

A stackelberg-game model in a two-stage supply chain

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Abstract

We set a stackelberg-game model of full postponement strategy in a two-stage supply chain made up of one manufacture and one distributor in the first place. We study the impact of decision variables, i.e. customization service price and promised customization time of distributor, final customized product price and promised delivery time of manufacture on the profit of manufacturer and distributor for industrial engineering.

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Keywords: Postponement; Stackelberg game; Mass customization; industrial engineering

1. Introduction

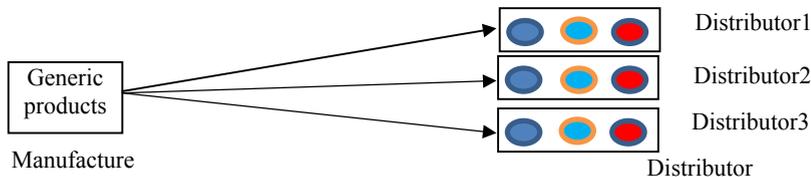
Postponement is the capability of a supply chain to delay product differentiation or customization until closer to the time that demand for the product is known (Gattorna, 2006), and the product is kept in the generic form in the upstream of supply chain with lower inventory cost until to the point of differentiation closer to final customer. When demand for the product is known, the generic product is then completed to meet the unique requirements of the customer, so the customization of final product of specified demand characters is finished with higher customer satisfaction, and the delivery time can be reduced but the final product portfolio increase (Graman, 2010). Yeung et al (2007) proposed different types of postponement relating it to the degree of delay when the final product reaches its shape, form or place, i.e. full postponement (ETO, engineer to postponement), manufacturing postponement (MTO, manufacture to order) and assembly postponement (ATO, assemble to order), and based on this, Danuta and Swierczek (2010) find out the determinants of ETO, MTO and ATO by questionnaire searched in several countries,

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but they didn't referred to the problem of customization cost and the response time. As well known to us, the most important problem of postponement of mass customization is the response time and price of customized product, which will influence the customer choose between the customized product and standard products and thus the profit of manufacture and supply chain. If the price of customized product is too high or the delivery time is too long exceeding the specified waiting time of customer, then the customer will abandon purchasing customized product or turn to buy the standard product on the shelf or the more competitive product of other manufacture of supply chain. That is to say, various customer in mass customization is some sensitive to the price and response time of customized product, so the manufacture must provide the competitive combination of price and delivery time of customized product in the supply chain, especially after the CODP (customer order decoupling point) where the manufacture activity is driven by customized demand. In this paper, we consider the impact of price and promised delivery time of customized product on the manufacture and the distributor under the full postponement strategy which is different from the full postponement strategy in Yeung et al (2007) but relative to the postponement strategy in Graman (2010), and the full postponement strategy here means the manufacture produce only the generic product and the final customization activity is completed at distributor, as shown in fig.1.

Fig.1. full postponement strategy in a two-stage supply chain

The customer sends order to manufacture who will provide the final product price and promised delivery time of supply chain for customer based on the customization service price and time of distributor. So the decision sequence is that the distributor makes decision on the customization price and



promised customization time firstly, and then the manufacture makes decision on the final product price and promised response time of supply chain, which form a Stackelberg game relation, i.e. the distributor is leader and manufacture is follower in the supply chain, the decision sequence is shown in fig.2.

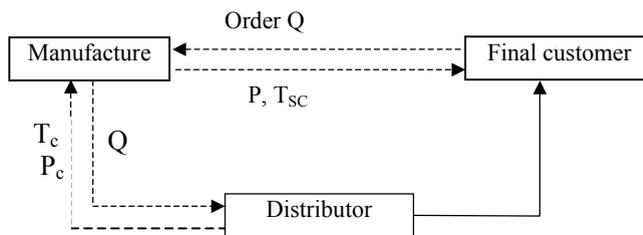


Fig.2. the stackelberg-game decision sequence in this two-stage supply chain

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