

OPTIMIZATION OF RESOURCE, TIME AND COST PARAMETERS OF MESO-LEVEL PROJECT

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Abstract: The relevance of the study is associated both with the project management basics in the process of management and implementation of managerial decisions, and with the problems of the regional economy concerning the issues of increasing the investment attractiveness and competitiveness of regions with the effective use of their resources. One of the modern tools of the decision-making system at various levels of management is project management, which allows achieving optimal results in terms of cost, time and quality and satisfying the interests of all participants through the timely ordering of tasks, identifying responsible executors, ensuring transparency in decision-making and identifying reserves. In this regard, the implementation of project activities in the management system is of great importance both at the micro level (enterprise) and at the meso-level (industry).

Keywords: Project Management, Sustainability Analysis, Cost, Timing, Resources, Meso-Level

1 Introduction

According to the concepts "region as a quasi-state" and "region as a quasi-corporation", a region is considered as a subject of economic relations, and a bearer of special economic interests. As such, regions become participants in the competitive struggle in the markets for goods, services, and capital. The issues solved by the "centre" in terms of placing orders, distribution of jobs, income transfers, and saving financial resources, have a significant impact on the economic situation of regions that have significant resource potential for self-development. The regions are constantly looking for ways to improve their economic activities to create more comfortable conditions for the implementation of certain initiatives, given the difficult socio-political and financial situation and in order to increase their investment attractiveness and competitiveness, accordingly.

In accordance with the above, there are problems of creating theoretical and methodological foundations of regional project management in terms of:

1. Effective coordination of economic resources with the determination of the best match of resources for each stage of the project cycle;
2. Scaling and adaptation of micro-level project management methods for the purposes of regional management; and
3. Increasing the efficiency of project management at the meso-level, taking into account the existing capabilities of a particular region.

Thus, the author understands in this study the efficiency as the ratio of results to costs of the project, and sustainability is such an organization of production that ensures the planned results of the project (amount of work) with the lowest project costs (cost) with the rational use of production factors and in the required time frame (time), which is a system of project constraints (Crawford, 2006).

Based on this information, the goal of the work is to study the theoretical aspects of project management at the meso-level and develop a methodological approach to managing regional

development projects based on the optimization of cost, resource and time parameters.

A regional development project in this case means a meso-level project that contributes to an increase in the level of well-being of a given region, its investment attractiveness, competitiveness; it strengthens its position in the subsequent selection of performers. In accordance with this assertion, the object of the study is the mechanisms for regulating the socio-economic development of the region, taking into account the effective use of the economic resources of involving organizations; the subject is the organizational and economic relations that arise in the process of project management at the meso-level with the rational distribution of economic resources.

In this vein, cost management is a very important branch of project management, as it needs many knowledge, from economy and finance to management involved.

Cost management is the process of estimating, allocating, and controlling the costs in a project. It allows a business to predict coming expenses in order to reduce the chances of it going over budget. Projected costs are calculated during the planning phase of a project and must be approved before work begins. As the project plan is executed, expenses are documented and tracked so things stay within the cost management plan. Once the project is completed, predicted costs vs. actual costs are compared, providing benchmarks for future cost management plans and project budgets.

Cost management is concerned with the process of finding the right project and carrying out the project the right way. It includes activities such as planning, estimating, budgeting, financing, funding, managing, controlling, and benchmarking costs so that the project can be completed within time and the approved budget and the project performance could be improved in time.

Cost management covers the full life cycle of a project from the initial planning phase towards measuring the actual cost performance and project completion. This article will explain the different steps and processes in Project Cost Management, in line with methods such as the Total Cost Management Framework of AACE International (Fortune et al., 2011; Jugdev et al., 2013; Polkovnikov & Ilina, 2014).

Resource planning begins in the scope and execution plan development process during which the work breakdown structure, organizational breakdown structure (OBS), work packages, and execution strategy are developed. The OBS establishes categories of labor resources or responsibilities; this categorization facilitates resource planning because all resources are someone's responsibility as reflected in the OBS.

Resource estimating (usually a part of cost estimating) determines the activity's resource quantities needed (hours, tools, materials, etc.) while schedule planning and development determines the work activities to be performed. Resource planning then takes the estimated resource quantities, evaluates resource availability and limitations considering project circumstances, and then optimizes how the available resources (which are often limited) will be used in the activities over time. The optimization is performed in an iterative manner using the duration estimating and resource allocation steps of the schedule planning and development process.

2 Methods

Traditionally, many social sciences and humanities use the methods of comparative analysis that exist within the framework of the comparative approach, which makes it possible to form contextual intersubject thinking and interdisciplinary vision of the subject. In accordance with this, the authors have structured

various approaches to the study of project management methodology.

The theoretical-oriented approaches to the methodology of project management included: logical-structural (V.V. Poznyakov), systemic (A.A.Gusakov), integrated (G.L. Tsipes), and comparative (V.I. Tyupa).

Practice-oriented approaches are: systemic (S.P. Nikanorova, V.N.Burkov, V.I. Voropaev), process (PMBOK, J. Becker, M. Trotsky), competence (T.S.Pyrkova, Widdet S., Halliford S.), screenwriting (E.A. Shumkov, E.P. Kudryavtseva), and value (VM Molokanova, I. Kendal) (Crawford, 2006).

The cost, time and resource determinants in the field of project management have been clarified based on the analysis of scientific literature. It has been determined that resource constraints are both a factor in the formation of costs (cost constraints) and the basis for choosing methods to improve efficiency. Various methods of cost management at each stage of project planning (PERT, "cost cube" (Fortune et al., 2011), earned value method (Jugdev et al., 2013), deviation method (Polkovnikov & Ilina, 2014), network planning methods (Radujković & Sjekavica, 2017) are considered.

Almost all the projects need to be guided right throughout in order to receive the required and expected output at the end of the project. It is the team that is responsible for the project and most importantly the project manager that needs to be able to carry out effective controlling of the costs. There are, however, several techniques that can be used for this purpose.

In addition to the project goals that the project manager has to oversee, the control of various costs is also a very important task for any project. Project management would not be effective at all if a project manager fails in this respect, as it would essentially determine whether or not your organization would make a profit or loss.

Following are some of the valuable and essential techniques used for efficient project cost control:

Energy Security Promotion Strategy Policies

- Division of powers and responsibilities
- Government agencies and executive companies
- Development of energy infrastructure with participation
- Public and private sector
- Increase geological discoveries and
- Exploitation of new fields
- Prevent increasing erosion

Main production centers and increase absorption

Investment

- Increasing the competitiveness of equipment
- Russian and encourage domestic products with
- High added value
- Increasing the quality of petroleum products with improvement
- Qualitative standards
- Transformation of the country's economic structure towards
- Energy-efficient branches
- Regional development and diversity of infrastructure
- Energy (pipelines, railways, ports, etc.)

3 Results

According to the analysis of scientific literature, the effectiveness of the territorial and economic complex of a region is determined by ensuring economic growth at minimal costs and meeting the needs of the population of the region. At the same time, the sustainability of the socio-economic development of a region depends on the level of self-sufficiency, self-financing and self-sufficiency, which are possible only with the rational use of regional material and intangible assets: natural resources, material and technical base, human capital, etc (Gray & Larson, 2003). To solve this problem, we put forward a hypothesis about the possibility of integrating project management methods into

the regional management system in order to load its regional industrial profile.

Russia is one of the world's largest oil and gas producers. Russia's hydrocarbon resources have not only played a vital role in the country's domestic economic growth, but have also played an important role in the country's economic, political and international power over the past 10 years, one of the most prominent examples being the EU's economic dependence on oil and gas. It is Russia. The economic policies adopted by the Russian government, especially in the field of energy, in recent years, show the serious efforts and determination of the Russian government to achieve a prominent international position and play a key role in the international economy. Domestically, the growth of production and export of oil and natural gas over the past few years has been the main driving force behind the growth and prosperity of the Russian economy, and the country has been able to achieve a higher level of prosperity and economic development by optimally allocating these revenues. Provide the Russian public.

For this purpose, it was necessary to determine the existing laws of the functioning of the economy in order to identify the main factors influencing economic growth. The methods of regression-correlation analysis allowed us to solve this problem.

The hypothesis of statistical processing was that there is an influence of innovation security, investment activity, export activity, and personnel performance on the current state of regional industry (GRP and industrial production per capita) (Safiullin & Safiullin, 2011).

The results of the analysis are presented on the slide; the main conclusion is that the factors of development of innovative capacity (developed and used advanced production technologies; volume of innovative goods, works, services; costs of technological innovation of organizations) and human resources (the ratio of workers withdrawn and came in; the number of students in higher educational institutions per 10 thousand people; the average monthly accrued wages; the share of highly qualified workers in the total number of skilled workers), which are formed at the level of industrial enterprises actively participating in the implementation of science-intensive projects.

Therefore, the regions should focus on the level of their intellectual capital, the constituent parts of which are innovative development and human potential (Bagautdinova et al., 2014) with its inherent competences generally characterizing the specialization of the region in order to increase the level of their investment attractiveness and competitiveness, and to accelerate the rates of economic growth.

The main prerequisite for project management at the meso-level is the lack of a unified methodology for project management involving various constituent entities of the Russian Federation, which makes them competitors for budget funds and affects the development of sectors in the Russian Federation.

The sectoral project management office acts as a curator in order to locate and monitor the progress of the project; the sectoral management office could be the supervising ministry, the customer or the headquarters of the concern, etc. It groups the regions according to the level of specialization and competence.

Further, the issue of selection of enterprises which can be potential executors is solved. A competency profile of enterprises in different regions is drawn up for this purpose in comparison with the required competency profile of the project. Then the problem of resource provision of the project is solved on the basis of the distribution of project tasks among the project participants in the least cost way (Ibatullina, 2019).

Simply coming up with a project budget is not adequate during your project planning sessions. You and your team would have to keep a watchful eye on whether the costs remain close to the figures in the initial budget.

You need to always keep in mind the risks that come with cost escalation and need to prevent this as best as you can. For this, use the above techniques explained and constantly monitor the project costs.

4 Discussion

For this purpose, the authors formulated a methodology for optimizing the cost, time and resource provision of the project (Figure 1).

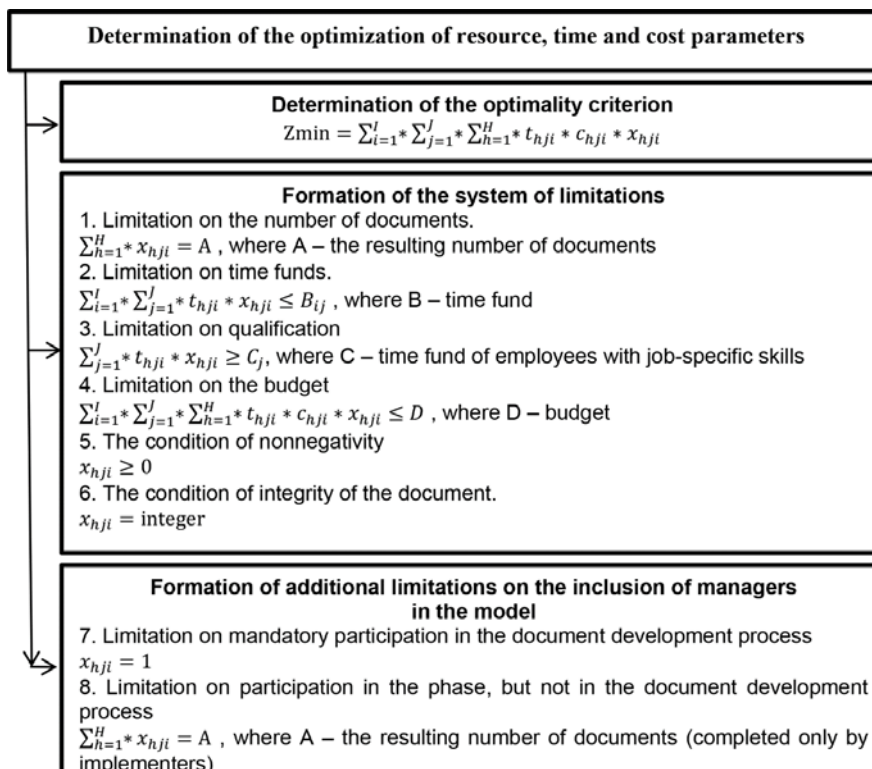


Fig. 1: Technique of optimization of resource, time and cost parameters (source: the authors' approach)

The main basis for the development of the methodology is the determination of the input work of the project and their cost according to the budget. A list of possible participants for each input work should be indicated who could cope with the work due to their qualification skills, taking into account the required specialists. Labour input in hours and wages per hour are prescribed for each participant; the result of the task or what is

presented at the end of the task (documentation, model, drawing, etc.) is indicated for them.

Let's consider one of the projects in more detail. The basis of the project No. 1 of the Kazan Electrotechnical Plant is the Customer's agreement; information is given in table 1.

Table 1: Description of the project of JSC "Kazan Electrotechnical Plant"

| | | Project No.1 of "Kazan Electrotechnical Plant" |
|---|--|--|
| 1 | Project foundation | Customer agreement |
| 2 | Type of projects | implementers |
| 3 | Project implementation period, months | 36 |
| 4 | Number of project tasks, pcs. | 73 |
| 5 | The cost of man-hours of the project, rub. | 39 504 096 |
| 6 | The result of the project | prototype |
| 7 | Number of reports, pcs. | 73 |

The optimality criterion in general form for project # 1 is as follows:

$$39\ 504\ 096 = \sum_{i=1}^{24} \sum_{j=1}^{39} \sum_{h=1}^{20} t_{hji} c_{hji} x_{hji} \rightarrow Z_{min}$$

Thus, an optimization model has been formulated, which allows, as a whole, to create the necessary restrictions; more accurately establish the cost of work with the condition of minimizing labour costs; integrate various functional areas in the performance of a particular task; calculate the workload of specialists to be able to attract specialists to other projects; reduce the amount of overtime; create a margin of financial strength for possible risks; contribute to budget savings (Ibatullina & Safiullin, 2018).

Next, the sensitivity of the optimality criterion is assessed. The stability analysis of the optimization modelling results consists

in studying the sensitivity of the optimality criterion (budget) depending on the parameters of the system of constraints, which can be "excessive" (not affecting the project budget), and "scarce" (affecting the project budget). The range of changes in the constraints allows us to determine how we can change the resource stock to improve the optimality criterion.

The results of the ranking of changes in the optimality criterion in terms of permissible increases in "scarce" constraints made it possible to determine:

- Constraints leading to an increase in the optimality criterion;
- Constraints leading to a decrease in the optimality criterion;
- Constraints that do not affect the optimality criterion.

At the same time, this part of the analysis of the sustainability assessment made it possible to identify the conditions for the constraints for which the optimality criterion is improved, namely: an even greater decrease in the project budget is possible by reducing the number of documents, by increasing the working time fund of individual specialists (that is, attracting specialists with the same category) and by improving the qualifications of performers. It should be noted that the only constraint that fully contributes to the budget reduction is the constraint on qualifications (not a single scenario of deterioration), while the remaining constraint can both increase and decrease its value.

Thus, the main conclusion of the optimization modelling of the project No. 1 is to find the potential for savings in project management: if the introduced constraints meet GOSTs conditions and restrictions on the part of the Customer are not regulated, then by agreeing with the Customer, it is possible to change the structure of the resources involved, the available working time fund, and the number of required documents. In this case, we can create different versions of the project, which will be the same in their content, but different in cost. In other words, Parametric estimating uses statistical modeling to develop a cost estimate. It uses historical data of key cost drivers to calculate an estimate for different parameters such as cost and duration. For example, square footage is used in some construction projects. Reserve analysis is used to determine how much contingency reserve, if any, should be allocated to the project. This funding is used to account for cost uncertainty.

5 Conclusions

The advantages of the proposed approach to project management at the meso-level can be considered from four distinguished positions related to management and regional economics: from the point of view of project management, from the point of view of enterprise management, from the point of view of regional management, and from the point of view of industry management. The proposed developed approach to the management of territorial development projects solves the following tasks:

- Building a management mechanism for the sector based on project management;
- Interaction between regions in the implementation of one project, and promotion of cooperation ties;
- Development of the intellectual capital of the regions;
- Project risk management;
- Control and supervisory functions of the project implementation;
- Distribution of project costs in conditions of limited resources.

The main conclusion of the study concerning the theoretical aspects of project management was the formulation of a hypothesis about the possibility of using its methods for the

purposes of regional project management. The approach proposed by the authors to the management of regional development projects based on network planning and optimization of resource provision has proved the practical importance of integrating project management methods into the regional management system, justifying the feasibility of improving the qualifications of the project team in order to execute the project more efficiently.

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Literature:

1. Bagautdinova, N. G., Levitsky, B. E., Vorobyeva, L. E., & Pratchenko, O. V.: Formation of synergetic effect of human resource management of business organization. *Mediterranean Journal of Social Sciences*, 5(12), 2014. 15-20.
2. Crawford, J.K.: The project management maturity model. *Information Systems Management*, 23(4), 2006. 50–58.
3. Fortune, J., White, D., Jugdev, K., & Walker, D.: Looking again at current practice in project management. *International Journal of Managing Projects in Business*, 4(4), 2011. 553-572.
4. Gray, C. F., & Larson, E. W.: Project management: a practical guide. *Math. from English.–Moscow: Publishing House "Business and Service"*, 2003. p. 528.
5. Ibatullina, A.A.: Determination of the optimization model reserves concerning the resource provision in the management of research projects. *Journal "Society, Politics, Economics and Law"*, 9, 2019. p.62.
6. Ibatullina, A.A., & Safiullin, A.R.: Topical issues of development of enterprises included in the military-industrial sector of Russia. *"Kazan Economic Bulletin" magazine*, 1(33), 2018. 16-20.
7. Jugdev, K., Perkins, D., Fortune, J., White, D., Walker, D.: An exploratory study of project success with tools, software and methods. *International Journal of Managing Projects in Business*, 6(3), 2013. 534-551.
8. Polkovnikov, A.V., Ilina, O.N.: The reality of project management practice in Russia: Study results. *Procedia-Social and Behavioral Sciences*, 119, 2014. 805-810.
9. Radujković, M., & Sjekavica, M.: Development of a project management performance enhancement model by analysing risks, changes, and limitations. *Grđevinar*, 69(02.), 2017. 105-120.
10. Safiullin, M. R., & Safiullin, A. R.: *Regional competitive advantages (on the example of the Republic of Tatarstan)*. Kazan: Kazan University, 2011. 716.

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