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A study on pricing and delivery strategy for e-retailing systems

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ABSTRACT

This study investigates the dynamics between price and lead time for an e-retailing system in which one of its commodities is offered by two duopolistic suppliers. A Stackelberg game is formulated by considering the two suppliers as the leaders and the e-retailer as the follower. The proposed model assists the channel members in getting an equilibrium relationship in a competitive environment. The results suggest that when a supplier chooses a shorter lead time as the competitive strategy, the other supplier should choose a lower price for counteraction, and channel members should understand the characteristics of demand before promoting their commodities.

1. Introduction

The emergence of e-commerce encourages the trend of moving from brick-and-mortar to click-and-mortar for companies (Jones and Biasiotto, 1999; Burt and Sparks, 2003; Dennis et al., 2004; Rabinovich and Bailey, 2004). With e-commerce on the internet, products can be easily sold globally through the websites of the product producers, and the customers' requirements can also be effortlessly collected in no time for product improvements. e-Retailers can offer customers various services and assist customers in comparing alternative product features and selecting proper commodities to save their time surfing on the internet or shopping at real stores (Maltz et al., 2004; Turban et al., 2006). Moreover, suppliers can take advantage of well-known brand names of e-retailers to lift up their product visibility and thus increase their product sales volume. However, in addition to product quality and customer service, the differences regarding purchasing prices and delivery times are another two essential aspects that customers consider when they make a purchasing decision on the internet.

In considering the issues of price and lead time for obtaining a commodity, customers usually present various characteristics for their requirements. Some customers may be lead time sensitive and require that commodities have to be delivered to their hands as soon as possible with the intention of being willing to pay higher prices. On the other hand, some customers may be price sensitive and expect to obtain commodities with lower prices even if the waiting lead time is longer. Since it is impossible to satisfy every type of customer in the market, e-retailers usually have more than one supplier to provide alternative commodities with very similar features but different service offers. This arrangement is able to avoid shortages and also satisfy customers with different characteristics (e.g. price sensitive or lead time sensitive customers). Therefore, the decisions of price and delivery time of a product for suppliers would not be based only on their own internal capacity and cost considerations. The decisions and counteractions of other suppliers selling similar products are also important issues which should be seriously taken into account. Furthermore, e-retailers will thus set the retailing prices according to the prices determined by the suppliers to maximize their own profits. However, the retail prices affect the market

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demands, which, in turn, influence the ordering amounts from the retailers to the suppliers, and therefore will ultimately affect the profits of the suppliers. As a result, the dynamics among channel members in an e-retailing system are complex and consist of both vertical and horizontal competitive games. In this paper, a non-cooperative game for an e-retailing system with one retailer and two suppliers is discussed in which each player observes and predicts the strategies of other players and makes his (her) own decision for the optimal response strategy accordingly. In addition, Choi (1996) stated that there have been four channel structures: exclusive dealer channel; monopoly common retailer channel; monopoly manufacturer channel; and, duopoly common retailer channel; and studied the price competition in a duopoly common retailer channel. Different channel structures imply different types of competition situations which would be considered seriously for attracting customers to buy the commodity. Rosenbloom (2003) classified the competition of marketing channels into four different types: horizontal; vertical; within industry; and, among channel systems competitions. In this study, a monopoly common retailer channel structure with horizontal competition was regarded as our basic research framework to discuss the mechanism of the e-retailing system.

Having considered ways of gaining competitive advantages, companies have to do serious research to understand their own and major competitors' strengths and weaknesses in order to ensure the possession of competitive advantages and thus obtain a higher market share. In addition to quality and service, price competition is often the most popular factor considered in conventional product competition models. In particular, considering a commodity market in which the product quality is similar while the concern of brands is also a minor issue, a lower price than other competitors can offer would thus attract more consumers to purchase the product (Ray and Jewkes, 2004). The pricing strategy is essential in marketing products, and has been studied in previous literature (Choi, 1996; Chen and Wan, 2003; Cheng et al., 2003). Furthermore, the prevalence of e-commerce enables time to be another critical factor for companies, either manufacturing or service, to compete in gaining more market share, and the fact that many companies devote themselves to shorten the lead time of delivering products to customers has been notably observed (Stalk and Hout, 1990). Recent years have seen increased attention to the study of determination of proper lead times for companies in order to lower inventory cost, improve customer service, increase product sales, etc. (Lederer and Li, 1997; So and Song, 1998; Spearman and Zhang, 1999; Barnes-Schuster et al., 2006; Rao et al., 2005; Hsu and Li, 2006).

However, price and lead time are generally correlated, since in attempting to have a shorter lead time, a higher price will be necessary to offset the cost increase caused by possible requirements of more plant capacity and human resource in response to the prompter delivery; conversely, a lower price would usually result in a longer lead time (Ray and Jewkes, 2004). Chatterjee et al. (2002) considered that, in setting a lead time for delivery, though a shorter lead time may attract more customers, it may render more delay cost because of capacity shortage; on the other hand, a longer lead time can ensure the product to be delivered on time, but it may result in sales loss because of the long waiting time. Furthermore, some customers may be willing to pay higher prices for quicker deliveries, but this works for only lead time sensitive customers. For price sensitive customers, they may rather spend less money for later delivery. Therefore, how to set a combination strategy of proper lead time and price to improve product sales and gain profits has become an essential issue in literature. So (2000) obtained an equilibrium solution of optimal price and lead time for every individual company in a market with multiple suppliers under the assumption that all the influencing factors except for price and lead time are similar, and learned that companies with more capacity can provide quicker deliveries and companies with less operating cost can offer lower prices. Hill et al. (2000) considered the effect of delay cost on overall profit to determine the optimal lead time which would be prolonged as the delay cost increases to ensure products can be delivered on time. Moreover, by also taking into account the effect of price, the optimal strategy of pricing and lead time setting is able to be derived using the nonlinear optimization technique. Easton and Moodie (1999) considered that two make-to-order suppliers may competitively offer different combinations of price and lead time for products to acquire orders after evaluating their own capacities and service rates under the assumptions that lead time can be correlated with price, while contingent order can affect lead time. Tang and Tang (2002) studied time-based pricing and lead time policies for a build-to-order manufacturer, and found that when the product value decreases swiftly, using a customized pricing strategy would be better than an ordinary one; when production cost decreases rapidly, adopting a dynamic lead time strategy would be better than a fixed one.

It is possible that some companies offer two different combinations of price and lead time to serve two types of customers with different requirements, e.g., Fedex and DHL tender various services of different delivery times and prices to customers to choose from. Boyaci and Ray (2003) considered two similar products with different delivery times and prices (i.e., regular delivery product and express delivery product) to analyze the correlation of time and price in deriving the delivery time for the express delivery product and the prices for the two types of products, and also probed into the effects of reducing delivery time on capacity and cost. In addition to the above two factors of delivery time and price, Boyaci and Ray (2006) further assumed that the reliability of delivery can also have impacts on capacity and cost, and revealed that similar products would have substantially different delivery times, prices, and reliability of delivery requirements for customers under different marketing situations. Furthermore, the decisions of the price and delivery lead time have been discussed in several studies. For instance, Xu et al. (2012) studied the strategies concerning the price and delivery lead time under the channels for the manufacturer-owned and the decentralized mode, and suggested the appropriate ways of the product delivery as well as the service in respondence to different customer requests for the delivery lead time. Also, from the perspective of the customer acceptance of the products adopted from either the traditional retail or online direct channel, Hua et al. (2010) probed into the optimal price and delivery lead time in a dual-channel supply chain with a Stackelberg game. Xiao et al. (2010) deliberated the price and lead time through a supply chain model with one retailer, one subcontractor, and one manufacturer.