Chapter 24

Genetic Algorithm Approach for Inventory and Supply Chain Management:
A Review

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ABSTRACT

Inventory and supply chain management is a real concern for business community in today’s globally competitive scenario. Various inventory models are proposed, significant parameters are analysed and finally optimized by researchers in order to give managers an insight for the different parameters. Mathematical and logical analysis of different inventory and supply chain models helps managers in overall cost reduction and further higher revenue generation. Members often encounter conflicting interest and unforeseen scenario. So, all this makes supply chain very complex and dynamic process. Complex and uncertain nature of inventory and supply chain, many times either it is not feasible to solve the issue with traditional methods or it is not cost effective. Thus many researchers are using artificial intelligence approach for investigation. Genetic algorithm is one among them that works efficiently with complex nature of the inventory and supply chain management. This article provides an up to date review about the role of GA in overall inventory and supply chain management.

INTRODUCTION

The Supply Chain Council (1997) defined Supply Chain as “a term increasingly used by logistics professionals - encompasses every effort involved in producing and delivering a final product, from the supplier’s supplier to the customer’s customer. Four basic processes - plan, source, make, deliver - broadly define these efforts, which include managing supply and demand, sourcing raw materials and parts, manufacturing and assembly, warehousing and inventory tracking, order entry and order management. Plan: SCM planning is a multi-step operational process used to create consistent forecasts. Effective
planning can guide users to improve the accuracy of revenue forecasts, align inventory levels with peaks and troughs in demand, and enhance profitability for a given product. Source: Procurement is a process of exploiting global efficiencies in production. Strategic sourcing proves to be an important component of supply chain management, for improving and re-evaluating purchasing activities. Produce: It is an act or process employed to transform tangible goods (raw material semi – finished goods) and intangible input ideas information into goods and services. Deliver: Managing the movement of goods from supplier or manufacturer to end customer. Distribution management is a principal term that refers to numerous activities and processes such as packaging, inventory, warehousing, supply chain and logistics.

Supply chain is asset of facilities, products, people, principles and procedure that involve in purchasing and distribution. This chain connects supplier, distribution channel, retail outlets and end customers. Significance of coordination among members of supply chain to increase overall profit and reduce costs is explained by Thomas & Griffin (1996). Sabri & Beamon (2000) discussed flow of goods, services as well as information takes place among members of supply chain.

Commercially speaking supply chain management (SCM) is the management of the flow of goods and services that involve the movement and storage of raw materials, of work-in-process inventory, and of finished goods from point of origin to point of consumption. Interconnected or interlinked networks, channels and node businesses combine in the provision of products and services required by end customers in a supply chain.

Inventory management is the controlling of non-capitalized assets (inventory) and stock items. A component of supply chain management, inventory management supervises the flow of goods from manufacturers to warehouses and from these facilities to end customer. Since many years inventory was considered as an asset but the Japanese perceived it as necessary “evil”. Hence they introduced “Just in Time” concept. The key features of just in time methodology lies in inventory being closely managed, understanding the customers buying behaviour, having reliable suppliers. It also favour removal of unnecessary inspection steps. It has totally changed industry mind-set regarding inventory management. Firms now believe that they are losing opportunity cost if excessive cash blocked in unwanted inventory. Many companies have been successful in achieving this through improvement of flow of materials in their supply chain. These companies in addition to focusing on the efficient ways to do things, also focused on the strict “don’ts” such as purchasing huge stock and treating them as an asset, excessive changes to schedules, treating all types of stock in the same way without any regard to the value of the good.

With this new avenue in the inventory management, company’s not just adopting just-in-time inventory practices but engaging in more integrated supply chain management. Now most of the organizations are focused on creating processes that reduce or eliminate inventories, mainly by reducing or eliminating uncertainties that make them necessary. These efforts have been motivated in part by the recognition that metrics describing the performance of a company’s inventory management practices can be important signals to shareholders regarding the efficiency of the company’s operations and hence its profitability.

Organization have realized that in supply chain management not only goods and services but information also flows. This lead to idea of an integrated inventory management that helped companies in Coordination and optimization of their core competencies. The integrated system allows companies to optimize the linkage between supply chain and inventory and coordinate the inventory management to reduce costs and enhance differentiation. Experiences also reveal that managing inventory effectively in our economy and the business environment is difficult. For example, in 1993, Dell Computer’s stock embarked as company predicted a loss. Dell recognized that the company was sharply wrong in its demand forecast, resulting in inventory write-downs. Similarly, 1993, Liz Claiborne went through an unexpected