in the control and coordination of the supply chain. This study was performed aiming at transformation of a definitive risk management model to a fuzzy risk management model and defuzzification of the model by rank function. Model defined by Ravindran et al. (2010) described in equations 1 to 12 was first presented, and then its fuzzy model was defined. After defining the obtained wholly fuzzy model, using the definition of the rank function described in equation 14, the model was defuzzificated. The main objective of this study was to compare the results of the general model presented in the literature with those of the fuzzy model developed here. By solving the model in Gomez software using the source data Mehrali-Dehnavi and Aqaei (2013), it was found that the results obtained from fuzzy model solved in this study were much improved compared to the results obtained in Mehrali-Dehnavi and Aqaei (2013). Defuzzy model is also capable of higher integration than the similar model defined by Ravindran et al. (2010) and the model developed by Yang (2007).

In general, risk management is associated with reduction of uncertainty and improvement of current efficiency, thus the content of this study involves the improvement of two concepts "efficiency' and "accuracy". In this study, a mathematical model provided in the literature was examined and then redefined and optimized for improved efficiency, resulting in a model with significant structural differences with its predecessor. In this model, the first objective function minimizes the overall cost of purchase consisting of two components, variable cost and fixed cost of association with the supplier, and the second and third objective functions minimize respectively the number of parts with delayed delivery and the number of parts with defects. Thus, the overall objective of this mathematical model is to reduce the cost or the number of delayed parts. Hence, it is clear that the most important factor in this model is the efficiency. In addition, the model has been optimized with fuzzy-order function technique, the most notable characteristic of which is the increased accuracy reflected in better quality and optimality of results. So, using an accuracy and optimality oriented technique along with an efficient model results in accurate outputs and improved efficiency through the following:

- Providing realistic production capacity proportional to demand: Defuzzification technique allows the model to provide optimal capacity and address excess or low production (this enhances the accuracy and improves overall efficiency by balancing the production with demand).
- Optimization of "delay in delivery": It is obvious that the shorter is the delay in the delivery, the higher is the efficiency. Therefore, providing the real delay in product delivery leads to improved accuracy.
- Optimization of purchase cost: Optimizing the cost by estimating the real capacity reduces the excess financial burden and thus improves the efficiency of the company, thereby serving both efficiency and accuracy objectives.
- Moderation of cost of association with suppliers: Estimating the realistic number of suppliers and defining the type of association with the selected suppliers eliminates additional costs arising from, for example, rework, replacement of suppliers, and forming relationships with new ones. This increases the efficiency and allows the number of suppliers and type of extent of associations to be estimated with greater accuracy.
- The risk of delay in delivery, substandard quality, and natural disasters and the financial risk suppliers: The goal of this study is reduce the risks, or actually increase the certainty (accuracy) of model outputs and its efficiency.
- The size of order: The model provides orders suitable for production capacity, and also determines the cost of these orders and delay penalties. Thus, it enables the user to achieve optimal production level and costs according to the size of orders. This also serves the efficiency in performance and accuracy in outputs of the model.
- The work presented addresses the same challenging problems that others have tried to address but the methodology presented in this paper is more efficient in terms of execution performance and accuracy.

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Biographies

Mojtaba Qolipour is a graduate of Master of Science in Industrial Engineering at Yazd University, Yazd, Iran. He has published 8 journal papers mostly at Elsevier.

Mostafa Rezaei is a Master of Science in Industrial Engineering at Yazd University, Yazd, Iran. He got B.S. in Electronic Engineering from Yazd University. He has published 4 journal papers. His research interests include renewable and sustainable energy such as wind and solar, hydrogen production, optimization, Multi Criteria Decision Making problems.

Amir-Mohammad Golmohammadi (IRAN, Male, 1988), Obtained his B.Sc. degree in Industrial Engineering from Kurdistan University in 2010 and M.Sc. degree in Industrial Engineering from South Tehran Branch at Islamic Azad University in 2013. He is current a Ph.D. student in Department of Industrial Engineering at Yazd University. He was engaged in the industrial system engineering technology development and the technical consultant from 2011 up to year. His main research fields are facility layouts and location design, cellular manufacturing systems (CMS), using meta-heuristics for combinatorial optimization problems and applications of Operation Research (OR) in engineering. He has published a number of journal and conference papers.

Hengameh Hadian is a lecturer of industrial engineering department at University of Nahavand in Iran.

Mehdi Soltani is a graduate of M. Sc. of Industrial Engineering from Islamic Azad University, Qazvin Branch, Iran.