

Decision making in two-layer supply chain with doubt fuzzy set

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ABSTRACT

In this article, we discuss the application of doubt fuzzy set in a pollution sensitive economic production quantity (EPQ) model. Here, we study some doubtful situations like proper, harmful, depressive and confident based on human decision-making behaviour of a life-long inventory process. Secondly, we construct two-layer supply chain model of profit a maximization problem with backlogging. In fact, in supply chain there exists so many processes uncertainty due to doubts of managerial decision making. These doubts are basically coming from the actual quantity to be ordered and that of backorder quantity in a specific cycle time. Therefore, considering several doubt fuzzy sets in the order quantity, we construct a doubt fuzzy model by taking a case study then solve it with the help of a novel approach. Finally, numerical illustrations, sensitivity analysis, comparative study and graphical explanations are done to justify the proposed work.

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1. Introduction

Doubt fuzzy set has been developed very recent to capture the COVID-19 pandemic uncertainties in industrial decision making. In fact, dynamical decision-making process under more complex situation can be handled by this approach. Articles on learning theory using fuzzy set carried great importance to analyse the industrial complex behaviour. Some of the notable articles may be considered along this direction. A time dependent backlogging economic order quantity (EOQ) model was studied with step order fuzzy set by Das et al. (2014). A review of inventory lot sizing was discussed by Bushuev et al. (2015). Maity et al. (2018) applied the nonlinear heptagonal dense fuzzy concept to solve a backlogging EOQ model. Pollution-based economic order quantity model using lock leadership game theory was developed by Bhattacharya and De (2021). De et al. (2021a) introduced volumetric fuzzy set to construct a deteriorating inventory model under trade credit. A pollution-based production-inventory problem with quantity loss was solved by Choudhury et al. (2021).

In recent time, numerous research articles about supply chain modelling have been done by the researchers in which growing item-based problems, multi-stage product problems, imperfect production systems are involved. Some of them may be viewed here. Amjadian and

Gharaei (2022) developed an integrated reliable five-level closed-loop supply chain under generalized outer approximation with exact penalty. Askari et al. (2021) solved a multi-product EPQ model for imperfect items using stochastic programming approach. Gharaei and Almehdawe (2020) gave a deep attention on economic growing quantity. A new concept on optimal sustainable order quantities for growing items developed by Gharaei and Almehdawe (2021). Gharaei et al. (2021a) studied an integrated supply chain with multi-stage products under backlogging and probabilistic constraints. An integrated lot-sizing policy was developed by Gharaei et al. (2022) in discussing the inventory management problem. Gharaei et al. (2020) established the generalized benders decomposition method for solving joint economic lot-sizing in multi-product multi-level integrated supply chains. Vendor-managed inventory for joint replenishment planning was solved by Gharaei et al. (2021b). Gharaei et al. (2021c) studied a concept on optimal lot-sizing of an integrated EPQ model with partial backlogging and reworkable products. Gharaei et al. (2021d) introduced an integrated stochastic EPQ model under generalized cross decomposition under the separability approach. Joshi (2022a) gave a new concept on multi-criteria decision making based on novel fuzzy knowledge measures. Multi-criteria decision-making based on bi-parametric