

Understanding Complexity at Pre-Construction Stage in Project Planning of Construction Projects

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Abstract : The construction planning and scheduling based on using the current tools and techniques is resulted deterministic in nature (Gantt chart, CPM) or applying a very little probability of completion (PERT) for each task. However, every project embodies assumptions and influences and should start with a complete set of clearly defined goals and constraints that remain constant throughout the duration of the project. Construction planners continue to apply the traditional methods and tools of "hard" project management that were developed for "ideal projects," neglecting the potential influence of complexity on the design and construction process. The aim of this research is to investigate the emergence and growth of complexity in project planning and to provide a model to consider the influence of complexity on the total project duration at the post-contract award pre-construction stage of a project. The literature review showed that complexity originates from different sources of environment, technical, and workflow interactions. They can be divided into two categories of complexity factors, first, project tasks, and second, project organisation management. Project tasks may originate from performance, lack of resources, or environmental changes for a specific task. Complexity factors that relate to organisation and management refer to workflow and interdependence of different parts. The literature review highlighted the ineffectiveness of traditional tools and techniques in planning for complexity. However, this research focus on understanding the fundamental causes of the complexity of construction projects were investigated through a questionnaire with industry experts. The results were used to develop a model that considers the core complexity factors and their interactions. System dynamics were used to investigate the model to consider the influence of complexity on project planning. Feedback from experts revealed 20 major complexity factors that impact project planning. The factors are divided into five categories known as core complexity factors. To understand the weight of each factor in comparison, the Analytical Hierarchy Process (AHP) analysis method is used. The comparison showed that externalities are ranked as the biggest influence across the complexity factors. The research underlines that there are many internal and external factors that impact project activities and the project overall. This research shows the importance of considering the influence of complexity on the project master plan undertaken at the post-contract award pre-construction phase of a project.

Keywords : project planning, project complexity measurement, planning uncertainty management, project risk management, strategic project scheduling

Conference Title : ICEPMIE 2022 : International Conference on Engineering Project Management and Industrial Efficiency

Conference Location : Amsterdam, Netherlands

Conference Dates : November 03-04, 2022