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An Empirical Study into Identifying Project Complexity
Management Strategies

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Abstract

Complexity is a term that is used throughout the construction industry. When complexity is poorly understood and managed, project failure become the norm. However, there are limited number of studies which investigated best practices which could overcome the undesired outcomes of complexity challenges. This research focused on identifying strategies to manage complexity in order to increase the likelihood of project success. Initially, this paper reviewed different project complexity definitions and suggested a single definition. Furthermore, the differences between complexity, uncertainty and risk were explained. Moreover, complexity management strategies were collected and enhanced. For this purpose, two rounds of qualitative Delphi method were applied to identify and improve complexity management best practices. In the first round, Subject Matter Experts were asked to individually provide top complexity management strategies. In the second round of this study, the twelve experts were participated in a complexity management workshop to advance the identified strategies.

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1. Introduction

Complexity is a term applied to projects throughout the construction industry. However, most references to low or high complexity are often made by intuition and at times represent a relative assessment of complexity by comparison to other types of projects within the organization's previous experience or industry sector. There is no single or standard definition for project complexity that can be applied to a variety of projects. Furthermore, there is no consistent depiction or agreed upon understanding of project complexity. One fact persists that complex projects always present additional management challenges to achieving project objectives.

In order to identify the management strategies which can overcome project complexity challenges, complexity indicators should be defined. For this purpose, this study utilizes the Construction Industry Institute research [1] results on identifying and measuring project complexity. This paper aims to identify strategies to mitigate and manage the negative influence of the identified indicators of complexity.

2. Background

Project complexity is a term which has been defined differently in various studies. In general, the authors came across more than thirty definitions of complexity in construction and other industries. In this section ten definitions of complexity described by different researchers will be presented. The selected ten complexity definitions are based on similar definitions in different studies.

The first complexity definition was found in several dictionaries. Dictionaries describe complexity as something consisting of many varied interrelated parts. Perrow [2] explains that the complexity of a task is the degree of difficulty and the amount of thinking time and knowledge required to perform the task. However, Gidado [3] believes that project complexity is the measure of the difficulty of implementing a planned workflow in relation to the project objectives. Baccarini [4] defines project complexity as something that consists of many varied but interrelated parts and can be operationalized in terms of differentiation and interdependency. Complexity is also described as a property of a model, which makes it difficult to formulate its overall behavior [5]. Sbragia [6] believes the number of elements in the project, intensity of interactions between elements, and difficulty of cooperation between the functional areas determine the complexity level of the project. The complexity is also defined as the degree of manifoldness, interrelatedness, and consequential impact of a decision field [7]. Hass [8] clarifies that complexity is characterized by a complicated or involved arrangement of many inter-connected elements that it is hard to understand or deal. Vidal [9] defines project complexity as a property of a project, which makes it difficult to understand, foresee, and keep under control the project's overall behavior. Finally, Remington [10] believes that a complex project demonstrates a number of characteristics to a degree, or level of severity, that makes it difficult to predict project outcomes or manage projects.

Based on the literature and discussions with experienced industry experts, the authors defined project complexity as the following: "Project complexity is the degree of interrelatedness between project attributes and interfaces, and their consequential impact on predictability and functionality." This is the definition which is used to identify project complexity indicators and management strategies which reduce the undesired outcomes often related to project complexity.

2.1. Complexity, Uncertainty and Risk

There is a wide misunderstanding between complexity, uncertainty and risk terms. It is intended to differentiate complexity from uncertainty and risk in order to identify and detect the right management strategies which could potentially overcome project complexity issues.

One of the concerns in the literature is that while significant research can be found regarding project complexity, project risks, and project uncertainty, a clear link between these concepts has not been established yet. While the authors have come to the conclusion that concepts of risk and uncertainty do not have influence on the project complexity, most of the scholars have different point of view. Some studies consider uncertainty as one of the most

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