

of intellectual activity of the enterprise, defined by the managers, carrying out the tasks of functional blocks. To systematise and optimize the production intellectual activity superstructure – management subsystem is created. It is based on an organizational structure of management in which management functions are implemented.

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#### ФОРМИРОВАНИЕ СИСТЕМЫ УПРАВЛЕНИЯ ИНТЕЛЛЕКТУАЛЬНЫМ КАПИТАЛОМ НА ПРЕДПРИЯТИИ

Исследована функция планирования в системе управления интеллектуальной деятельностью на предприятии, которая включает в себя обучение персонала по четырем видам планов. Рассмотрено функцию – организация в системе управления интеллектуальной деятельностью на предприятии. Выделено первостепенное значение функции мотивация в системе управления интеллектуальной деятельностью на предприятии.

**Ключевые слова:** интеллектуальный капитал предприятия, подразделения интеллектуальной деятельности, функциональные блоки интеллектуальной деятельности.

*Andriushchenko Kateryna, Doctor of Economics Sciences, Professor of the Enterprise Economic Department, Kyiv National Economics University named after Vadym Hetman, Ukraine, e-mail: katya373@i.ua, ORCID: <http://orcid.org/0000-0002-6274-5310>*

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Lemeshko N.

## ANALYSIS AND ESTIMATION OF EFFECTIVENESS OF INVESTMENT PROJECTS

*Проведено аналіз стану розвитку інвестиційних проектів в Україні. Представлена загальна характеристика міжнародної практики існуючих методів оцінки ефективності інвестиційних проектів/програм. Подане обґрунтування доцільності прийняття інвестиційних рішень щодо обраних проектів/програм. Представлені етапи розробки та впровадження інвест-проекту/програми, а саме: організаційно-підготовчий етап; етап безпосередньої розробки проекту/програми; етап узгодження й затвердження проекту/програми; етап пропаганди проекту/програми та контролю за його виконанням.*

**Ключові слова:** *інвест-проекти, методи оцінки ефективності інвест-проектів, етапи розробки інвест-проектів/програм.*

### 1. Introduction

The relevance of research is due to existing political and socio-economic problems in Ukraine, a significant drop in production in certain sectors of the national economy and, as a consequence, a decrease in investment activity both among many enterprises and among individual investors. At the same time, the imperfect legal field and the ineffectiveness of the existing investment mechanisms also predetermine the creation of an unfavorable investment climate in all sectors of the domestic economy, in

turn, does not encourage domestic and foreign investor to further conduct investment activities.

Increased competition in the world and domestic markets, rapid development and change of production technologies, diversification of production, and new criteria for assessing the effectiveness of business projects – all this led to new requirements for the financial analysis of investment projects/programs in building sector.

In this regard, the role of an effective analysis of financial and economic activities and the calculation of investment efficiency in the work of building companies

is constantly growing. With the help of the analysis, the trends in the development of building are studied, the implementation of investment decisions is monitored, the reserves for increasing the efficiency of building production are revealed, the results of the activity of building companies are estimated, and an economic strategy for their further development is planned. Calculations for various long-term building projects are carried out taking into account the international practice of effectiveness evaluation of investments (investment projects/programs).

## **2. The object of research and its technological audit**

The object of research is investment activity, in particular, the analysis and evaluation of efficiency and stages of development of invest-projects. In order to study the investment dilemma, a study of the world practice of financial management dealing with the problems of investment projects, studies of the development of investments in countries with economies in transition, studies of budgeting and the design of investment projects are carried out. The market of the most significant international investment companies is also investigated, according to the ratings, based on the Forbes Global 2000 ranking, which ranks investment banks and companies in terms of assets [1]. Statistics and major international companies are analyzed that deal directly with investment activities, in particular: investment banking and investment management, mortgage finance, securities trading, private capital management, insurance, brokerage, depository activities and financial consulting. The first and second places are occupied by the American investment companies FANNIE MAE and FREDDIE MAC, with a total assets of 5193 billion USD, the third is the Swiss company CREDIT SUISSE – 927.5 billion USD, the fourth place is occupied by GOLDMAN SACHS (USA) – 856.2 billion USD, the fifth – MORGAN STANLEY with the capital of 803.1 billion USD. In Ukraine, with the appropriate conditions for the gradual development of the economy and the fight against corruption, there is an objective opportunity to attract investment companies to domestic investment projects.

## **3. The aim and objectives of research**

*The aim of research* is to determine the main methods for evaluation of effectiveness and stages of developing investment projects.

A systematic approach to the realization of the aim of research determines the solution of the main objectives:

1. Development of methodological and theoretical bases of investment.
2. Analysis of the main financial criteria for making investment decisions.
3. Definition of the basic directions of investment decisions on the basis of development of the investment project/program.

## **4. Research of existing solutions of the problem**

Let's address to definitions. Investments are the costs of restoring depreciated fixed capital and increasing fixed capital [2]. Since investments are one of the main compo-

nents of GDP, the fluctuations in investment flows reflect the patterns of the cyclical development of the economy in the country.

The definition of the concept of «investment» did not exist before; it was replaced by the concept of «capital investments». Modern world experience has many theoretical and practical improvements in the development and analysis of investment projects, which are of great importance for the study and development of investment processes in Ukraine.

The most famous foreign and domestic authors in this direction are a wide range of issues on financial management and investments, including financial management and investment attraction in transition countries, problems of financial diagnosis of investment projects, problems of managing financial flows and costs, budgeting problems and investment planning [3–7].

Many theoretical and practical developments are devoted to the general characteristics of methods for assessing efficiency, the main criteria for the effectiveness of investment projects, the analysis and evaluation of risks of investment projects, the technology of compiling a business plan for investment projects [2, 8–10].

A lot of scientific developments are also devoted to the development of complex tasks in the field of investment design and forecasting financial reports on the calculation of investment efficiency [11, 12].

However, scientific research of certain aspects of investment activity does not take into account the specifics of the development of the domestic market for investment services. There is also an urgent need for a scientific justification and detailed development of technology for the preparation and practical implementation of investment projects/programs in Ukraine. Insufficient state of the research of the scientific problem as a whole, the urgent need to develop practical recommendations for enhancing the investment of the Ukrainian economy cause the relevance of the research topic.

## **5. Methods of research**

*The methodological basis* of research is the general scientific methods of financial research and calculations, the provisions of foreign and domestic economic thought on the problems of investment at macro- and micro-levels.

*The information base* of research is the normative documents of the ministries of economy and regional development of Ukraine, analytical reviews of foreign experts, scientific and financial and educational literature of leading international universities.

## **6. Research results**

Investigating the international practice of investment effectiveness evaluation, based on the concept of the time value of money, it can be summarized that it is based on such principles [6, 11, 12].

1. Effectiveness evaluation of the use of invested capital is carried out by comparing the cash flow, which is formed in the process of implementing the investment project and the initial investment. The project is considered effective if it provides a return of the initial investment amount and the required return for investors who have provided this capital.

2. The capital raised to investments, as well as the cash flows generated by this capital, is reduced to the present time or to a certain calculation year (which usually occurs at the beginning of the project).

3. The process of discounting capital investments and cash flows is made at different discount rates, which are determined depending on the specifics of investment projects. When determining the discount rate, the structure of investments and the value of individual components of capital are taken into account.

The essence of all evaluation methods is based on the following simple scheme: the output investment in the implementation of a project generates cash flow  $CF_1, CF_2, CF_3 \dots CF_n$ . Investments are recognized as effective if this flow is sufficient to return the initial amount of capital investments and ensure return of invested capital [6, 11].

When calculating efficiency, the following indicators of the effectiveness of capital investments are most common, namely:

- Discount payback (DPB);
- Net present value rule (NPV);
- Internal rate of return (IRR).

These indicators, as well as the corresponding methods, are used, mainly in two versions, namely:

- to determine the effectiveness of independent investment projects/programs (so-called absolute efficiency), when it is concluded whether to accept the project or reject it;
- to determine the effectiveness of mutually exclusive projects (comparative effectiveness), when it is concluded which project to adopt from several alternative ones.

In conclusion of consideration of the general provisions of the technology for effectiveness evaluation of investment projects, two main assumptions can be noted that are taken into account in calculating performance indicators and, accordingly, making investment decisions, namely:

1. Cash flows are given at the end of the estimated period of time. In fact, they can appear at any time during the considered investment period.

2. Cash flows generated by investments are immediately invested in any other project to provide additional profit from these investments.

Among the most significant investment indicators used in the world – a criterion for investment, which leads to respect for the welfare of shareholders – is *net present value rule* [6].

NPV is a value which increases the welfare of the shareholders of the company. Formulated as a major criterion for investment decision of managers, this rule dictates – invest in the proposed project if its NPV is *positive* [10].

In relation to large projects with long payback periods, it is unlikely that the application of the commercial efficiency criterion will bring accurate results. In addition, in large projects, Ukrainian investors are not interested today, and therefore support from the state is needed here. Criteria for effectiveness evaluation of such projects should be indicators of general economic (national) efficiency, that is, direct, side and full effects from implementation should be assessed.

The most important results of financial and investment analysis should also be conclusions on the investment attractiveness of investment objects and the possibilities of using the investment market.

At the stage of the project idea, it is very important to know how effective the project management's actions will be in attracting finance for its implementation. Therefore, it is necessary to conduct a preliminary analysis of all proposed variants of the investment project in order to obtain a response to three main questions:

1. How what the specified objectives of the investment campaign correspond to the existing objective requirements (the effectiveness of certain goals).
2. How what the obtained results correspond to the outlined tasks (the effectiveness of the campaign).
3. How what effective the costs (financial, human, temporary) of obtaining the planned result.

To evaluate the effectiveness of the final results of the investment campaign, the cost recovery ratio ( $C_r$ ) and the profitability ratio ( $R_f$ ) are used [6, 11, 12].

The *cost recovery ratio* shows, how many times for the chosen period expenses pay off at the expense of raised funds in the investment project:

$$C_r = \frac{\text{Raised funds}}{\text{Project costs}}. \quad (1)$$

The investment profitability ratio shows how much the profit (the difference between the raised funds and the project costs) is per unit of funds raised for the investment project (from the investment company).

$$R_f = \frac{\text{Profit}}{\text{Raised funds}} * 100 \%. \quad (2)$$

Analysis of the effectiveness of investment companies in Ukraine is possible only if the system of financial and audit accounting is well-organized. The effectiveness of cooperation with various donors can be displayed in: the number of requests for project/program support; the number of positive answers; the total profit amount; average amount of project/program support; received profit in comparison with the forecasted, etc. After the analysis it is possible to draw a conclusion about the prospects of further work on this or that project.

Investigating the problems of search and search for investment programs, we came to a conclusion about the main issue of the investment planning process and the investment decision. This is, in our opinion, the investment project itself [3–5].

The analysis of the investment project presents a rather complex sequence of decisions regarding possible events in time, from the first idea of the project, the collection of information on the assessment of possible revenues and expenses for project implementation, and the development of a step-by-step strategy for its implementation. At the same time, it is rather difficult to forecast all possible costs and revenues from the project. They will depend on decisions and actions that can be controlled, and on the logic of events developing spontaneously. At the same time, it should be noted that it is difficult not only to forecast cash flows, but also to give the most correct assessment of their possible impact on the final value of the raised investment capital.

Therefore, at the stage of collection and analysis of information on the assessment of the possible revenues and expenses of any investment project is the study of investment risks. Determination of investment risk degree

is a prerequisite for making an investment decision. The degree of investment risks, for example, building investment projects need to be determined by all possible groups, namely: project, financial, construction, operational, etc.

After making an investment decision, it becomes necessary to process a feasibility study of the project/program, in which measures are being developed to prevent or reduce the effect of potential risks/threats, that is, the likely protection of investments. Protection of investments must be carried out during the whole «life cycle» of the investment project/program. An integral part of the feasibility study of any project/program should be an *assessment of the financial feasibility and likelihood of an investment project* that is a general stage of justifying the feasibility of further investing in a project. This, unfortunately, in the conditions of modern development of the domestic economy it requires further substantial study.

As for determining the degree of project risk, it should be noted that it is necessary to comply with the basic generally accepted criterion, namely, «invest in the proposed project if its NPV is positive» [6, 8].

Immediately before the investment decision is made, a feasibility study for the investment project is being developed, because the more credible and financially sound information about the project the investor receives, the less the risk is waiting for him at the stage of implementing this project. In addition, prior to investing, a sufficiently long period of negotiations, expertise, approvals, inspections is needed, the subject of which is the feasibility study of the investment project.

Development of the project/program is an organizational activity, reflected in the adoption of a number of consistent managerial decisions. Having studied the experience of developing investment projects, we propose such sequence of development of investment projects (is applied to building investment projects, in particular) [5, 7].

From the organizational and technical side, the planning of the project/program consists of several stages, each of which solves its own specific tasks:

- organizational and preparatory stage;
- stage of project/program development;
- stage of agreement and approval of the project/program;
- stage of project/plan propaganda and organization of control over its implementation.

**6.1. Organizational and preparatory stage.** At this stage, the organizational conditions for successful planned activities are created. Their creation involves the formulation and solution of certain tasks.

1. *Formulation of the overall purpose of the project/program.* This task determines the entire technology of its development and implementation. And the ambiguity of the formulation may negatively affect its development and implementation. The customer of the project/program can be various social subjects (authorities, public organizations and institutions, private investors). There are two possible development versions.

The first one – in the «American style», «soft version» reduces the program/project to the totality of received applications and project variants. These applications can be distributed in certain blocks (directions), the difference between which is technically auxiliary rather than principled. The second is a «hard version» involves thorough research, concretization of priorities and specific deadlines

for all planned work for a certain period of time. In any version, all project materials must have not only a complete work assignment, including detailed description of production tasks, justification of financial security, schemes for accomplishing tasks and control.

2. *Identification of performers – who will develop the project/program.* Usually, the development of projects/programs is entrusted to the most qualified specialists, since planning involves a fairly broad horizon to consider prospects for further work. In some cases, especially when it is necessary to develop large-scale projects/programs, it is advisable to create a development commission, as well as to involve representatives of customers, public organizations, specialists in public administration, building and land use, authorities and government agencies (by mutual agreement or on a contract basis).

3. *Determination of the real terms of the project/program development.* It is important to determine the actual terms of the project/program development, as well as the terms of its approval. It is worth remembering that a full-fledged project/program can be developed for a certain real time period.

4. *Information support for the future project/program.* Information support for the project/program is collection, organization and analysis of preplanning information, on the basis of which a final decision can be made. This information should be the basis for further analysis of the real state of the matter, identifying the necessary material, financial, labor and other resources, searching, attracting and using modern technologies for calculating all costs. Certain requirements are made demand on the information, namely: objectivity and reliability, efficiency and timeliness, completeness and concreteness, systematicity and control.

5. *Methodical support (instruction).* The main project manager should be sure that all participants in the development correctly understand their tasks, as well as the technology of project development. Therefore, it is necessary to provide for meetings to familiarize with the experience of planning work of other similar organizations (institutions) that already had such experience.

## **6.2. Stage of direct project/program development.**

1. *Identification of current problems, for solution of which the project/program is designed.* The main thing is to understand, in solving which problems we can take part, exactly who can be useful to the project. Understanding of real problems leads to, sometimes unexpected social partnership, opens up prospects for attracting additional resources. Information on these problems can be given by the media, administrative documents, and special studies. They can be determined by appropriate norms and regulations, formulated as a result of marketing research of certain processes by the method of analysis.

2. *The budget of the project/program,* except for the total amount, should contain the following main items of expenditure:

- payment for labor: separately staffed and attracted, for example, on a contract basis, employees and specialists;
- additional payments (with the obligatory justification of the need for payments);
- deductions from salary (including all mandatory contributions and payments);
- services of outside organizations (rent, publishing, printing, courier, transportation services, etc.);



- unforeseen expenses (no more than 12–15 % of the total amount of previously mentioned expenses);
- funds for the formation of a development fund for building organization (also generally not more than 15 % of the total amount of basic expenses).

The other part of the budget should contain sources of covering the necessary expenses. A detailed calculation of each of the articles is added to the budget, and accordingly, the expenditure and revenue side of the budget should be balanced [5].

3. *Documentation of the project/program.* The project/program after justification can be «put on paper». There is no single standard form for design of projects/programs. Design depends on the type of specific planning document (complex or long-term, prospective or by years) and their purpose. Therefore, the main requirement for the design of the project/program is to find the answer to all questions of interest to performers, customers, and investors, as well as relevant instructions, plans, informative materials with which they will be acquainted. In order to become a full-fledged document, the project/program should be coordinated and approved by representatives of all parties.

**6.3. Stage of agreement and approval of the project/program.** At this stage, the following tasks are solved: familiarization, agreement and approval. The project/program is coordinated with all instances, on which its implementation and execution depends, agreement is coordinated with the help of the «AGREED» requisite on the last page of the planning document, where representatives of all parties participating in the project/program are indicated.

**6.4. Stage of project/plan propaganda and organization of control over its implementation.** The success of the project/program depends on how far its positions are communicated to specific performers, how much of its participants are realized and close to the common goal and objectives. For this, it is necessary to envisage and plan special explanatory work: meetings, seminars, talks, trainings, round tables. An equally important issue is the constant informing of partners, investors and donors and public about the stages of the project/program implementation. In such information work, the media, various forms and types of public relation technologies can be used. It is also advisable to publish information on interim results of activities.

## 7. SWOT analysis of research results

*Strengths.* The strength of research is the possibility of preliminary analysis of the investment project in order to get an answer to the question: how many of these goals of the investment campaign correspond to the existing *objective requirements and outlined objectives* of the investment project.

*Weaknesses.* The weak side is that the obtained data regarding the development of stages and the calculation of the effectiveness of investment projects are related to the time value of money.

*Opportunities.* Opportunities for further research is the borrowing of international investment experience of developed countries to improve the analysis of the methodology for calculating the efficiency and profitability of investment projects.

*Threats.* Threats to research results are that it is impossible to finally answer the question: how effective will the costs (financial, human, temporary) to obtain the final result.

## 8. Conclusions

1. Analysis and processing of the state of development of investment projects in Ukraine requires selection and improvement of methods for effectiveness evaluation of investment projects used in world practice. It is also necessary to continue studying international experience in planning investment projects, that is: mechanisms for optimizing investment projects; assessment of financial provision of investment projects; marketing and implementation work on certain investment projects, forecasting of financial reports and calculation of indicators of investment projects. There is a need to develop standard problems of investment mathematics, etc.

2. Making any investment decisions regarding a certain investment project/program, as well as the stages of its development, are related to the analysis of the financial criteria for the evaluation of the project/program. When calculating the effectiveness of an investment project, it is necessary to apply such indicators of the effectiveness of capital investments, namely:

- Discount payback (DPB);
- Net present value rule (NPV);
- Internal rate of return (IRR).

These indicators, as well as the corresponding methods, are used, mainly in two versions, namely:

- to determine the effectiveness of independent investment projects/programs (so-called absolute efficiency);
- to determine the effectiveness of mutually exclusive projects (comparative effectiveness).

3. In order to make an optimal investment decision, the project organizers must do a great deal of analytical and financial work, which includes, in particular, all calculations for implementation the investment project, as well as effectiveness evaluation of investment projects based on the concept of the time value of money. Determination of the main directions for investment decisions based on the development of the investment project/program is related to the coordination of the system of general monitoring and control over the implementation of the investment project in accordance with the intended purpose. Almost all types and means of financial calculations and financial control can be used for this, which, in turn, are accompanied by corresponding expected forecasts.

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#### **АНАЛИЗ И ОЦЕНКА ЭФФЕКТИВНОСТИ ИНВЕСТИЦИОННЫХ ПРОЕКТОВ**

Проведен анализ развития инвестиционных проектов в Украине. Представлена общая характеристика международной практики существующих методов оценки эффективности инвестиционных проектов/программ. Представлено обоснование

целесообразности принятия инвестиционных решений относительно выбранных проектов/программ. Представлены этапы разработки и внедрения инвест-проекта/программы, а именно: организационно-подготовительный этап; этап непосредственной разработки проекта/программы; этап согласования и утверждения проекта/программы; этап пропаганды проекта/программы и контроля за его выполнением.

**Ключевые слова:** инвест-проекты, методы оценки эффективности инвест-проектов, этапы разработки инвест-проектов/программ.

*Lemeshko Nataliia, Department of Economics and Entrepreneurship, National Technical University of Ukraine «Igor Sikorsky Kyiv Polytechnic Institute», Ukraine, e-mail: klimchuk.irina@gmail.com, ORCID: <http://orcid.org/0000-0002-9783-2393>*

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**Sharko M.,  
Burenko J.,  
Gusarina N.**

## **MODELING OF MANAGEMENT OF THE INFORMATION POTENTIAL OF COMPLEX ECONOMIC SYSTEMS UNDER CONDITIONS OF RISK**

*Проведено інформаційний аналіз і синтез процесів, що відбуваються в складних економічних системах, що характеризуються різноманіттям варіантів структури відносин. Розглянуто структуру управління ієрархічними системами з використанням лінгвістичного, евристичного, інформаційного і математичного підходів. Представлена структурно-функціональна послідовність операцій управління з урахуванням обмежень на ресурси і впливів зовнішнього середовища.*

**Ключові слова:** економічні системи, управління інформаційними можливостями, умови ризику, інформаційний потенціал.

### **1. Introduction**

In modern conditions of functioning of complex economic systems, modeling is the main stage of system analysis of production and socio-economic systems and an urgent problem for each enterprise. Along with widespread simulation for solving management problems, structural and functional modeling of analysis and synthesis of complex systems using computer models begins to be used. Difficulties in solving the problems of managing economic systems under conditions of uncertainty of the influence of the external environment and risk are determined by both the large dimension of the control actions and the dimensionality of the system of constraints.

To form an effective strategy for managing economic systems under conditions of risk, it is necessary to correctly use the information potential of enterprises on the basis of analysis and synthesis of methods for modeling complex economic systems.

### **2. The object of research and its technological audit**

With the purpose of effective use of the information potential of the enterprise, a study of the scientific and

methodological foundations of managing complex multi-level economic systems under conditions of uncertainty and risk has been carried out. The essence of information analysis of processes occurring in economic systems is the collection of necessary information, its exchange with subsystems, analysis, processing and its use [1]. The task of information synthesis includes justification of the necessary volume, forms of information, methods and means of its processing and storage [2]. Both these areas of studying information processes occurring in economic systems are an effective tool for studying complex economic systems [3–5].

Complex production systems are characterized by such features as the presence of a large number of interconnected subsystems and elements, multidimensionality, due to the large number of connections between the elements, the diversity of the objectives of the subsystems, multifunctionality, and the variety of structure options. In most cases, the structure of interactions between the elements of the system is hierarchical [6].

The difference between hierarchical and centralized systems is that for systems with centralized control there is a single criterion for optimality. For hierarchical systems, each of the subsystems has its own local criteria [7].