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Literature Review on Uncertainty Management in Construction Sites

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Abstract - *Uncertainty is unavoidable in construction projects. Uncertainty can occur at any stage of a projects life cycle and is difficult to handle. The current project management approaches are oriented to manage risk rather than uncertainties. Therefore new technique like uncertainty management with more focus on uncertainty should be practiced. Uncertainty management identifies and manages the source of uncertainties in the construction projects. In this paper a literature study on the uncertainty management in the construction sites have been discussed.*

Key Words: **Risk, Uncertainty, Project Life Cycle, Uncertainty Management, Construction Projects**

1. INTRODUCTION

Project management has become a core business process for many firms both on a strategic and operational level. In fact, any activity that is perceived as significant and necessary from the customer perspective could be termed a project, and each big project can be seen as a series of sub-projects. Consequently, such developments change the way project management is perceived. Project management puts a lot of emphasis on assuring conformance to time, budget and scope constraints. Increased customer orientation is one of the most significant trends in project management. It leads to the fact that many companies concentrate their operations to the provision of high-value integrated solutions instead of standalone products and services.

All projects are to a certain degree unique complex undertakings. However, there are few significant similarities. First of all, most projects have restrictions in time, costs and scope as well as certain demands for quality. Secondly, there is a high level of uncertainty with both positive and negative effects in any project. The traditional approach to project management still puts a lot of emphasis on assuring conformance to time, budget and scope constraints. Considerations, such as continuous improvement, customer-centric thinking, reflective learning are often left behind. This leads to the fact that project companies become less flexible, unable to accumulate knowledge and experience necessary for coping with uncertainty.

2. LITERATURE REVIEW

Olga Perminova *et al.* (2008) discuss the phenomenon of uncertainty in projects and attempts to integrate it as part of project management. Recent researches in project management has shown that there is a need to study on uncertainty in projects. In this paper, uncertainty have been defined and an understanding between the terms risk and uncertainty have been made. Olga Perminova. Argues that reflective learning and sense making as enablers of flexibility and rapidness in decision-making regarding the choice of alternative actions in response to the situation are the key elements of managing uncertainty.

Uncertainty management is necessary for the effective management of projects. Uncertainty has a wide ranging sources and have a fundamental effect on projects and project management. The sources of uncertainty may include lack of information, ambiguity, characteristics of project parties, tradeoffs between trust and control mechanisms, and varying agendas in different stages of the project life cycle. Roger Atkinson *et al.* (2006) says that common project practices does not consider the uncertainties in projects. In this paper the projects have been classified as soft projects and hard projects. More efforts are needed to identify and manage important sources of uncertainty.

Projects have been programmed by assuming a deterministic environment and complete task information. But projects are subjected to changes due to uncertainty. Fernando Acebesa *et al.* (2014) discusses about the presence of an uncertainty of seasonal type that affects some of the activities that comprise the project. This paper focus on how the project risk can be affected by such uncertainty, depending on the start date of the project. The statistical distribution functions of project duration was computed using Monte Carlo Simulation. They represented the variability of the project through the so-called Project Risk Baseline. Various sensitivity metrics - Criticality, Cruciality, Schedule Sensitivity Index are studied by Fernando Acebesa *et al.* (2014) and used them to prioritize each one of the activities of the project depending on its start date.

Stephen Ward *et al*. (2003) argues that a focus on uncertainty rather than on risk will enhance the project management. All current project risk management processes are not focused on the management of project uncertainty. In all decision situations, both risk and opportunities are involved. But in risk management focus is more on risk rather than equally on risk and opportunity. Uncertainty management also identifies and manages all the many sources of uncertainty which give rise to and shape our perceptions of threats and opportunities. The paper suggests how project risk management processes can be modified to facilitate an uncertainty management perspective.

Derek H.T. Walker et al. (2017) developed a novel methodological approach by using Weick's sense-making process of reflection and re-analysis. A project database and contemporary literature was mined using the perspective of

Snowden's Cynefin ambiguity framework. Derek H.T. Walker et al. (2017) found that project teams are able to cope with risk, uncertainty and ambiguity in the project life cycle using an adaptation of the Cynefin framework. Two industry sourced examples were used to support the arguments made by them. In their work, they have identified ambiguity as being viewed through a people/process and situational lens. They suggest that having these perspective tools is useful for identifying ambiguity where it may otherwise be missed or subsumed into risk and uncertainty contributes to practice. Derek H.T. Walker et al. (2017) have also found how collaboration and team integration enhance understanding by those teams of the project context and through that how they better cope with ambiguity.

Darius Migilinskas et al. (2008) consider uncertainty and risk as threats associated with indefinite source and consequences during the implementation of construction projects. In this paper analysis of possibilities to reduce uncertainty solving technological and economical problems was done. A step by step tool for risk and uncertainty management in construction was presented in methodology. They proposes that improved communication between project participants and unified terminology can reduce uncertainties. Precise calculation of work amounts using 3D building information model can give a better idea about the project. Active planning and virtual project simulation should be done.

Jingya You et al. (2018) classifies uncertainty into environmental uncertainty and behavioral uncertainty and distinguishes contractual complexity from a functional perspective, with elements including control, coordination and adaptation. Data from 220 owners and general contractors in the Chinese construction industry was used in the research. From the research it was found that a positive relationship exists between uncertainty and opportunistic behavior. Contractual control and adaptation have effects on weakening the relationship, while contractual coordination can mitigate the opportunistic behavior induced by behavioral uncertainty. The study was done by establishing a contingency framework to test the efficacy of contractual complexity in addressing two types of uncertainty. The study overcomes the limitation of an incomplete model by incorporating transaction characteristics, governance mechanism and performance of a governance structure together. The study accords the controversy among uncertainty, contractual complexity and opportunistic behavior by paying attention to the different function of contracts.

Samuel Ekung et al. (2015) studied the use of uncertainty management tools within the construction sector in Nigeria. The study evaluates the level of use of uncertainty management tools and techniques and determined the factors responsible for the low knowledge and misconception of uncertainty within the construction sector. The study found that use of uncertainty management tools and techniques are low due to the lack of clear understanding of uncertainty and its management parameters. The type of project management practice in use, and over reliance on the use of deterministic approach was found to be responsible for the low knowledge of uncertainties. The study identifies the need to start a project by understanding the context and profile of inherent uncertainties in the project system. They recommends collaborative management approach, flexible contracting to the traditional contractual practice to entrench relationship management, contract formalisation and the use of other advanced tools and techniques such as experimentation.

Ali Jaafari (2001) makes a case for a shift to strategy-based project management, a component of which is real time management of risks, uncertainties and opportunities using a life cycle project management approach. Study says that Risk analysis and management should not be viewed as a separate planning and response operation. Risk and opportunity management is a way of thinking and a philosophy that should permeate the entire spectrum of project activities. In the study, Ali Jaafari has argued the case for a major shift in practice, from the current task and activity based approaches to a strategy-based management within an integrated and collaborative framework, which has the potential to overcome traditional dispersion of responsibilities on these projects.

3. CONCLUSIONS

Uncertainty can be regarded as a part of evolution and uncertainty will occur in projects as each project is unique. Therefore uncertainty management should be practiced in construction sites. Todays project management techniques like risk management is mainly focused on managing risks only. The uncertainty management technique not only manages risk and opportunities but also identifies and manages all the many sources of uncertainty which give rise to and shape our perceptions of threats and opportunities. However, there is a lack of common understanding regarding the definition of uncertainty, and as a result, sufficient tools to manage it. More researches should be done on the uncertainty management.

Therefore, to improve the management of challenges in Construction industry, to improve construction project deliveries and to promote efficient and quality use of resources in construction in developing countries, there should be a systematic development and utilization of risks and uncertainties management knowledge, skills and techniques. This shall enable construction industry to play their rightful and necessary role and contribution to sustainable development of developing countries.

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