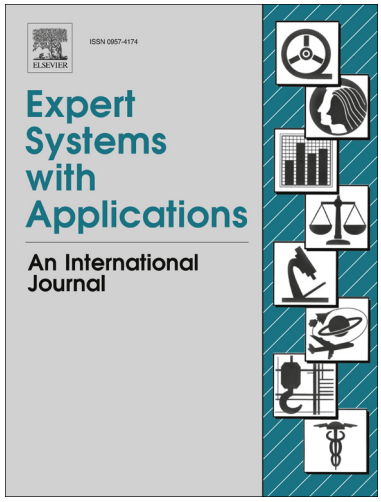

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A REAL-TIME SPC INVENTORY REPLENISHMENT SYSTEM TO IMPROVE SUPPLY CHAIN PERFORMANCES

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Abstract

Inventory replenishment rules contribute significantly to the bullwhip effect and inventory instability in supply chains. Smoothing replenishment rules have been suggested as a mitigation solution for the bullwhip effect but dampening the bullwhip effect might increase inventory instability. This paper evaluates a real-time inventory replenishment system denoted as SPC that utilizes a control chart approach to counteract the bullwhip effect whilst achieving competitive inventory stability. The SPC employs two control charts integrated with a set of decision rules to estimate the expected demand and adjust the inventory position, respectively. The first control chart works as a forecasting mechanism and the second control chart is devoted to control the inventory position variation whilst allowing order smoothing. A simulation analysis has been conducted to evaluate and compare SPC with a generalized (R, S) policy in a four-echelon supply chain, under various operational settings in terms of demand process, lead-time and information sharing. The results show that SPC is superior to the traditional (R, S) and comparable to the smoothing one in terms of bullwhip effect, inventory variance, and service level. Further managerial implications have been obtained from the results.

Keywords: Supply Chain, Ordering Policies, Inventory Replenishment, Order-Up-To, Smoothing, Bullwhip Effect, Inventory Variance, SPC, Control Chart, Simulation

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