Implementing bargaining game-based fuzzy cognitive map and mixed-motive games for group decisions in the healthcare supplier selection

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Abstract

Evaluating and selecting proper suppliers in the healthcare centers due to their high impact on the financial situation and citizens' satisfaction is vital. The abundance of various criteria affecting the Supplier Selection (SS) problem makes it a decision-making problem. To this end, an approach according to the Bargaining Game-based Fuzzy Cognitive Map (BG-FCM) and mixed-motive games has been proposed for simultaneously modeling the SS complexity and suppliers' competition in the market. First, according to the BG-FCM, the causal relationships between SS criteria have been determined. Then, by implementing Particle Swarm Optimization and the S-shaped transfer function (PSO-STF) and scenario-making, the BG-FCM is executed to extract robust payoffs for suppliers to compete. The competition between suppliers is modeled by mixed-motive games and their robust payoffs to determine their best strategies in the competition. Finally, suppliers compete with each other two by two, and suppliers with the most wins will have higher priority. The proposed approach has been applied in a general hospital to evaluate major suppliers for purchasing necessities. Then, it is compared with two well-known Multi-Criteria Decision Making (MCDM) approaches, showing a better performance in modeling the complexity and competition in the problem. The proposed approach can help the hospital select the most appropriate suppliers according to its preferences and avoid cooperating with inappropriate suppliers, which may cause a low-quality Supply Chain (SC) system or financial calamities.

Keywords Bargaining Game-based Fuzzy Cognitive Map (BG-FCM) · Mixed-motive games · Group decision in supplier selection · Healthcare

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