www.elsevier.com/locate/ijpe

Modeling and Analyzing Information Delays in Supply Chains Using Transfer Functions

Kai Hoberg, Ulrich W. Thonemann

PII: S0925-5273(14)00182-0
DOI: http://dx.doi.org/10.1016/j.ijpe.2014.05.019
Reference: PROECO5784

To appear in: *Int. J. Production Economics*

Received date: 6 November 2012
Accepted date: 24 May 2014

Cite this article as: Kai Hoberg, Ulrich W. Thonemann, Modeling and Analyzing Information Delays in Supply Chains Using Transfer Functions, *Int. J. Production Economics,* http://dx.doi.org/10.1016/j.ijpe.2014.05.019

Modeling and Analyzing Information Delays in Supply Chains Using Transfer Functions

May 31, 2014

Abstract

Advanced inventory policies require timely system-wide information on inventories and customer demand to accurately control the entire supply chain. However, the presence of unsynchronized processes, processing lags or inadequate communication structures hinder the widespread availability of real-time information. Therefore, inventory systems often have to deal with obsolete data which can seriously harm the overall supply chain performance. In this paper, we apply transfer function methods to analyze the effect of information delays on the performance of supply chains. We expose the common echelon-stock policy to information delays and determine to what extent a delay in inventory information and point-of-sale data deteriorates the inventory policies' performance. We compare the performance of this policy with the performance of an installation-stock policy that is independent of information delays since it only requires local information. We find that this simple policy should be preferred in certain settings compared to relying on a complex policy with outdated system-wide information. We derive an echelon-stock policy that compensates for information delays and show that its performance improves significantly in their presence. We note potential applications of the approach in service parts supply chains, the hardwood supply chain, and in fast moving consumer goods settings.

(Keywords: *Supply Chain Management; Control Theory; Multi-Echelon Inventory Control; Information Delays)*

1 Introduction

In the past decade, research in supply chain management has highlighted the value of information for managing inventories. In numerous settings, many authors (see among many others Gavirneni et al. (1999), Lee et al. (2000) and Croson and Donohue (2006)) have demonstrated that sharing information between the partners in the supply chain can significantly cut operational costs, thus increasing competitiveness and