

Chapter 2

Research of Supply Quality Control and Optimization Under Multi-Period Dynamic Game

Jun Hu

Zhejiang Gongshang University, China

Yulian Fei

Zhejiang Gongshang University, China

Ertian Hua

Zhejiang Gongshang University, China

ABSTRACT

To control quality in supply chain, this paper presents multi-period, dynamic game models in principal-agent theory, which are opposite to static, single period game models. The research comes from industrial practice and the conclusions are more operational and feasible in theory. Finally, the research is applied into two famous companies in different industries and shows good effectiveness.

1. INTRODUCTION

From “Magdala Red Accident” in 2005 to “Sanlu Milkpower Accident” in 2008 and “OMP Accident” in 2009, there have being many food accidents since 2000. Control and management of quality in food supply chain has been paid more and more attention by people. At present, quality management in supply chain will threaten not only single company but also industrial development.

Pasternack (1995) set forth quality management in supply chain. From view of incentive and restraint mechanism, supply chain contract is new field in quality control and management, in which quality is managed and controlled through quality provisions. Some researchers pay the role of incentive to quality management and quality contract becomes one approach to control and manage quality in supply chain. As illustrated, there are many academic and practical researches

to quality management from view of incentive and restraint.

Here, we should explain some definitions. Firstly, there are two kinds of contracts: supply chain contract and supply chain quality contract. So-called supply chain contract is meant traditional contract in supply chain, in which main variables are price and quantity while quality is neglected or fixed. And supply chain quality contract is a kind of supply chain contract, in which main variables quality, price, quantity and other related variables while quality interacts with other variables. Secondly, there are two kinds of models: one is structural model and another is economic and quantificational model or called game theory. Structural model depicts transaction process and information flow between supplier and buyer, in which information of variables such as price, volume and quality are passed down to next and how these variables change. Economic and quantificational model is called the game theory, which includes many variables, formula, algorithm, mathematics and constructed based on principal-agent theory.

There have been many supply chain quality contract models. For example, there are some parameters such as price, quantity, revenue, quality level, sampling level, penalty and incentive in these models. Although there are some achievements in the contract research, these models have some disadvantages such as static, single period, simple structure and lack of operation. So, there are many things to manage supply chain quality in the future.

2. LITERATURE REVIEW

Contracts and quality contracts in supply chain have been studied by overseas and domestic researchers for long time.

Corbett, Zhou, and Tang (2004) found that more suppliers get information about buyers' cost structure, higher the value between supplier and

purchaser become. Gurnani and Erkoç (2008) studied the distribution channel on the condition that demand is influenced by supplier's quality and retailer's promotion. When the cost of promotion is private, there are three types of contract: wholesale price contract, fixed fee contract under marginal cost and franchise contract. Manufacturers have different choice and costs under three contracts. Starbird (2001) studied that the relation among quality, quality cost and information and how to coordinate quality of supplier, sampling inspection of purchaser and penalty of bad quality between the risk-neutral supplier and risk-neutral purchaser. Reyniers (1995) studied that as to different sampling policy, the optimal contract arrangement in supply chain model involved quality into the contract. The contract model of price rebate and after-sale guarantee cost is constructed concerning quality of the supplier, sampling policy of production and the finished product quality. The strategy and contract of quality management is studied under cooperation and non-cooperation circumstance. Baiman, Fisher and Rajan (2000) studied that the relation among quality, cost and information, and how to coordinate the quality of supplier, sampling inspection of purchaser and penalty of bad quality between the risk-neutral supplier and the risk-neutral purchaser. Starbird (2000) designs optimal contract arrangement in supply chain model involving quality into the contract as to different sampling policy. Reyniers and Tapiero (1995) designed the contract model of price rebate and after-sale guarantee cost concerning quality of supplier, sampling policy of production and the finished product quality. Agrawal (2002) considered the choice of contract between an entrepreneur and a worker: in a situation where the worker cannot readily observe the outcome (such as profit or output) of their joint effort, while the entrepreneur cannot easily observe the effort supplied by the worker. On the basis of analyzing cost in supply chain, Rahim (2000) studied the quality cost of supply chain based on the principal-agent theory under

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