Chapter 5
Meta–Heuristic Approaches for Supply Chain Management

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ABSTRACT

Supply chain management (SCM) is essentially a set of approaches utilized to efficiently integrate suppliers, manufacturers, warehouses, and stores, so that merchandise is produced and distributed at the right quantities, to the right locations, and at the right time in order to minimize system-wide costs or maximize profits while satisfying service level requirements. To solve complex problems in SCM and to obtain optimization, various meta-heuristics algorithms can be used. Thus, this chapter discusses the background of meta-heuristics algorithms. The related work and future research direction for using meta-heuristics approaches for supply chain management are addressed in this chapter.

INTRODUCTION

Supply Chain Management (SCM) is the task of integrating organizational units along a Supply Chain (SC) and coordinating materials, information and financial flows in order to fulfil customer demands with the aim of improving competitiveness of the SC as a whole. (Stadtler 2005). A SC is defined as a system of services that delivers raw materials and these materials have become intermediate and final products, and have been dispersed among the customers (Simchi-Levi et al 2000). SC consist of suppliers, manufacturing sites, distribution centers, retailers and customers, and consists of two processes that are highly integrated with each other, such as production planning and inventory control process that deal with production, storage and relationship between them, and logistics and distribution process that how to transportation of products to customers and identifies how they are recycled.

Integration of activities, cooperation, coordination and information sharing throughout the entire supply chain, from suppliers to customers is a challenging task. Hence there is the necessity of refined Decision Support Systems (DSS) based on powerful mathematical models and solution techniques. There are improvements in the area of meta heuristics that can provide an effective response to complex problems in SCM. Meta heuristics have many necessary features to be an excellent method to solve very complex SCM problems: in general they are simple, easy to implement, robust and have been proven highly effective to solve hard problems. Even in their most simpler.

Section 2 introduces the background of various meta heuristic algorithms for SCM. Section 3 discusses the challenges involved in SCM, Section 4 discusses the related work based on SCM. Section 5 explains the future research directions and Section 6 concludes the chapter.

BACKGROUND

Furthermost of real-world, SC problems are complex due to high number of indices which increase the dimension of the problem and it may lead to inefficiency of routine solution approaches (Fahimnia et al. 2013). Increase in the size of problem and the exponential growth in complexity makes the model to be NP-hard (Park et al. 2007; Jolai et al. 2011). Meta heuristic solution methodologies can be applied for the above problem. Two classifications of meta heuristic algorithms are as follows: (1) population approaches, such as ant colony optimization, the genetic algorithm, particle swarm optimization, and bee colony algorithm; and (2) trajectory approaches, such as the tabu search, and simulated annealing.

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