

Abstract

The primary objective of this thesis is to develop analytical models to study the coordination issues of a decentralized supply chain under diverse settings. A decentralized supply chain, with conflicting objectives and asymmetric information among the members is inefficient as compared to that of a centralized one. Therefore, a considerable amount of research has been directed towards addressing the issue of devising effective coordination mechanisms to improve the transaction efficiency of a decentralized supply chain. Considering the broad spectrum of coordination issues with different coordination mechanisms, no single model can capture all the aspects of the coordination processes. Therefore, this thesis focuses to develop different coordination models using mainly quantity discount mechanism to address several coordination issues of a decentralized supply chain.

The motivation for this research is driven by the shortcomings of the coordination models available in the published literature. Accordingly, a number of analytical models have been developed to coordinate different members of a supply chain under different situations. The objective of each of the coordination model is to apply quantity/price discount to enhance the system-wide transaction efficiency without making any channel member worse-off. The different coordination models developed in the thesis are as follows:

- i. Three-stage supply chain coordination in a price-sensitive demand environment,
- ii. Buyer-vendor coordination under asymmetric cost information,
- iii. Supply-chain coordination model with insufficient production capacity and option for outsourcing,
- iv. Single-vendor multi-buyer optimal discount pricing model,
- v. Two stage supply chain coordination under price competition,
- vi. Coordination and price competition in duopoly distribution channels.

To formulate and solve the analytical models, several tools/techniques including, Game-Theory, Fuzzy Set Theory, Evolutionary Computations (Genetic Algorithm) have been applied. The different analytical models have been illustrated with numerical examples and several insights have been drawn. Finally, the thesis includes some possible research directions that require further investigations.

Key Words: Supply chain coordination; Quantity discount; Asymmetric information; Price competition; Game theory; Optimization; Genetic algorithm; Fuzzy set theory.