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MODELING THE MULTIFACTORIAL PROCESS OF FORECASTING EFFECTIVE PROJECT MANAGEMENT

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Abstract

The paper considers approaches to modeling the multifactorial process of project management efficiency forecasting. An analysis of key factors influencing the effectiveness of management decisions in project activities is carried out. The use of mathematical models and multifactor analysis methods is proposed to increase forecasting accuracy. Emphasis is placed on the integration of statistical, economic and organizational parameters into a single forecasting system. The results obtained can be used to optimize the management of complex projects in various fields of activity.

Keywords*:* management system; expert modeling system; unclear logic; linguistic variable; optimization; effect.

INTRODUCTION

Effective management of construction projects is impossible without the implementation of optimization models that allow reducing costs, minimizing work time, using resources in a balanced way, and reducing risks. In modern construction management practice, both classical mathematical and modern digital optimization models adapted to the dynamics of real processes are used [1-4].

MAIN PART

The construction industry is characterized by a high degree of project complexity, a large number of participants, dependence on external factors (weather, supply, financing) and significant investment risks. In such conditions, optimization is not only a tool for increasing efficiency, but a strategic necessity.
Main management processes that need optimization (tabl 1):

- Formation of a work schedule.
- Resource management (material, labor, technical).
- Organization of supply logistics.
- Making management decisions based on analytics.
- Financing planning and budgeting.

Table 1 - Classification of optimization models

Model type	Characteristic	Application
Deterministic models	Work with fixed parameter values	Optimization of resources, schedules, logistics
Stochastic models	Take into account the probabilistic nature of variables (risks, weather, prices)	Risk management, scenario modeling
Network models (CPM, PERT)	Determine the critical path and dependencies between tasks	Construction schedule planning
Simulation models (Simulation)	Reproduce complex processes by modeling system behavior	Testing management alternatives
Optimization algorithms	Use mathematical methods to find the best solution	Minimizing costs, maximizing profits, allocating resources
Artificial intelligence methods	They apply machine learning, neural networks , and fuzzy set logic.	Forecasting, adaptive planning

Modeling multifactorial process prognostication effective project management can be based on expert assessments, which are of a qualitative nature. In order to create an expert modeling system for multifactorial analysis was used mathematical apparatus, what based on theories unclear logic [5-6].

This approach represents a system of interconnected mathematical models, algorithms and formalized methods, which allow use expert and linguistic information to predict project management effectiveness depending on the impact of various factors. For installation hierarchical connections factors, what effect onthe magnitude of project management effectiveness done their classification. The application of fuzzy logic for expert modeling "If-then" statements in construction project management requires the identification of factors through the corresponding values:

- A (Funding) – amount of available funds ($), level of financing (% of the required budget), credit risks (low/medium/high).
- B (Legislation and regulation) – level of compliance with regulations (% compliance), risk of regulatory restrictions (low/medium/high).
- C (Technology and innovation) – level of automation (% of implemented technologies), innovation index (high/medium/low).
- D (Environmental factors) – level of environmental impact (low/medium/high), compliance with environmental standards (% compliance).
- E (Project team) – level of qualification (average length of service of employees, years), level of motivation (staff survey, scale 1-10).
- F (Risk management) – number of critical risks (pcs.), level of readiness for risks (% of implemented protection mechanisms).
- G (Logistics and Supply) – delivery accuracy (% of deadlines met), material availability (% of stock in the warehouse).
- H (External economic factors) – inflation rate (%), market stability (market change index).

Considering this process at the system level, the linguistic variable X, which describes project management efficiency, can to present in the form of correlation:

$$X = f(A, B, C, D, E, F, G, H), \quad (1)$$

Where X is a linguistic variable (LV), describing affecting construction project management.

Conclusions

Models for optimizing construction management processes are critical to achieving efficiency, reliability, and competitiveness of projects. Their application allows minimizing costs, shortening implementation times, reducing risks, and improving the quality of execution. The combination of classical mathematical approaches with modern digital technologies and artificial intelligence provides a new paradigm for construction process management - flexible, analytical, and integrated.

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