

Abstract

Every business is facing rapidly changing competitive market. Markets are expanding due to globalization, customers' behavior are becoming more and more complex; product variety are increasing and environmental regulations are coming into the picture of every business. Thus, the management of production and inventory in supply chains are becoming extensively complex and challenging. The growth of information technology, role of social media, price-quality competition and collaboration among partners have changed the strategies of supply chain managers completely, from what-it-was few decades ago. Taking all of these into account, the present thesis will attempt to develop some mathematical models to address some realistic inventory systems and supply chains. In order to facilitate managerial implementation, the mathematical formulation of the models in this thesis has been kept simple enough while capturing the necessary practical aspects.

Customer satisfaction is the main objective of inventory control and supply chain management. Product availability, product cost and product quality are the significant factors in determination of customer satisfaction. This thesis attempts to incorporate all these factors to develop mathematical models which provide customers high quality products available at minimum cost. With the simplicity, popularity and wide applicability; three types of inventory models are investigated in this thesis (EOQ, EPQ and Newsvendor) and coordination in the supply chains under deterministic and probabilistic demand are also investigated. The principal features of the models discussed in the thesis include: imperfect quality items, novel selling price dependent demand function, inclusion of pollution factor approach, stockout aversion in supply chain, supply chain coordination and dealing shortages by product substitution. Some algorithms are also developed whenever required.

Keywords: Inventory, Supply chain, Newsvendor, Time varying demand, Random demand, Shortages, Deterioration, Single-manufacturer, Single-buyer, Imperfect quality, Learning effect, Game theory, Declining selling price, Price dependent demand.