between financial and management accounting for investment activities, information support for management accounting for investment activities, content, methods of creating and maintaining classifiers for management accounting of investment activities, technologies for processing accounting information, forms and procedure for presenting internal reporting, document flow standards, and other elements.

II. Methodical. The methodological section of the accounting policy for the purposes of management accounting of investment activities includes: objects of

management accounting for investment activities, classification of costs of investment activities, a method of distributing indirect costs between investment objects, the choice of methods for accounting for costs of performing work in the investment process and calculating their cost, a list and methodology for calculating indicators (criteria) for evaluating the effectiveness of the centers of financial responsibility, other elements.

The management accounting system forms information support for the current management of the investment process, allows calculating analytical indicators of compliance with the norms and standards of investment costs and identifying possible reserves for their reduction, summarizes information for calculating the cost of work results (investment objects). In the absence of a planning service in the company, the competence of the management personnel is investment cost planning and budgeting.

In the classical investment analysis, the following types of mathematical models are defined, which determine certain parameters of the performance of an investment project: Amount (NV, NPV, MNPV), Profitability (NRR, IRR, MIRR, MIRR (bar), Profitability Index (DPI), Payback period (payback, TC-payback, duration), Cash flows (net cash flow).

In the International Financial Reporting Standard IAS 7 «Statement of Cash Flows», investing activity refers to the acquisition and disposal of long-term assets and other investments not related to cash equivalents. Investment operations are operations for the investment of the organization's investment resources in investment objects in order to obtain a positive economic effect from their use in the future. The objects of investment are investments in non-current assets (investment assets) and financial investments.

The indicator of the implementation of the investment project is NCF (Net Cash Flow), which is also the main economic indicator in appraisal activities. In an investment analysis to determine the effectiveness of a project, Net Cash Flow is the sum of depreciation and profit payments less investment, maintenance costs of fixed assets and changes in working capital.

$$NCF = OCF + FCF + ICF \quad (1)$$

Net Cash Flow is the difference between the sum of all cash receipts and the sum of all payments for a certain period of time. An analysis of the cash flows of an investment project is carried out at all stages of its implementation.

There are three stages of an investment project:

- pre-investment (preparatory, where the conditions for its implementation are determined, the main parameters are calculated, etc.)

- investment (implementation of the project program);

- operational (the period from which the project results are used to generate income).

In accordance with the stages of project implementation, the entire cash flow of the project can be conditionally divided into three parts:



1) Net Investment (NI) - the initial investment in the project;

2) Net Operating Cash Flow (NOCF) - Cash Flow from operating activities;

3) Net Closing Cash Flow (NCCF) - Cash Flow arising from the results of the completion of the project.

Thus, the Net Cash Flow of the entire project can be calculated as the sum of Cash Flow at all stages of the project. Moreover, when conducting investment analysis, only the change in the value of indicators (their increase or decrease,  $\Delta$ ) is taken into account. In this case, the calculation of the net cash flow of the investment project is based on the formula:

$$NCF = \Delta NI + \Delta NOCF + \Delta NCCF, \quad (2)$$

In accordance with the provisions of IAS 7 «Statements of Cash Flows», the net cash flow from operating activities can be calculated using the formula:

$$NCF = PN + A + NWC, \quad (3)$$

where PN – net profit of the reporting period; A - depreciation charges; NWC - Net Working Capital (amount of inventories and operating receivables minus payables).

All components of formula (3) can be considered as factors of changes in the net cash flow from current activities, with the greatest interest being the effect of the efficiency of activities (the factor of net profit PN) and changes in individual components of the Net Working Capital (NWC). If the components of the Net Working Capital remain unchanged, the company's cash flow from current activities is proportional to the net profit of the reporting period and differs from it by the amount of depreciation and other non-cash expenses. Note that with a positive value of the net profit factor, the cash flow may decrease due to changes in the turnover of receivables and payables that are unfavorable for the company, or if they are significantly imbalanced.

The information in the cash flow statement also allows you to identify the priorities of the current payment policy of the company. The likelihood of non-fulfillment of financial obligations by an organization depends not only on the availability of funds, but also on the decisions of the management (representatives of the owner), which establish the actual sequence and timing of repayment of obligations. The indicators of the turnover of debts on accounts of settlements with personnel, suppliers not only reflect the terms and sequence of payments established by the management, but also allow diagnosing the financial problems of the company at an early stage of their occurrence.

We present another approach that is worth considering in this study. The activity of a separate business structure is an ongoing investment process. In this context, an assessment of the company's performance can be made based on the cash flow generated at any time during the company's existence. The total amount of expenses (x) that the company spends can be considered an investment of a certain time (period t). At the same time, income (y) for a certain period of time is the receipt of

funds. With this approach, after a while a series will be formed:  $[x(t), y(t)]$ , where  $t = 1 \dots n$ .

Based on the obtained series  $[x(t), y(t)]$ , it is possible to calculate the cash flow that the company generates for a certain time of activity:  $CF(t) = y(t) - x(t)$ .

At present, accounting (financial) statements must comply as much as possible with international requirements for their preparation. This enables interested users to conduct a qualitative analysis of the financial condition of the organization to identify financial risks when investing resources in investment projects.

Information in the company's public financial statements becomes its special commodity, an information product that allows:

- protect the property and economic interests of potential investors;

- to organize information saturation of the mechanism of market relations between companies and investors, which are expressed by indicators of business activity;

- to promote the attraction of additional investment funds in the development of the company's activities;

- to inform the participants of the investment process at the stages of investment of financial resources, their circulation and determination of financial results;

- to ensure effective competition in the capital market.

Analyzing the list of reporting functions, you can see that the main emphasis in financial reporting is on attracting potential investors and external sources of funding. Scientific publications highlight the issues of disclosing high-quality and relevant information in reporting, which is necessary for analyzing the investment attractiveness of a company. To satisfy the interests of long-term portfolio and strategic investors, an analysis of the company's investment attractiveness is required, not only in the context of current financial and economic activities, but also from the standpoint of its investment activity, the effectiveness of capitalized profit [20-22]. Lack of information provided to users can become a serious obstacle to the inflow of additional capital as an investment source for expanding the organization's activities, since business partners will not receive the information they are interested in about the financial stability, solvency, and development prospects of the organization.

The formation of an information and accounting platform and the direct implementation of analytical procedures for making management decisions in the field of investment management should be provided with special software products that automate the accounting processes for economic activities and ensure the accumulation of data in the most relevant perspectives of the company. With the help of special programs, you can conduct a special analysis and audit analysis. The special analysis block allows you to analyze the financial condition of potential partners, banks, investment projects and assess the likelihood of a company's bankruptcy based on public reporting data. In the block of audit analysis, the user is offered a methodology for auditing the strategy of borrowed funds and a methodology for auditing the flexibility of a production development strategy and

dividend policy. The result of the analysis is an assessment protocol, which ends with specific recommendations for the company's management personnel.

#### Conclusions and prospects for further research.

The results of this study confirm the need for further development of the paradigm of accounting and analytical support for investment management. This development is provided by the following provisions:

– the system of accounting and analytical support, should be focused on the final results of the implementation of the investment project;

– the unity of the subsystems of accounting and analytical support for the management of investment projects and the management of the company's current activities should be ensured.

The theoretical significance of the study lies in the development of conceptual provisions of management accounting for investment analysis in the context of domestic practice. The practical significance lies in improving approaches to the formation and disclosure of accounting information on the implementation of investment projects by companies, as well as in the development of analytical support for the management decision-making process. In particular, recommendations for clarifying the calculation of cash flows and disclosing elements of accounting policies for the needs of management accounting are of practical importance.

Prospects for further research in this direction are finding algorithms and procedures for collecting and processing non-financial information, expanding the technical capabilities of data transmission and storage. And also, theoretical, methodological and organizational foundations of information security and protection of valuable information for making management decisions in the field of investment activities.

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Received 11.02.2021

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