
Editorial

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1 Introduction

Inventory plays a critical role in balancing supply and demand across different echelons in a supply chain. Inventory management and control systems, however, have been extensively studied with the focus on aggregate level analysis (for example, based on aggregate demand). Today, however, the internet and technology development drive the new economy, and these forces are dramatically reshaping the ways consumers shop for and purchase products. Consequently, the demand pattern has diverged dramatically and fundamentally from that traditionally assumed in the literature. Over the last decade, researchers' interests have moved to individual customer incentives and behaviour, but only limited studies have been done on inventory systems with consumer behaviour considerations. This suggests a need for a better understanding of the impacts of individual behaviour on inventory systems. This special issue aims to fill this gap by publishing relevant, deep, and timely theoretical and empirical findings on this topic. Here, we present new findings based on quantitative models, in the field of inventory systems with consumer behaviour consideration.

2 Inventory insights

This special issue includes four papers. We begin with 'How consumer demand affects order quantity in practice: an empirical study on inventory management decisions in fashion retailing', by Chan, Choi, and Ho. In this paper, the authors investigate inventory decisions, and statistically verify the relationships between order quantity and several critical factors, through a case study involving a nine-month sales dataset of 189 fashion product items from a Hong Kong-based fashion retailing company. With reference to the newsvendor problem setting, they find that theme an of demand, the standard variation of demand, and the profit margin of the fashion items are statistically significantly correlated with the ordering quantity decisions of the company. They find no statistically significant difference in the order deviation from the mean of demand between high- and low-profit-margin products. This empirical study suggests that the profit target and budget considerations may have been taken into account during decision-making process of the company. It also implies that the management should be aware that the parameters significantly affect inventory decisions, and incentives for supply chain coordination should be carefully evaluated.

'Inventory types and their effects on sales', by Kim and Kim, considers the impact of different types of inventory on firms' sales and performance. Differing from previous studies focusing on the role of finished goods inventory in enhancing a firm's performance, Kim and Kim analyse the panel data, consisting of 4,624 firm-year observations of 272 manufacturing firms, in 21 different industries, listed in the Korean stock market indices from 1996 to 2012. Taking a supply chain perspective, they find that for each inventory type (raw material, work-in-process, and finished goods inventory), there is a positive relationship between current inventory and current sales. Controlling for current inventory, their analysis shows that the relationship between the previous year's inventory and current sales is negative. Their study implies that a firm should not follow a simple rule of thumb in deciding inventory level. Analysing the historical data and finding an ideal inventory level by trading off current and previous inventories is a good option. In addition, this research suggests that it is necessary to consider each type

of inventory independently, as both the raw material and the work-in-process inventories, in addition to the finished goods inventory, have a significant effect on sales.

In 'The effect of smoothing filters on supply chain performance', White and Censlive discuss elimination of the bullwhip effect, an important inventory issue in the supply chain, by employing smoothing filters. They show that models using a control-theoretic formulation to determine sales smoothing functions can be designed to substantially reduce the inventory response to changing sales. Their analysis illustrates that the effect of replacing the traditional moving average technique (EWMA) with one based on control theory can result in a much lower stock-out value for a shorter time, improving both bullwhip effect and customer service levels. The paper provides a numerical implementation of the lead/lag filter for use by practitioners. It points out that application of the new filter to a four-tier supply chain is not recommended if sequential information transmission (SIT) is used, except that the retailer will always benefit from its' application, even if it is to the detriment of the others in the chain. If a supply chain using EPOS data is employed, on the other hand, the improvement in supply chain performance results from the lead/lag filter's faster response, which can reduce stock-out by up to 50% and substantially reduce the bullwhip effect. All the members of the supply chain are hence benefitted.

The final paper in this special issue presents 'A heuristic optimisation algorithm for two-echelon (R, Q) inventory systems with non-identical retailers', by Al-Rifai, Rossetti, and Sheikhzadeh. The authors develop an optimisation algorithm that minimises the total inventory investment of a one-warehouse and m non-identical retailer's inventory system, using reorder point and order quantity (R, Q) policies. The inventory system is subject to constraints on the average ordering frequency and number of backorders. They decompose the system by echelon and location, and derive approximate expressions that allow the setting of the inventory policy parameters at the retailers and at the warehouse. The results indicate that the algorithm efficiently optimises large inventory systems in competitive times. The experiments presented here show that the effect of delay at the warehouse on the inventory investment percentage difference is negligible for large-scale systems. Even if the inventory investment percentage difference is small, however, the difference measured in dollars may be significant. Sensitivity analysis suggests that practitioners can determine the robustness of policy decisions and better assess the risks to optimal cost projections of small changes in parameters. This research provides approximations and a heuristic optimisation procedure for a two-echelon inventory system for the non-identical retailer's case.

The papers presented in this special issue offer interesting results with important management implications. Furthermore, they suggest directions for future research in inventory management and control systems, a promising field which is reacting quickly to new developments in technology and practice. The Editor-in-Chief, Tsan-Ming (Jason) Choi, and three guest editors of this special issue, thank the authors for bringing these important results and insights.