

The Effect of Product Quality on the Pricing of New and Remanufactured Short Life-cycle Product

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Abstract. Remanufacturing is one of the recovery process that has become significant among many attempts to mitigate the landfill exhaustion, especially from mountain of wastes that come from short life-cycle products disposal. However, remanufactured product are often perceived to have lower quality compared to the new one. There are misconception about remanufactured product and lack of knowledge about its characteristics. On the other hand, several studies show that price and product quality have positive relationship. This paper investigates the effect of product's perceived quality on the pricing decision, to maximize the profit of the retailer and the manufacturer. We develop pricing decision model for new and remanufactured short life-cycle product in a closed-loop supply chain consists of a manufacturer and a retailer, where the manufacturer is a Stackleberg leader. We find that lower product's perceived quality would decrease the retail and wholesale prices of new and remanufactured products, but does not affect the new product's sales volume significantly. Also, the speed of change of demand influences the optimum total profit.

1. Introduction

Due to the rapid development in technology and research innovation, products' life-cycle has become shorter, especially for technology-based product such as electronics products. The period between launching a product and the introduction of newer model, newer design, or addition of new features has become shorter, and this has convinced customers to buy new product even though the previous one is still perfectly functioning. Usually, in the introduction phase, the product's demand would increase significantly, but when newer product or model is introduced, it would decrease rapidly. The demand characteristics of short life-cycle product is totally different from durable product. Therefore it is important to develop demand function that could capture the dynamics. Hsueh [1] claims that product life-cycle in electronic industry is getting shorter due to the high-speed technology advancement.

Recently, there are numerous attempt to study closed-loop supply chain, which is a study that is not only considering forward chain but also the reverse chain. In the reverse chain, a used product is collected and sent for a recovery process and then put back to the market with higher value than its discarded stage. This approach could extend product's useful life and slower the disposal rate. There are several recovery processes i.e. repair, refurbishing, and remanufacturing [2]; and remanufacturing is considered to be the ultimate form of recycling [3]. Remanufacturing is a process of transforming used product into "like-new" condition, where the value added during manufacturing is recaptured [4]. Several studies show that one of the critical factors to ensure successful remanufacturing is durability of the product. A short life-cycle product is also suitable for remanufacturing, and doing so could be beneficial for the environment and yet maintaining profitability [5].