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Multi-criteria analysis of Projects' performance in construction



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ABSTRACT

Construction companies usually perform several construction projects at the same time. Projects differ by complexity, duration, budget, variety of works, and number of implementers. Also vary the results of the projects: some of them have been implemented successfully, other terminated with losses or accidents. To determine the causes of one or another result the analysis of project work flow indicators should be performed. The evaluation of project indicators during implementation is not easy task due to the lack of up to date data and indicators measuring problem. The purpose of the research was to analyze common project management problems, the success factors of construction projects and to illustrate how to assess a projects' execution efficiency by mean of the aggregated indicator in particular company. In case study the problem of project performance indicators selection was analyzed, the aggregated project's performance criterion was determined by applying the methods of multi-criteria analysis and logarithmic normalization method was applied. Results show that by using the aggregated indicators it is easy to compare the projects, the received impartial information is useful for strategic planning, quality management, for solving the tasks of resource allocation, motivational project evaluation.

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1. Introduction

The company's survival in competing construction market depends on the successful implementation of projects. Therefore the latter being the main aim of every construction company. Another, equally important, is a high efficiency of project implementation being the characteristics of a company's competitiveness in market. In addition, the efficient performance will allow the company to make better use of their material, financial

and human resources to achieve higher quality, and finally higher profits.

Construction companies are usually implementing several construction projects at the same time. Projects differ by complexity, duration, budget, variety of works, and number of implementers. Also vary the results of the projects: some of them have been implemented successfully, other terminated with losses or accidents. To determine the causes of one or another result the analysis of project work flow indicators should

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be performed. The evaluation of project indicators during implementation is not easy task due to the lack of up to date data and indicators measuring problem. There is also need to collect, store and analyze data on the previously implemented projects. Each completed project to be discussed in order to identify key performance indicators and frequent project interferences. It is important to transfer the findings to motivational system if latter applicable.

This article aims to analyze common project management problems and projects success factors and to illustrate how to assess a projects' execution efficiency by mean of the aggregated indicator in particular company.

2. Construction projects' performance: problems and success factors

The topics of project performance and success factors are discussing widely by professionals for a long time. So the success of the project as temporary organization is affected by the resources and effectiveness of the corporate organizations; and the success of the organization also affected by the performance and success of every separate project. Different stakeholders of construction process (institutions, society, construction industry representatives, and government) also influence the performance of construction sector, mainly through regulatory mechanisms, information dissemination, training and research. Well performing, efficient and innovative construction industry is crucial factor in rising quality of life, especially in the light of low carbon future.

The construction value stream begins with a perceived need for a new or improved building, and leading to investigation, design, production, commissioning, facility management, maintenance, adaptation, conservation, restoration, dismantling and recycling [1]. Clients have recognized that the involvement of construction managers in the initiation of projects is vital to project success, because early engagement enables to deliver a more sustainable product and more efficient construction practices. The research of Morris [2] revealed that projects are often embarked upon without sufficient preparation. Long [3] analyzed large construction projects and found that the problems could be grouped under five major factors: (1) incompetent designers/contractors, (2) poor estimation and change management, (3) social and technological issues, (4) site related issues, and (5) improper techniques and tools. The findings of Iyer and Jha [4] study show that conflict among project participants, ignorance and lack of knowledge, presence of poor project specific attributes and non existence of cooperation, hostile socio economic and climatic condition, reluctance in timely decision, aggressive competition at tender stage, and short bid preparation time are the main factors, that adversely affect the cost performances of projects. Further analysis indicates that coordination among project participants as the most significant of all the factors having maximum positive influence on project performance. The analysis made by Meng [5] reveals that the deterioration of the relationship between project parties may increase the likelihood of poor performance. Chan et al. [6] identified five major groups of independent variables, namely project-related factors, project procedures, project management actions, human-related factors, and external environment are

identified as crucial to project success. Critical success factors obtained by the Iyer and Jha [4] are: project manager's competence; top management support; project manager's coordinating and leadership skill; monitoring and feedback by the participants; coordination among project participants; and owner's competence and favorable climatic condition. Enshassi et al. [7] study shows factors that causes the variation orders in construction projects, namely lack of materials and equipment spare parts due to closure, change in design by consultant, lack of consultant's knowledge of available materials, errors and omission in design, conflicts between contract documents, owner's financial problems, lack of coordination among project parties, using inadequate specification for local markets by international consultant, internal politics, and change is specification by owners. The project nature, the effective project management tools, and the adoption of innovative management approaches are the critical success factors for projects in construction. To better indicate the success level of design-build projects, Lam et al. [8] developed a project success index, which is assessed by the key project performance indicators of time, cost, quality, and functionality. Cha and Kim [9] states that it is very difficult to assess an overall performance level of a constructed project in a reasonable manner, because in the construction industry, which is characterized as project specific, a clear delineation of scope of performance is absent, and the standard procedure and operations are not fully developed.

As success factor influencing the good performance of projects Wu and Chaturvedi [10] mentioned the use of high-performance work systems (HPWSs). The distinctive managerial approach that enables high performance through people is widely used in organizations named High Performance Work Systems (HPWS) and sometimes known as high involvement or high commitment organizations. The main idea of HPWS is to create an organization based on employee involvement, commitment and empowerment, not employee control [11]. In construction field this idea is mainly adapted in projectized organizations and appear as so called "company in company" model. Although key dimensions of HPWS are well known, the particular set of managerial practices for HPWS vary from company to company. Some companies select a highly rational way to deal with problems, some have adopted the strategies and structures allowing them to respond in an integrated, flexible way to changes, some have developed long-lasting, authentic partnerships with their customers, some have chosen socially responsible ways creating workplaces that elevate their members' lives [12]. The influence of HPWS on organizational outcomes was investigated by Wei and Lau [13]. The study of Evans and Davis [14] concluded that HPWS lead to (a) financial performance via administrative efficiency and (b) sustainable performance via flexibility arising from the coordination and exploitation of knowledge resources.

The significant number of studies revealed the relationship between an ISO 9000 certified quality management system (QMS) and elements of performance in construction project environments. Din et al. [15] indicated that ISO 9000 certified companies have enhanced levels of performance in their project environments compared to those in non-certified companies. Turk [16] study showed that ISO 9000 Quality Management System provides important advantages for the construction firms. Sharma [17] hypothesizes that ISO 9000 certification is associated with

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