Component Procurement Strategies for Assembly-To-Order Systems under Supply Uncertainty

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Abstract

Sourcing components in a global supplier network can lead to a high degree of uncertainty in the supply process due to various potential glitches such as unexpected supply disruptions, insufficient supplier capacity, incorrect shipment quantities, or transportation delays across borders. For assemble-to-order systems, such supply uncertainty makes the coordination of component procurement difficult and can increase the overall assembly cost of the final product. In this research, we develop an analytical framework to illustrate how supply uncertainty of a component can affect the component procurement strategies of other components in an assemble-to-order system. In particular, we consider an assemble-to-order system where one of the components faces uncertainty in the supply process in which the actual available quantity is equal to some random fraction of the production quantity. We analyze how such supply uncertainty would affect the optimal procurement strategies of the components. We first analyze a centralized system in which the assembler decides the optimal order quantities from the component suppliers. We then extend the analysis to a decentralized system using a vendor-managed inventory contract in which the assembler offers a unit price to each individual component supplier and pays only the components actually sold, and the component suppliers decide on the production quantity of their components for the system.

Short Bio

Professor Rick So is Professor of Operations and Decision Technologies at the Paul Merage School of Business at the University of California, Irvine. Professor So's research focuses on the optimal allocation of resources in the design and management of production and services systems, and has published extensively in scholarly journals in the areas of operations and supply chain management. Professor So had previously served as Associate Dean of Undergraduate Programs and Ph.D. Program Director at the Paul Merage School of Business. He has recently won an Excellence in Teaching Award and Faculty Service Award at the School.