

Fuzzy Inference Approach for Assessing Time Related Risk Factors on Highway Rehabilitation Projects in Nigeria

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Abstract. Construction projects are unique and continuously increasing in complexity. Hence, researchers relied heavily on data collected through expert judgement to assess risks on them. Expert judgement are subjective data, fuzzy and so this paper aimed at exploring the application of Fuzzy set theory for an accurate assessment of risk on Federal highway rehabilitation projects in Nigeria. This study undertakes a comprehensive review of literatures and conducted project specific questionnaire survey of sixteen Federal highway rehabilitation projects and the professionals in the client, construction and consulting firms who are directly involved in the execution of the sampled projects. Data collected were subjected to normalisation and Fuzzy inference analysis. Twelve risk factors are found to be significantly leading to time overrun on highway rehabilitation projects. In addition, Fuzzy inference analysis revealed that interest rate fluctuations and unexpected site conditions made 'Large' contribution to poor performance experienced on the highway rehabilitation projects. This is contrary to the medium impact values derived from normalisation. Hence, the results of this study provide a more accurate database of significant risk factors to local highway contractors and guide the foreign contractors wishing to do construction business in Nigeria on SWOT analysis.

Introduction

Time and cost overrun as well as poor quality work had been global challenges to highway project development; they occur both in developed and developing countries though the extent of the challenges is more in developing countries (1;). Uncertain events or conditions that can occur with positive or negative effect on any of the project performance objectives such as the time, cost and the quality are described as risk (2). All construction projects have associated risks and the higher the degree of risks on a project the lower the likelihood of success (3). These risks have to be properly managed to improve performance on highway construction projects.

Threatening underground conditions on highway construction projects vary from one highway projects to another, hence precise risk data for all potential risks on a proposed highway projects are impossible, hence, subjective data are collected via expert judgments, experience and intuition. Subjective data is best handled by the application of fuzzy logic (4). Fuzzy logic was developed as a means of expressing imprecise, vague and qualitative information in a precise and quantitative way (5). It is capable of modelling and representing uncertainties inherent in natural language and can reflect the enormous diversity of real world problems (6) and suitable for uncertain or approximate reasoning that involve human intuitive thinking (7). The theory can be used to manipulate linguistic expression or description of objects; therefore it is more suitable for real life risk assessment problems on highway projects. Its application are numerous in real life construction risk management .problems. Fuzzy inference technique model was developed in (8) to assess the magnitude of risk for earthworks package of a major work. (9) also applied fuzzy inference analysis to assess country and project risk factors on of a dam & hydro-electric power plant in Turkey. Other application of fuzzy logic on construction projects are Fuzzy synthetic evaluation and the fuzzy implication and composition techniques that was used in the risk assessment and allocation studies on PPP projects in China (10 and 11).