Chapter 16
Fusion of Fuzzy Multi-Criteria Decision Making Approaches for Discriminating Risk with Relate to Software Project Performance:
A Prospective Cohort Study

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ABSTRACT

The prediction and estimation software risks ahead have been key predictor for evaluating project performance. Discriminating risk is vital in software project management phase, where risk and performance has been closely inter-related to each other. This chapter aims at hybridization of fuzzy multi-criteria decision making approaches for building an assessment framework that can be used to evaluate risk in the context of software project performance in following dimensions: 1) user, 2) requirements, 3) project complexity, 4) planning and control, 5) team, and 6) organizational environment. For measuring the risk for effectiveness of project performance, we have integrated Fuzzy Multi-Criteria Decision Making (FMCDM) and Fuzzy Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS) approaches. Moreover the fusion of FMCDM and TOPSIS has not been adequately investigated in the exiting studies.

DOI: 10.4018/978-1-7998-3016-0.ch016

INTRODUCTION

Software industries realize the importance in the prioritization of project risks for the success of project in the context of performance characteristics. Earlier studies (Chen, 2015; Han, 2015; Na et al., 2007; Takagi et al., 2005) have revealed and identified a wide variety of project management, project failure measures due to cost-schedule overrun, requirements misinterpretations and client dissatisfaction. There are a certain risks (project, technical, and business) involved for any worthwhile software project. Software risk management is vital and has become one of the key factor to obtaining good project outcome and performance. This fact highlights the need for early prediction of software risk and risky projects to enable the planning of essential risk management activities and resources during their implementation, where the risk and performance are closely integrated each other. Suitable planning of resources and actions can effectively increase the success rates of such software projects. Subsequently, previous researchers (Liu & Wang, 2014; Keil et al., 2013; Na et al., 2007; Han & Huang, 2007) have investigated the correlation between risk factors and project outcome. Consistent with earlier literatures, this chapter focuses at proposing an assessment methodology that can be utilized to measure risk in the context of software project performance via five dimensions:

1. Requirements;
2. Estimations;
3. Planning and control;
4. Team organization; and
5. Project management.

Numerous binary prediction approaches have been constructed by statistical techniques for classifying risk-prone projects in the literature. Examples include logistic regression, Bayesian classification, and the association rule. Although the overall classification accuracy of these approaches is at an acceptable level, correctly identifying a risky project at a true-positive rate is still a challenge. Effort investment without the premise that a risky project is correctly identified at the initial stage is ineffective. For project managers, misjudging a risky project diminishes their alertness during implementation. Consequently, the failure rates of the project would increase without prior warning and thus, a great cost would be expended in controlling the crisis. In other words, the incorrect classification of not risky projects at the initial stage does not increase failure rates, even if extra effort and resources are invested. In this context, the classification and prioritization of software risks measured through fuzzy set theory has been presented in this chapter.

THEORETICAL FOUNDATIONS

In this chapter, the FMCDM approach is integrated with TOPSIS the assessment of software risk factors in the context of software project performance using Triangular Fuzzy Numbers (TFNs). The proposed framework for measuring the risk factors on software project performance evaluation methodology covers of two main stages: Firstly, we measure weights of the risk criteria, incorporating FMCDM approach. Secondly, FMCDM weights have been applied in TOPSIS approach to identify the rank and significance that is overall prospect value (risk performance index) of each risk factor.