

# Multi-objective production planning model for equipment manufacturing enterprises with multiple uncertainties in demand

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## ABSTRACT

A production planning model with multiple uncertainties was established in this paper. Customers' demands for quantity, quality, delivery time and price are different. For an ambiguous number of customers, the expectation of the degree of satisfaction was determined by a triangular fuzzy number method. A trapezoidal fuzzy number method was used for customer prices to determine the expectation of satisfaction of the delivery date. Fuzzy intervals and interval numbers were used to describe quality uncertainty and price uncertainty, respectively. A multi-objective planning model was established, which consists of four objectives, namely, meeting customers' needs, minimizing costs, minimizing delivery time and maximizing corporate profits. Then, the non-dominated sorting genetic algorithm (NSGA-II) was implemented to simulate and solve the problem of uncertain optimization. This model resolved multiple uncertainties in customer demand during the process of production planning for the equipment manufacturing enterprises. The results of the running showed and generated a series of Pareto solutions, which are consistent with the results of a multi-objective planning solution. Manufacturers can obtain the best production plans according to the company's production objective priority rules. Finally, the adaptability and feasibility of the model were verified.

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