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PROJECT MANAGEMENT DECISIONS USING FUZZY LINEAR PROGRAMMING

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Abstract

Construction projects are complex in nature, which requires systematic and rational approach for decision-making. Linear Programming (LP) is one such technique widely used for optimal decision-making in a rigid environment. In LP model, the objective function and the constraints cannot be represented precisely in linguistic form causing difficulty in representing a real world problem. Usually, decision making in real world takes place in an environment in which the goals, constraints and the consequences of possible actions are not known precisely. Uncertainty has been one of the major factors that influence project performance and determines its ultimate success. Hence to obtain more realistic solution to the problems, a degree of flexibility is required to be introduced in to the crisp constraint inequalities. Accordingly, certain degree of flexibility is to be incorporated in the model parameters of the LP solution to optimize the project cost and the completion time. With the introduction of fuzzy set concepts, this desired flexibility could be incorporated in the model using fuzzy linear programming. This paper presents a practical application of fuzzy linear programming (FLP) in a real-life project network problem with two objectives as minimum completion time and crashing costs required to be optimized simultaneously. The FLP model considers both objectives simultaneously using the LP solution as the intervals for the objectives related with the membership functions which are not changed from DM to DM. Fuzziness in the problem stems from the imprecise aspiration levels attained by the decision maker to both the objectives. These imprecise aspiration levels are quantified using linear and continuous membership functions. The objective function of the FLP is to maximize the membership value of intersection of both the objectives, which forms the fuzzy decision. The problem is solved using LINGO modeling system release 8.0 computer package and the best-compromised solution is found. Comparisons between solutions of FLP and LP are also presented. This paper demonstrates the applicability of fuzzy linear programming for project least-cost scheduling. A case study has been considered to demonstrate the proposed methodology.

Keywords: Fuzzy sets; Decision-making; Project network; Linear programming, Fuzzy linear programming; Tolerance limits.