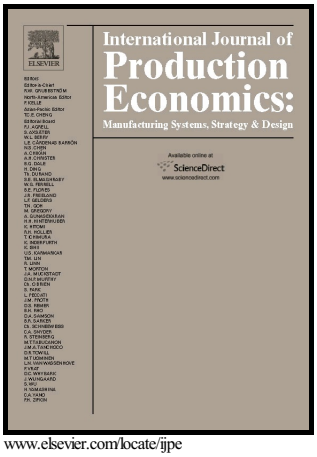

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Charlle Sy

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A Policy Development Model for Reducing Bullwhips in Hybrid Production-Distribution Systems

Charlle Sy[1]

Department of Industrial Engineering, De La Salle University, Taft Avenue, Manila, Philippines, 1004

charlle.sy@dlsu.edu.ph

Abstract

The study considered a hybrid production-distribution system (PDS) in which products move both downstream and upstream. The System Dynamics (SD) modeling methodology was used to examine the effects of integrating product returns and recovery options to the traditional downstream flow in the PDS. The recovery options of remanufacture, cannibalization and refurbish were found to have the most significant effects to the resulting degree of bullwhips and inventory variances. The SD model was then used to identify effective policies that could manage inventory, production and distribution flows in the PDS. Among these policies included the coupling of complementary recovery options and centralization of demand information. It was observed that these policies could actually smoothen the flow of production, which eventually leads to significant decreases in the inventory variances and amplifications in all echelons of the hybrid PDS.

Keywords: System Dynamics, Production-Distribution System, Simulation, Product Recovery

1. Introduction

Companies have had to continuously reevaluate the means by which they conduct their operations. Initially, competition was set among individual firms. This was subsequently changed to encompass entire supply chains composed of multiple firms. However, because of product recovery requirements, competition has once again evolved. These supply chains are no longer confined to one-way product flows but would also need to deal with used products moving upstream from customers to suppliers (Huang et al., 2013).

[1] Tel: (632) 5244611 loc 220.