ABSTRACT

Several analytical models have been developed to solve the integrated production distribution problems in Supply Chain Management (SCM). In certain multi-stage service supply chain like blood banks, the term ‘production’ is referred as collection. It is often crucial to consider the inventory and distribution costs for successful decision making in multi-stage service supply chain. In this paper, the authors have explored this problem by considering a Two - Stage Collection - Distribution (TSCD) Model for blood collection and distribution that faces a deterministic stream of external demands for blood product. A finite supply and collection of blood at stage one Central Blood Bank (CBB) has been assumed. Blood is collected at stage one CBB and distributed to stage two Regional Blood Bank (RBB), where the storage capacity of the RBB is limited. Packaging is completed at stage two (that is, value is added to each item, but no new items are created), and the packed blood bags are stored which is used to meet the final demand of customer zone. During each period, the optimal collection rate at CBB, distribution rate between CBB and RBB and routing structure from the CBB to RBB and then to customer zone, must be determined. This TSCD model with capacity constraints at both stages is optimized using Genetic Algorithms (GA) and compared with the standard operations research software LINDO for small problems.

Keywords: Blood Bags, Central Blood Bank, Genetic Algorithms (GA), Supply Chain Management (SCM), Two-Stage Collection Distribution (TSCD)

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INTRODUCTION

To exploit economies of scale and order in large lots, the important issue in supply chain is to optimize the inventory level by considering various costs in maintaining a high service level towards the customer. Since, the cost of capital tied up in inventory is more; the inventory decision in the supply chain should be coordinated without disturbing the service level. The coordination of inventory decision within an entity is viable, but not between the entities. So the integration of the entities to centralize the inventory control is needed. Several factors that influence inventory policy and practice of the firm includes distribution savings and demand seasonality in production and purchasing economies with the desired level of customer service. Transportation is the spatial linkage for the physical flows of a supply chain. Today, supply chain has to examine the effective use with value added processes in distribution center with minimum inventory levels for delivering the product in time. The gateway of the supply chain is to know our customer needs and serve by considering the aspects of speed and reliable service with the value proportions. The effective supply chain management needs to improve customer service, reduction of costs across the supply chain, optimal management of existing inventory with optimized manufacturing schedules. The impact of distribution inventory will enhance the customer value in the form of lower costs across the supply chain. This paper presents the Genetic Algorithm for Distribution and Inventory Management (GADIM) approach for optimizing the inventory levels of supply chain entities with the consideration of two-echelon blood bank to hospital and warehouse to customers. This model is especially suitable for inventory control and cost reduction by unlocking the hidden profits through the genetic algorithm optimization. The generalized GADIM evaluate the transportation link between the two entities and finds the best route for transporting the product from plant to warehouse and then to customer. The demand of the customer is known in advance, so that the production rate and the inventory levels can be adjusted in the plant and warehouse. Since the logistics plays an important role in the supply chain that the two important sectors transportation and distribution inventory has taken into consideration for redesigning the allocation and routing through optimization. This approach is based on genetic algorithm. It searches the population of solutions of an optimization problem towards the improvement by simulating the natural search and selection process associated with natural genetics. The model comprises the genetic algorithm optimization where the inventory level at the plant and warehouse are optimized according to the production capacity of the same. The distribution costs plays an important role in optimizing the inventory level, so that the total cost for the entire supply chain is minimized. The GADIM approach assure in minimizing the total cost of the supply chain by optimizing the inventory levels in accordance with production capacity of plant and warehouse.

LITERATURE REVIEW

John B. Jennings (1973) discussed a framework for the analysis of the whole blood inventory problem at the individual hospital as well as at the regional level, presents a realistic model of blood inventories for both the individual and regional cases, and analyzes the effects of several alternative inventory policies. Lee and Billington (1992) describe fourteen pitfalls of supply-chain management and some corresponding opportunities. The more complex your network of suppliers, manufacturers and distributors, the more likely you can gain operational efficiencies by attending to inventory. Clark (1994) discussed multi-echelon inventory and areas of current and future applications. Stenger et al. (1994) defines priorities of topics about strategic planning considering the SWOT analysis and completed considering actions and objectives through Fuzzy Logic theory. Hokey Min et al. (1998) discussed the past evolution of location-routing literature and then explore
Information System Costs of Utilizing Electronic Product Codes in Achieving Global Data Synchronization within the Pharmaceutical Supply Chain Network


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