

METHODS FOR ASSESSING THE EFFECTIVENESS OF INNOVATIVE PROJECTS IN HOUSING AND COMMUNAL SERVICES IN UKRAINE UNDER THE CONDITIONS OF THE VUCA WORLD

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Abstract

The article presents the results of the study, the purpose of which was to study the current state and prospects for the development of methods to assess the effectiveness of innovative projects in housing and communal services in Ukraine in the VUCA World. Considered the concept of efficiency in the system of conceptual apparatus of economic research, the basic approaches to the study of efficiency, the classification of objects of its evaluation. The analysis of the current state of the study of the problem, identified promising directions for the development of approaches to assessing the effectiveness of innovative projects. Approaches to assessing the effectiveness of pilot projects are considered.

Keywords: *innovative project, pilot project, investment project, efficiency, criterion, indicator, management decision, business process*

1. INTRODUCTION

In modern conditions of development, the processes occurring in society are becoming increasingly complex, and the development of economic systems is becoming less and less predictable. Modern socio-economic processes, including the innovation process, are taking place under the conditions of a new reality, which the expert community has defined as "VUCA World". VUCA is an acronym of the English words volatility (volatility, variability, instability), uncertainty (uncertainty), complexity (complexity), ambiguity (ambiguity, ambiguity); the set of these words fully reflects the present specific conditions of economic systems functioning [1].

In most cases, the existing approaches to assessing the effectiveness of innovative projects are based on standard criteria of investment analysis, and therefore do not consider the specifics of innovative projects, which are implemented in conditions of lack of information about environmental factors, under conditions of high uncertainty of the decision-making environment and significant risk.

Thus, the study and improvement of methodological support for assessing the effectiveness of innovative projects is currently an urgent problem of economic science. The article presents the results of the study, the purpose of which was to study the current state and prospects of development of methods for assessing the effectiveness of innovative projects in the conditions of VUCA World.

To achieve this goal, the following tasks were solved:

- to consider the concept and types of efficiency;
- to define the criteria of effectiveness;
- identify existing approaches to assessing the economic efficiency of innovative projects;
- to determine perspective directions of development of approaches to assessment of economic efficiency of innovation projects, including pilot projects.

The object of research: Efficiency of innovative pilot projects in housing and communal services of Ukraine.

Methodology: theoretical and empirical methods: analysis, synthesis, generalization, and comparison.

Analysis of the research and setting of the task: Innovative processes in the Ukrainian society at the present time are quite actual and topical. Especially sensitive are the issues of innovation and their perception by an individual, a group of people, the team at such a micro level as the housing sector of housing and communal services. In the housing sector of the housing and communal services sphere it is very important to create the atmosphere of the so-called innovative climate, that stimulates search and development of innovations both in consumption of housing and communal services and innovative management of the housing sector. In the modern understanding the innovation climate is an integral part of the overall organizational and economic culture of the organization of housing and communal services. Also, the innovation climate is understood as a system of factors, the elements of which contribute to the creative efforts of employees in the development and implementation of new ideas, creating a comfortable environment for intellectual potential.

In the classical interpretation the innovation climate is defined as the state of the external environment of the organization, promoting or counteracting the achievement of the innovative goal of this or that organization. Basically, its manifestation is carried out through the innovation potential of the organization and its external environment. Economic literature is dominated by publications, where the issues of innovation, innovation climate, innovation potential, etc. are linked to the functioning of production and development of entrepreneurship, in which it is considered either from the organizational and legal point of view, or when the entrepreneur is innovative, that is, in principle, is a subject that carries out innovations.

From the point of view of A. M. Mukhamedyarov: "...innovations (innovations) represent the basis for satisfaction of public needs..... It is explained by elasticity of needs, variety and dynamism of their structure, possibility of satisfaction of existing needs due to innovations (due to economic inexpediency of production of "old" products, discrepancy of their parameters to consumption conditions), and ability to satisfy various needs due to the introduction of one innovation. In general terms, innovations are real opportunities to meet social needs, expressed in tangible form and representing specific ways, ways and means of achieving the main goal of production". [2]. Based on this understanding, we can say that innovation and innovation climate and innovation potential are inherent in both commercial and non-commercial side of human life, which is especially important when analyzing the innovation climate in the housing sector of the housing sector. Practice shows that the process of management of the housing sector is influenced by two strategies: commercial (through Management companies) and non-commercial (through HOAs, housing cooperatives, municipal companies), as well as their symbiosis, presented in figure 1.

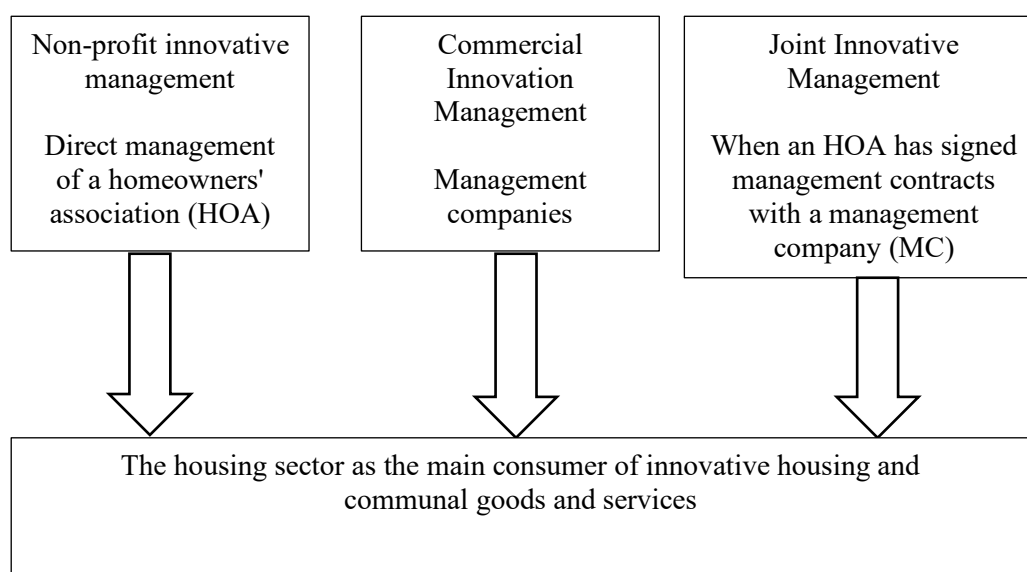


Fig. 1. The housing sector as a consumer of innovative goods and services of housing and communal services (personal contribution of the authors)

From the author's point of view, the housing sector has innovation potential, as the owners of housing (based on their increasing needs) have a willingness and receptivity to innovation (innovation), considering scientific, technical, production, labor, material and resource, financial and other capabilities.

Brauer K.U. considering innovative conditions (as a synonym of the innovative climate), defines a whole complex of factors:

- "- communications: communication, access of employees to information resources;
- natural-geographical conditions: access of the company to raw, fuel, energy and material-technical resources; transport;
- technological and scientific-technical sphere: market of developments and scientific-technical information; availability of consulting, engineering, venture, etc. companies
- economic and financial sphere: tax system, benefits, investment climate at the federal and regional levels, availability of investors interested in innovation developments;
- political-legal sphere: federal and regional plans and programs; legal and subordinate acts in the field of scientific, technological and innovation activities;
- strategic area of business: speed of appearance of innovations in the given segment of the market;
- labor market: labor market of specialists, managers, highly qualified workers, etc." [1].

From the above it can be concluded that the formation of a favorable innovation climate in the management system involves identifying and overcoming factors that level the creative efforts of managers and the joint innovative work of staff of housing and communal companies and organizations, the use of organizational and motivational tools that help "generate" new ideas in housing and communal management.

2. RESULTS OF THE STUDY

Innovative aspects of management in the housing and utilities sector are due to the specifics of organizational and economic relations:

- Special properties of innovative goods and services provided by housing and communal services to the population. Here there is a problem of managing the quality of housing and communal services, as differentiated needs of people depending on the socio-cultural level, formed in each municipality.
- Conditions and ways of production of innovative goods or services of housing and communal services. The problem of management and coordination of production facilities and subjects.
- Market segmentation. The problem of management of residential and non-residential funds. For example, in a rural municipality, most of the households are private, while in an urban municipality a wide range of forms of ownership is represented.
- The movement of goods and services of the housing and utilities sector from producer to consumer. The problem of managing innovative channels and network systems of supply of goods and services of housing and communal services depending on their forms of ownership, material and technical component, availability as such. From our point of view, the determining factor in the development of competition in the housing and utilities market will be municipal ownership of channels and networks for the delivery of goods and services, rather than their long-term lease or ownership of private housing and utilities structures, as they do now. A cost mechanism of financial provision of public amenities. The problem of management of financial flows depending on the quantitative differentiation and qualitative degree of improvement objects. In different municipalities these indicators may differ in multiple qualitative and quantitative parameters.
- Authority as a component of the power of local government. The managerial problem of innovative personnel potential, the qualification of the administrative apparatus. For example, today many creative,

qualified, experienced, with a long record of service employees of the management apparatus of housing and public utilities of various administrations have gone to work in the management structures of private housing and public utilities (due to a higher wage rate than in municipalities). They are replaced either by young managers with no work experience, or managers from other structures, who are not familiar with the innovative specifics of management in the housing and utilities sector.

- Material and technical support of managerial work. Technical support of managerial work is the most urgent problem of municipal management today. The lack of office equipment, equipment for transmitting information, etc. has a negative impact on the technology of managerial activity. It is impossible to modernize management processes based on old methods of work.

Information culture of managerial work. A critical problem in municipal government that gives rise to numerous social and economic conflicts. Weak managerial influence on the communications process is a "pain point" of domestic management in general. Here we must clearly define the communication line to each consumer segment. Establish with what information objects or subjects to convey information. And most importantly, carefully to study and implement the information response of the consumer [3].

Summarizing all the above, we would like to note that the optimal ways of development of innovative aspects of management of the housing sector of the sphere of housing and communal services will be:

- the formation at the federal and regional level of legislative norms and bylaws aimed at the innovative development of the housing sector;
- development at the regional and municipal level of programs that support innovative organizational forms of housing and communal services enterprises;
- development at the regional and municipal level of educational and informational programs that support innovative management methods in the housing sector;
- development of programs at the regional and municipal level to provide incentives and state subsidies to housing and communal enterprises that produce goods and services on an innovative basis with the formation and use of innovation funds;
- formation in each region of the program parameters of the methodology for assessing the effectiveness of innovation results;
- forming measures for informational and technical equipment of the innovation process among the population;
- organization among the managing personnel of housing and communal services enterprises of advanced training courses, aimed at the formation of skills and experience in working with the moral and psychological methods of influence on the innovative activity of the population [4].

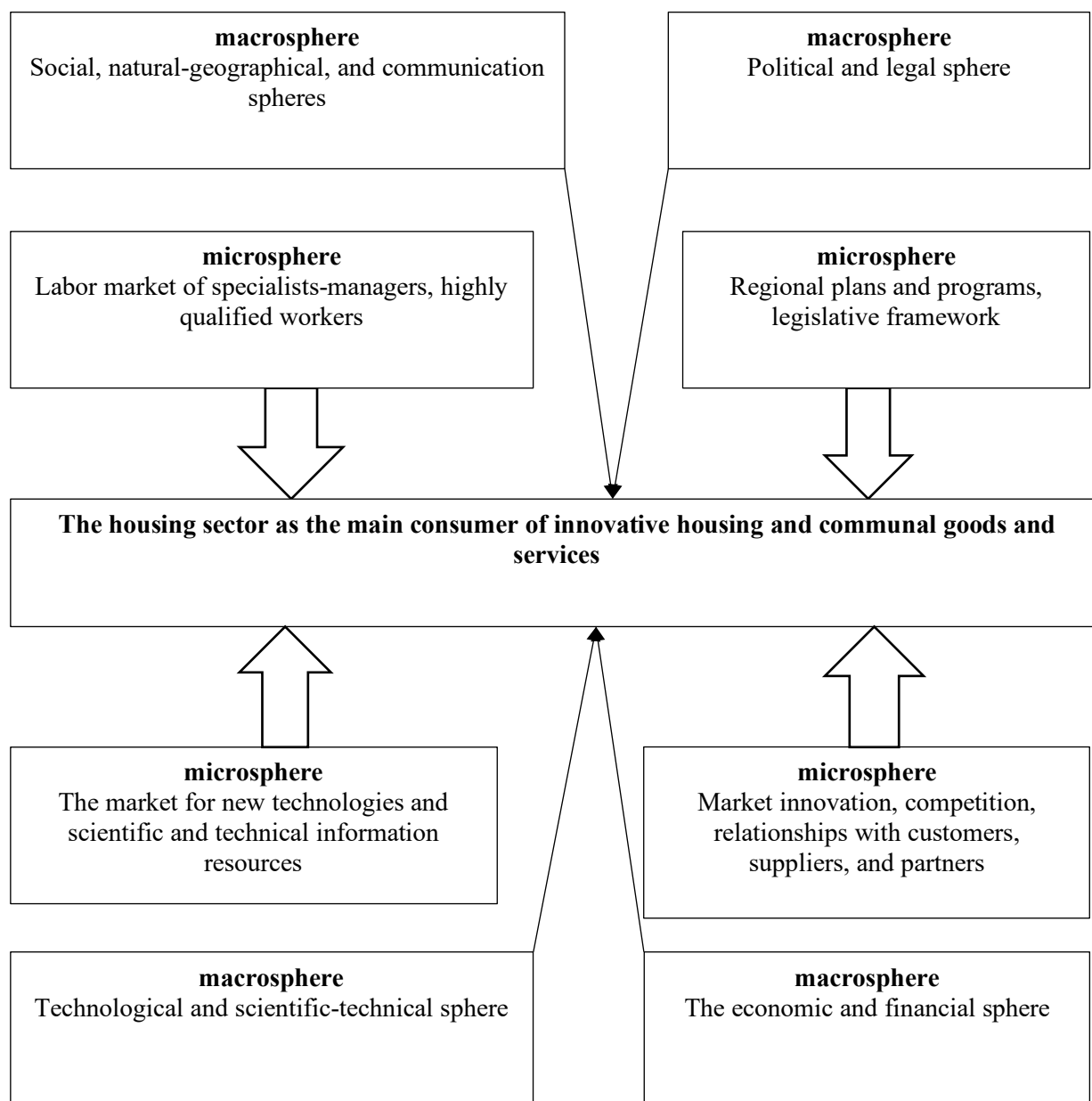


Fig. 2. Structure of the innovative climate in the housing sector (personal contribution of the authors)

Development of approaches to assessing the economic efficiency of innovative projects

As it is known, the term "efficiency" (Latin effectus - execution, action) means the ability to perform work and achieve the necessary (desired, required) result with the least expenditure of time and effort. Efficiency is a universal characteristic of effectiveness (expediency) of any activity, including economic activity. It should be noted that the concept of "efficiency" is also used to determine the value of the relative effect as a synonym for the concept of "effectiveness", defined as the ratio of the effect (result) to the amount of costs (expenses) that ensured its receipt.

The performed analysis of subject area of research has revealed, that nowadays there are three basic approaches to efficiency research, the first of which is based on compliance with interests, the second - on maximization (minimization) of values of any values, the third - on compliance with some principles (fig. 3).

As a rule, the term "efficiency" is used in the meaning of "economic efficiency"; in all other cases a certain adjective is added to the noun "efficiency" (commercial efficiency, social efficiency, etc.). For example, the selection of investment projects for financing involves the calculation of socio-economic, commercial, and budgetary efficiency of investment projects [5]. Socio-economic efficiency reflects the effectiveness of the project in terms of obtaining results for the whole society, which allows it to be considered a public good; commercial efficiency of the project considers the consequences of its implementation for the participants; budget efficiency considers the impact of the project on the income (expenditure) of the state budget.

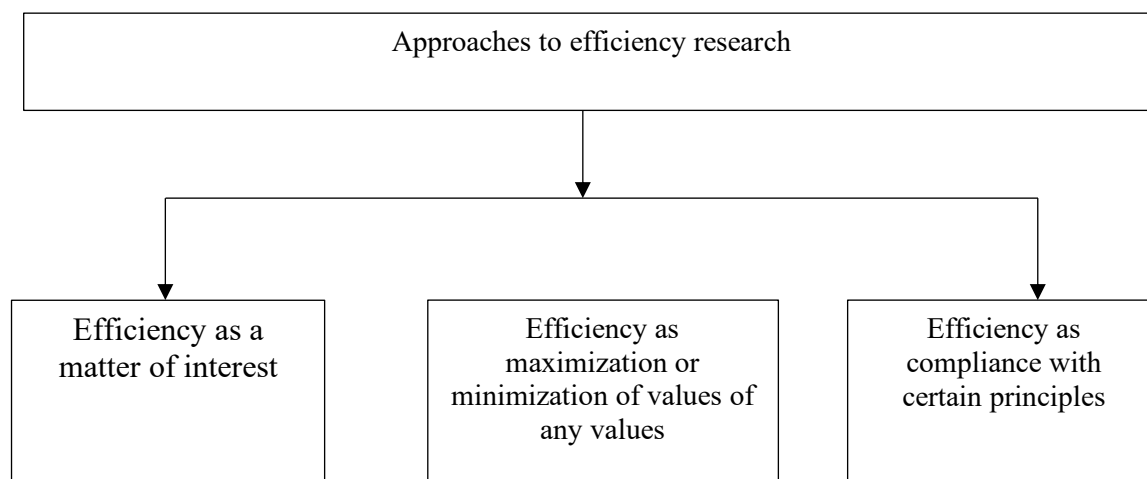


Fig. 3. Approaches to efficiency research (personal contribution of the authors)

According to P. Samuelson and W. Nordhaus [6] economic efficiency is expressed in obtaining the maximum possible benefits from available resources; it is necessary to constantly correlate the benefits (benefits) and the costs of obtaining them. According to the concept of optimal distribution of limited resources, an effective economic system is one in which the quality and quantity of combinations of all resources provides the maximum possible level of total utility. Evaluation indicators of such efficiency (allocative or distributive) are "payback period, break-even points and budgetary efficiency" used in the process of evaluating the effectiveness of investment projects.

Another type of efficiency is adaptive efficiency as the ability of the economic system to solve the problems that life poses; "the ability to abolish costly procedures and create institutional and other conditions for economic growth" (Pfnür A.) [7]. The total (aggregate) efficiency of a socio-economic system is characterized by synergetic efficiency, which O. S. Sukharev [8] defines as the aggregate of allocative and adaptive efficiency, which characterizes the viability of any economic system.

Let us cite several other types of efficiency, currently used by researchers in the scientific turnover to present the results of their scientific research: equilibrium, integral, structural-dynamic, financial, target, resource, institutional. Efficiency is defined in relation to various objects (processes, projects, operations, tools, etc.).

The author proposes a classification of objects of assessment of effectiveness based on integral classification attribute that summarizes, on the one hand, the purpose of assessment (development of a program or project, justification of management decisions), and, on the other hand, the approach used in the assessment - program, project, management (Fig. 4).

Analysis of the results of scientific research devoted to the study of efficiency allows us to conclude that most often efficiency is perceived as a generalized indicator of evaluation of some actions or the

functioning of the socio-economic system, but there is another point of view, which seems more correct to us.

The author agrees with the opinion of Pfnür A. [7] that efficiency should not be considered as a certain calculated indicator, it is more correct to represent it as a goal (for example, the development and implementation of macroeconomic policy); it is in this logic, based on the proposed model of institutional transformation, the value of the scale of institutional reforms is determined.

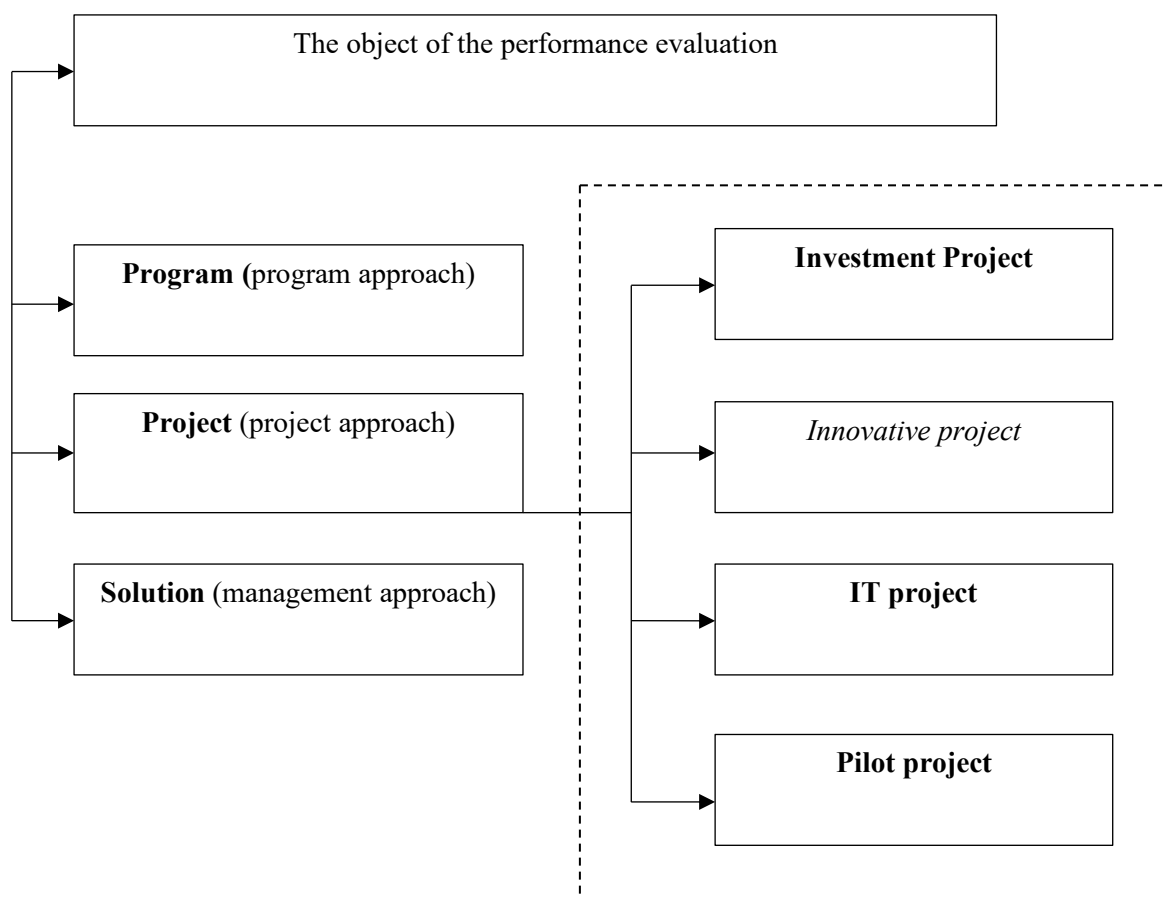


Fig. 4. Classification of performance evaluation objects (personal contribution of the authors)

Problems associated with efficiency, criteria, and indicators for its evaluation, etc., are the subject of scientific research of Russian and foreign scientists for more than a decade; and these issues were relevant for both planned (command-administrative) and market economy. It should be noted that traditionally efficiency was understood as its classical (traditional) interpretation - the improvement of one state (current, present) compared to another (desired).

In our opinion, it makes sense to talk about efficiency assessment, to a large extent, in the context of comparison and selection (selection) of the most preferable option (program, project, solution) from the available alternatives. That is why in the conditions of planned economy for the purposes of determining the comparative economic efficiency the criterion of reduced costs was introduced, which allows summing up the various costs, both operational (current) and non-recurrent (capital), using the capital efficiency coefficient.

Criterion (from the Greek *kriterion* - means for judgment) - an attribute based on which the assessment, definition, or classification of something is carried out, a measure of assessment [9]. Each criterion corresponds to a criterion indicator (or a system of indicators), which reflects the content of the criterion in quantitative measurement. So, for example, the criterion "maximization of results" corresponds to

criterion indicators: "the value of net profit", "the value of net present value", "increment of added value", etc.

Efficiency has several levels of measurement, so it is different, defined differently for each level. For example, capital efficiency and labor efficiency are different measures, although capital efficiency can determine the value of labor efficiency (through the index of labor efficiency). O. C. Sukharev [8] suggests using such criteria as economy, adaptability, flexibility, efficiency, and reliability as criteria of effectiveness of macroeconomic policy instruments (as the object of evaluation) (although he does not offer criteria indicators, which would give a quantitative assessment of these criteria). The criterion for the effectiveness of managerial decisions in entrepreneurial structures is the level of achievement of the indicators of the set goal.

The basic criterion in the study of the effectiveness of economic systems is considered the Pareto criterion of efficiency, which is based on the principle of Pareto-efficiency. This term is characterized by such a level of organization of the economy, when: it is impossible to implement any changes in favor of one individual (group of individuals), without worsening the situation of another individual (group of individuals); input resources are used most efficiently, and the result provides the highest possible level of utility for consumers.

It should be noted that the Pareto-efficiency principle has significant limitations, which economists are well known, but they are even more exacerbated when studying the problems of assessing the effectiveness of investment in innovative activities (implementation of innovative projects). Innovative projects have several features (a more representative circle of participants, mandatory comparative analysis of effectiveness, the presence of several criteria for assessing effectiveness, etc.), which allows us to talk about assessing their effectiveness as a special direction in the field of substantiation design decisions and project management.

The problem of assessing the results of innovations is quite complex, multifaceted and has many aspects, which explains the diversity of existing methods for assessing the effectiveness of innovative projects, based on different approaches, which are based on the principles that guide the performance of the assessment. To ensure the correctness of the assessment of the effectiveness of innovative projects, it is necessary to use appropriate methodological and methodological principles for assessing the effectiveness of investments in innovative activities (Table 1 (personal contribution of the authors)).

The world practice has a wide range of methods for calculating economic efficiency, which can be conventionally combined into two groups: methods based on calculations of such indicators as the period of return on investment and return on capital investment ratio; methods based on the use of such indicators as net present value of the project (NPV) and the internal rate of return of the project. As a rule, the existing methods of assessing the effectiveness of innovative projects use the procedure of mathematical discounting. The most popular method for assessing the effectiveness of innovative projects is the NPV method, but unfortunately neither this method nor other similar methods are sufficient to make an adequate decision on the acceptance or rejection of the project.

The practical implementation of innovative projects requires a fairly extensive information of regulatory, legal, marketing, engineering and technical nature, much of which is predictive, i.e. does not have the necessary completeness and accuracy, which negatively affects the reliability of estimates of the effectiveness of the project. The methodology for assessing the effectiveness of innovative projects, thus, does not fit into the framework of traditional methods of investment analysis.

Table 1. Principles of assessing the effectiveness of investment in innovation

Principles of evaluation	
Methodological principles	Methodological principles
Measurability	1. Comparison of the situation "with a project" and "without a project"
1. Comparability	2. Uniqueness
2. Profitability	3. Suboptimization
3. Consistency of interests	4. Past unmanageability
4. Payment for resources	5. Taking the time factor into account
5. Maximum effect	6. Time value of money
6. Systematicity	7. Incompleteness of information
7. Complexity	8. Capital structure
8. Irrefutability	9. Multicurrency

According to the author, the following directions of development of approaches to the assessment of economic efficiency of innovation projects are quite promising: multi-criteria approach; option approach (method of real options); fuzzy-multiple approach; synthesis of theoretical and probabilistic and fuzzy-multiple methods in analyzing the possibility of venture financing of investment projects based on real options (Fig. 5).

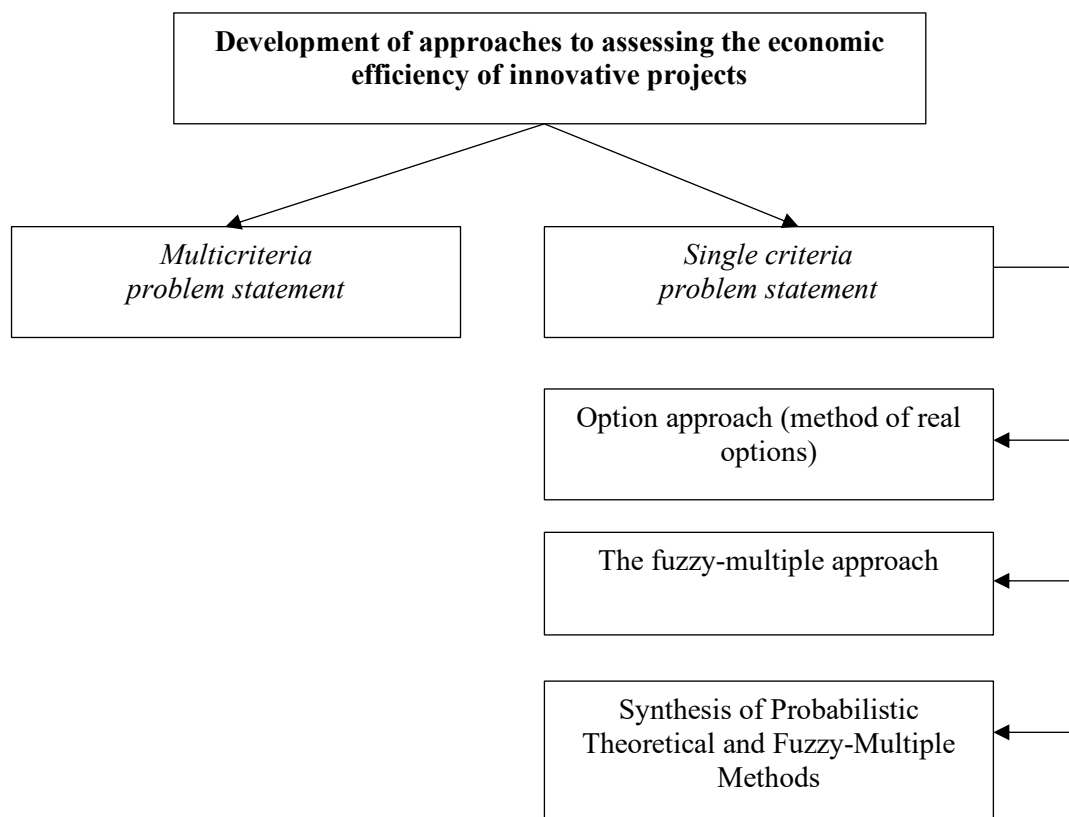


Fig. 5. Prospective directions for the development of approaches to assessing the effectiveness of innovative projects (personal contribution of the authors)

Classic discounted cash flow analysis assumes that once a decision has been made to implement an investment project; it is necessary to strictly follow the chosen strategy even though the situation may change to the disadvantage. But it is quite possible such situations in which the management can change the decision already made and refuse further implementation of the project or postpone it to the future. In this regard, the importance of evaluation methods that can be used to make more informed decisions aimed at managing the assets of the business entity in the face of possible changes increases. Traditional methods for assessing the effectiveness of projects have significant limitations, since they are not adapted to changes in environmental factors; the method of real options is devoid of this disadvantage.

An option is a contract that gives its owner the right to dispose (buy, sell) of a certain asset at a pre-agreed price. The concept of real options arose because of the transfer from the financial sector of risk management tools with the help of option contracts, to the real sector of the economy [5]. The key feature of the method of real options valuation (ROV) is the possibility to consider the degree of uncertainty (in the absence of uncertainty, options lose value) and the period of preservation of the investment opportunity [4]. The possibility of choice turns into the only possible decision in the given situation, considering the rationality of the LDP. The theory of real options well explains the fact that often investors, contrary to common sense (in the logic of traditional evaluation methods), do not abandon projects with a negative NPV, believing that the situation may change for the better and it will be possible to use the real option in the project, receiving as a result a positive NPV.

The theory of real options presents an alternative view of project evaluation, which is more in line with modern requirements. It should be noted that the ROV method, just like the NPV method, is based on discounted cash flows. The analysis of bibliographic sources led to the conclusion that the scope of application of the concept of real options covers a wide range of industries and areas of activity. For example, in the mining industry, it is successfully used to justify the life of a mineral deposit, which depends on the number of reserves and the annual production capacity of the enterprise (production volume). In mechanical engineering, the concept of real options has been used to make decisions about investing in projects to build new plants, in the automotive industry - with respect to changes in the project, the development of new models, modification of the design of the car. In telecommunications, based on the concept of real options were evaluated options for mergers and acquisitions in geographical expansion, the choice of the standard of mobile communications, the timing of the introduction of new services into the market. We can also note the effectiveness of the ROV method in the chemical, pulp and paper and pharmaceutical industries, transportation, electronics, trade, banking and advertising services, and the media.

The realities of VUCA World, increasing uncertainty and increasing risk in management decision-making have led to the need to use special mathematical methods and information technology that provided the opportunity to study in detail and effectively solve the complex problems encountered. When the ambiguity (vagueness) of the data on the probability of strategies, the compromise decision is made by cumulative application of the latter based on the mathematical apparatus of vague (fuzzy) sets. In domestic science the use of fuzzy sets theory (to solve the problems of financial management) is associated with the works of Gondring H., [3]. Nowadays the theory of fuzzy sets is widely enough used and allows to solve complex problems effectively. Examples of successful applications of fuzzy sets theory are solving problems of assessing the stability of building structures under the possibility of earthquakes, medical and genetic diagnostics, production scheduling, risk assessment of stock investments, etc. According to experts [10], the theory of fuzzy sets opens interesting new opportunities and promising prospects for science and technology.

The method of fuzzy sets is quite effective and often used method of analysis of projects in investment and innovation sphere. The approach proposed by Schäfers, W., whose distinctive feature is the synthesis of theoretical and probabilistic and fuzzy-multiple methods in the analysis of venture financing of investment projects based on real options seems promising [4].

In a set of problems of innovative projects efficiency estimation, it is necessary to consider separately an estimation of efficiency of pilot innovative projects. The pilot project is a trial (experimental) project, which is realized to study positive and negative sides of the chosen solution, to further understand the expediency of full-scale implementation; the main feature of the pilot project is relatively small budgets

and terms. In conditions of formation of innovative economy, the pilot project is an effective solution for innovative and high-tech projects, which are characterized both by a large degree of uncertainty of results and ways of their achievement; it helps to simulate the main project, predict, and plan its successful implementation. For the customer, the "pilot" allows to determine the real applicability of the chosen solution and assess the possible effects of its implementation. For the vendor, it is a serious step towards successful sales - if the customer has agreed to a small project, it is most likely that they will go on to order a more extensive project.

As a rule, the payback period is not so important for a pilot project; it is more important to identify a clear link between the set tasks and the quality of their implementation, since the main goal of a "pilot" is not to solve a problem in a specific process, but to prove the effectiveness of the chosen solution and the contractor's team. The pilot project is carried out in stages; at the final stage an efficiency evaluation is performed. As an example, here is the sequence of stages of a pilot project related to the implementation of an automated complex in the production process:

Stage 1: Obtaining data. Project organization.

Stage 2: Deploying systems. Building the complex.

Stage 3. Minimal basic training in all the directions.

Stage 4. Execution of a pilot project. Training "in the field".

Stage 5. Completion of the pilot project. Evaluation of effectiveness.

According to the author, the solution to the problem of assessing the effectiveness of the pilot project is possible in the logic of management decision-making and in the logic of the implementation of the business process. The criterion of managerial decision effectiveness is its quality, which is a set of properties that ensure the successful implementation and receipt of the planned outcome of the decision. Efficiency, therefore, is an obligatory property of a decision, which is expressed in the compulsory comparison of the expected and achieved economic and social effect with the costs of its development and implementation. At present for the analysis of production and office processes the method of mapping of business processes using one of the basic tools of "lean production" (Lean production) is successfully applied. Mapping is the visualization and analysis of material and information flows in the process of value creation from supplier (manufacturer) to customer (consumer).

Value Stream Mapping involves the following steps: 1) documenting the current state map; 2) analyzing the production flow; 3) creating a future state map; and 4) developing an improvement plan. Typically, Value Stream Mapping is used for well-established processes to assess their effectiveness. In a pilot project evaluation context, the use of this method is dictated by the ability to model the desired state of the process that is intended to be achieved in the future. The possible effects of process optimization, as a basis for efficiency calculation, are to improve the efficiency of the business cycle and to shorten the duration of the pilot project.

3. CONCLUSIONS

1. Currently, there are three main approaches to the study of efficiency, the first of which is based on compliance with the interests, the second - on the maximization (minimization) of the values of some values, the third - on compliance with some principles.

2. For the purposes of the study of effectiveness evaluation issues, a classification of evaluation objects based on an integral classification attribute that summarizes the purpose of evaluation (development of a program or project, justification of a management decision) and the approach used in performing the evaluation (program, project, managerial).

3. As a rule, efficiency is perceived as a generalized indicator of evaluation of some actions or the functioning of the system or development of the economy; the approach, according to which efficiency is not a calculated indicator, but the goal, seems to be the most correct.

4. traditional methods of evaluating the effectiveness of projects have significant limitations since they do not consider the possibility of making a certain decision in response to changing factors of the external environment.
5. The following directions of development of approaches to assessing the economic efficiency of innovation projects seem promising: multi-criteria approach; option approach (method of real options), fuzzy-multiple approach; synthesis of theoretical and probabilistic and fuzzy-multiple methods in analyzing the possibility of venture financing of investment projects based on real options.
6. The solution to the problem of assessing the effectiveness of a pilot project is possible in the logic of management decision-making and in the logic of business process implementation; in the logic of management decision-making, effectiveness is an obligatory property of the decision, which is expressed in the obligation to compare the expected and achieved economic and social effect with the costs of its development and implementation.
7. In the context of evaluation of pilot projects, the use of value stream mapping method to assess the effectiveness of the pilot project is due to the possibility of modeling the desired state of the process. Possible effects of process optimization, as a basis for calculation of efficiency, consist in increase of efficiency of a business cycle and reduction of term of realization of the "pilot".

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