

SCENARIO METHODS TO IMPROVE THE EFFICIENCY OF IMPLEMENTING THE LIFE CYCLE OF PROGRAM-TARGET MANAGEMENT: A CONCEPTUAL ANALYSIS

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Abstract. This paper is devoted to methodological and applied problems of improving the efficiency of program-target planning and management in socio-economic systems based on a scenario approach. The main features of the methodology and mechanisms of program-target management are considered. The idea proposed below is to manage and control the implementation of target programs using a scenario approach and life cycle models. A scenario W-shaped life cycle model is developed to improve the efficiency of program-target planning and management. This model involves the end-to-end methodology of proactive management to implement long-term socio-economic programs under uncertainty and risk. The model's methodological core consists of the following mechanisms: scenario analysis, simulation, forecasting, planning, and group management. The new approach is most effective under increasing uncertainty due to its focus on anticipating future conditions and alternatives for the development of socio-economic systems.

Keywords: planning, management, efficiency, target program, scenario approach, life cycle, uncertainty.

INTRODUCTION

Strengthening of negative processes in world development in the 2010s, the deepening of the global economic crisis caused by the COVID-19 pandemic, the destruction of international economic ties, the strengthening of the anti-Russian sanctions policy of the Western countries, the deterioration of budget indicators related to internal problems, and the decline in production have resulted in significant growth of various risks and uncertainties. All these factors tighten the requirements for the quality and efficiency of management of socio-economic systems (SEs), considerably narrowing the scope of conventional approaches and methods to plan and manage the sustainable development of such systems.

In the current unstable conditions, scenario analysis and simulation methods based on the program-target approach increase their role and importance. These methods reduce uncertainty and consider a wide range of external and internal threats to achieving the goals

by assessing the most probable and reasonable trends in the development of dynamic processes in the sectors under consideration, their stability, and other desired and undesired properties based on information about their structural features. Note that the sectors are characterized by a complex spatial, administrative, and managerial organization of SEs.

1. IMPROVING THE MECHANISMS OF PROGRAM-TARGET PLANNING AND MANAGEMENT

Program-target planning and management is a special public administration method intended primarily for the critical development areas of national SEs that combines the interests of society, the state, and economic entities of various forms of ownership. This methodology allows solving large-scale and complex problems of SEs development by structuring and interconnecting their components and organizing mutually beneficial partnerships between the state, business, science, education, and civil society [1].

To a large extent, program-target planning relies on the hierarchy analysis methodology [2, 3] to achieve the main goal by decomposing it into a system of intermediate goals (subgoals). The subgoals are achieved by implementing a set of interconnected measures (programs) by a group of executors.

The complexity of increasing the efficiency of program-target planning and management is due to different methods and approaches to solving management problems at particular stages of the process. In addition, the implementation of any large-scale, long-term project is associated with numerous variable and newly emerging risks and external and internal threats of various natures to be considered during program-target planning and management. These risks and uncertainties are different and significantly affect the problem specifics at different stages of program-target management.

Large-scale projects and programs involve many economic entities of various forms of ownership from different industries. They directly participate in the measures of state or federal target programs or (directly or indirectly) work to achieve the main goal on their initiative based on the state's interest in particular problems of socio-economic development. (In the latter case, they expect the economic demand for the results of such work.) The economic entities possibly use market mechanisms of economic management [4].

In this situation, when using conventional approaches to management, there is a threat of a reduced socio-economic effect from implementing particular projects and programs due to possible errors in the process of analysis, forecasting, and goal-setting, determining the real needs for resources, improper coordination in the activities of the managing substructures and executors of programs.

A way to improve the efficiency of program-target planning and management is to develop and implement a methodology based on the process and scenario approaches [5]. This methodology should reduce uncertainty and consider a wide range of external and internal threats to achieving the goals at different stages of designing and implementing target programs and projects. In addition, this methodology should effectively coordinate and control the activities of numerous economic entities for executing program measures while solving strategic development problems characterized by a complex spatial, administrative, and managerial organization of socio-economic systems.

2. ANALYSIS OF MANAGEMENT PROCESSES FOR IMPLEMENTING TARGET PROGRAMS BASED ON LIFE CYCLE MODELS

Any target program goes through several life cycle stages: identifying problems that need to be solved, forming a system of goals and efficiency criteria, planning and developing mechanisms to achieve the goals under uncertainty (hard-to-predict changes in the internal and external environments), managing the implementation of program measures (particularly by exception), assessing the results, and completing the program (the last stage).

Nowadays, the term "life cycle" (LC) is widely used in natural sciences, engineering, humanities, and other sciences. We note the structural and, roughly speaking, conceptual similarity of the LC definitions in application domains [6]. A systems engineering definition of the complete LC model was given in the book [7]: "The complete life cycle model of an individual object is a description of the sequence of all phases and stages of its existence from conception and emergence ("birth") to disappearance ("extinction")." Consequently, the complete life cycle model is characterized by structural invariance: the set of the LC phases does not significantly depend on the object described. Due to this invariance, the model becomes quite universal and widely applicable since, in the general case, almost any control object (a program or project) goes through all the main LC phases: design, implementation and development, and completion. The most common LC parameters are the time instants of beginning and end, the total duration, the duration of each phase (stage, step, task, etc.), the sequence of stages and steps, the type and form of intraphase changes, and the set of indicators characterizing the object's state (by phases, stages, or steps). Each LC stage has particular managerial tasks and features.

At its core, the LC model is an applied organizational management tool based on a systems approach that allows:

- ensuring compliance with the goals and an adequate understanding of management processes by representing the final results as a cumulative outcome of intermediate tasks that are easier to understand and assess;
- decomposing the management process into relatively independent and, at the same time, logically interconnected temporal blocks;



- structuring the management process;
- determining step by step the content of managerial tasks, the technology for their solution, partial efficiency criteria, and resource-time constraints, considering the goals and the object's dynamics;
- as a consequence, improving the methodological base and organizational principles of the management system.

Various LC models are currently used for solving a wide class of problems. Among them, we mention the cascade, incremental, spiral, V-shaped, and other models. Each model is focused on particular application domains and, accordingly, has some advantages and disadvantages. Perhaps, only the V-shaped model agrees with the tasks and features of program-target management [6].

Note that program-target management has the following specifics: for a long life cycle of programs (3–5 years or more), a complex set of interconnected but different problems should be solved under uncertainty, risk, and continuous changes in the external and internal environments. (For example, this set includes goal-setting, risk analysis, forecasting, design of program measures, financial and resource support, operational management of the implementation of measures, monitoring and assessment of the program's result and the efficiency of using allocated resources, to name a few.) Moreover, ineffective decisions at any stage will entail a whole “bunch” of problems at the subsequent ones (in the worst case, return to the initial stages of goal-setting and planning to make significant corrections affecting the entire management cycle).

At present, most organizational management systems of various levels and designated purposes focus on the object's internal development processes. As a result, they solve mainly operational and partially tactical tasks with maximum success. For the same reason, as the input data they use difficult-to-predict and, in many cases, significant changes in the internal environment and almost all events outside the system (in the external environment).

For such management systems, the “negative” input information requiring an immediate response is mainly the results of direct (external or internal) influence on the object when, in most practical cases, the damage has been done (in the broadest sense of this term). If the management system is limited to counteracting the consequences of unfavorable situations, it cannot guarantee an efficient solution for strategic and medium-term tasks of managing the socio-economic development of the state and society. All these circumstances are the main source of reducing the efficiency

of management processes for developing socio-economic systems.

In these conditions, the role and importance of the scenario approach in program-target management increase. This approach yields a predictive assessment of the quality of decisions made at various stages of the life cycle of large projects and programs. Moreover, it reduces uncertainty by considering a wide range of external and internal threats to achieving goals. Uncertainty is understood as a situation when information about the structure and possible states of the SES and (or) its external environment is partially or completely absent. This concept is one of the key methodological concepts of the scenario approach. The construction of scenarios pursues two goals: reducing the original uncertainty as much as possible within this approach and describing the residual uncertainty using some scenarios. Thus, the uncertainty in situation development is subsequently decreased to find the best solutions of the arising problems.

Scenario analysis, forecasting, planning, and group management are technologies to assess comprehensively the efficiency and consistency of a set of managerial decisions when selecting and implementing the development programs of SESs and to consider and coordinate the goals and activities of the economic entities involved in the implementation of program measures. They independently plan and execute their tactical actions in the middle- and short-term horizons within common long-term goals, rules, and obligations regulated by the relevant target programs and projects.

For increasing the efficiency of program-target planning and management, we modify the V-shaped life cycle model by adding a branch that reflects:

- the methodological basis for ensuring the sustainable progressive socio-economic development of the state and society under uncertainty requiring a response to unpredictable changes in the internal environment,
- the influence of negative phenomena and processes occurring in the external environment; see Fig. 1.

In the classical V-shaped life cycle model, special importance is attached to actions and procedures to verify and attest the results of planning and project management. Along with traditional analytical technologies, the W-shaped model yields a predictive assessment of the final goals and most significant intermediate results for them. Hence, we pass from the passive consideration of already accomplished events to proactive management of the implementation of target programs.

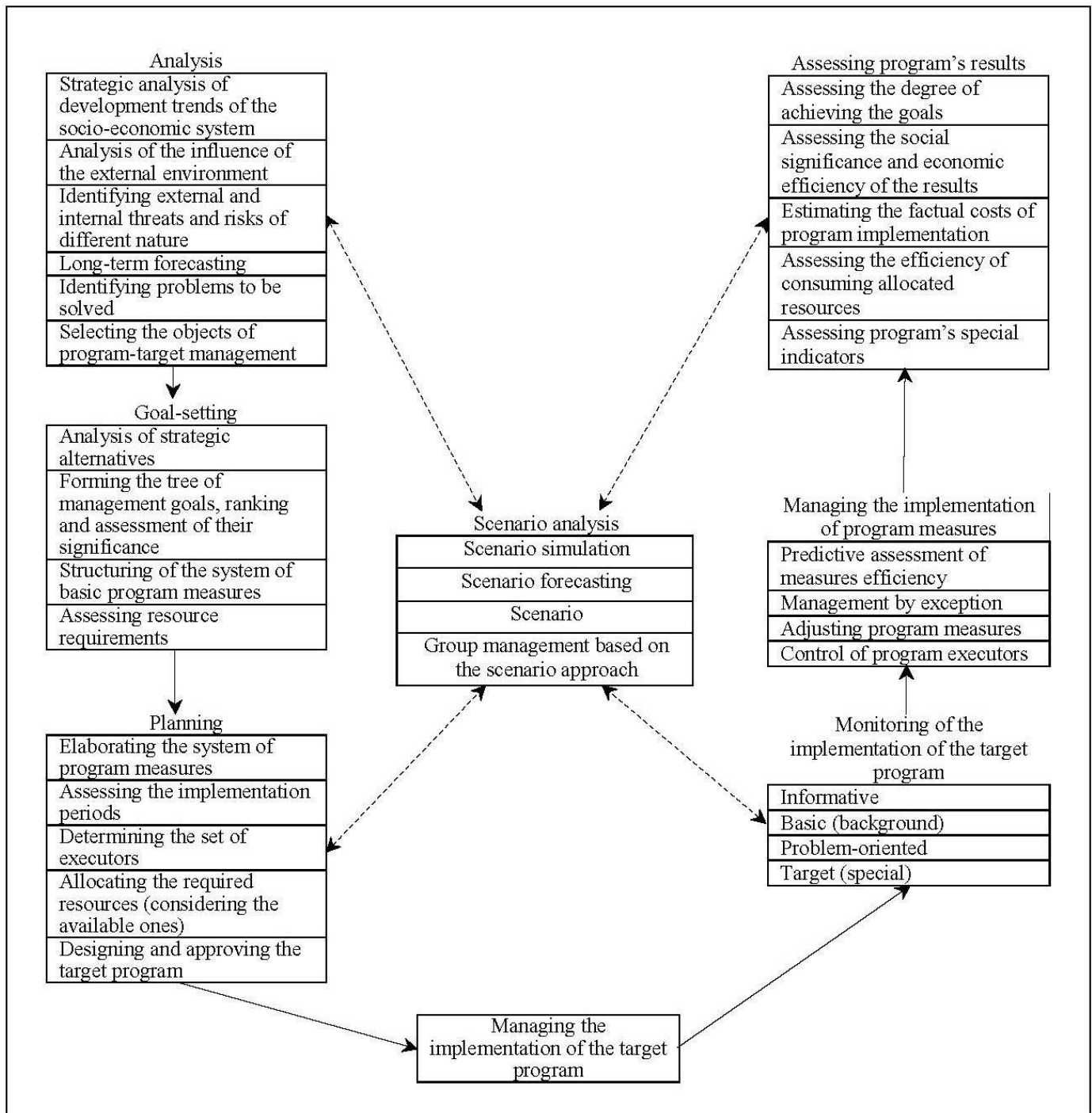


Fig. 1. The life cycle of program-target planning and management: W-shaped model.

The end-to-end methodology of scenario planning and group management of complex systems under uncertainty increases the efficiency of managing groups of objects within complex SESs (economic entities) by forming and analyzing a wide range of scenarios for the development of these systems and selected sets of their segments (including objects) that consider the

influence of the external environment and associated risks of various nature.

The new approach is most efficient in current conditions of growing uncertainty, which forms the need for tools and mechanisms of scenario analysis, simulation, forecasting, planning, and group management. To a large extent, they allow foreseeing future conditions



and corresponding alternatives for the development of SESs on different (mostly long) time horizons, identifying external and internal threats and risks, and exploring possible paths of situation development in the internal and external environments.

When elaborating managerial decisions, the methodology under consideration reduces the object of analysis to a finite number of alternatives (including the most probable ones) that reflect the most significant risks and threats to the goals at any stage of the target program life cycle. Moreover, this methodology allows developing optimistic and pessimistic scenarios and making forecasts for the development of given segments of SESs at different management levels, adjusting the strategic vision of the situation and highlighting the desired directions of its development, and assessing the level of coordination between the decisions in different stages of the life cycle of target programs and large projects.

CONCLUSIONS

Currently, considerable experience has been accumulated in developing a formal methodology for the analysis and design of models and methods that implement the scenario approach and in solving applied problems in the field of analysis, forecasting, planning, and management of the development of different segments of socio-economic systems. However, most of the solutions focus on the specifics of particular tasks and are limited by their scope. At the same time, there are almost no publications on the integrated application of the scenario approach:

- to increase the efficiency of program-target management for developing and implementing large-scale spatially distributed projects throughout their life cycle,
- to improve the quality and coordination of managerial decisions under uncertainty and risks of different nature.

Further fundamental and applied research in this area will solve a wide range of tasks to improve the efficiency of program-target planning and management processes and the implementation of priority national projects and socio-economic programs.

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