

Operations Management Seminar

Understanding the Effectiveness of Sparse Process Flexibility

Yehua Wei
MIT

Friday, Jan 25, 2013
10 – 11:30 am
GSB 3.104

Abstract

The long chain has been an important concept in the design of sparse flexible processes. This design concept has been applied by various manufacturers as a way to increase flexibility in order to better match available capacities with variable demands. Numerous empirical studies have validated the effectiveness of the long chain. However, there is little theory that explains this effectiveness, except when the system size goes to infinity.

Our objective is to develop a theory that explains the effectiveness of the long chain in any finite size system. We study the sales of the long chain and other sparse flexibility designs under both stochastic and worst-case demands. Under stochastic demand, we establish two fundamental properties of the long chain, a supermodularity property and a decomposition property. These properties are then used to justify the effectiveness of the long chain, and to derive new insights into designing flexible processes in large systems. Under worst-case demand, we propose the plant cover index and establish its relation with the worst-case sales. Applying this relation, we demonstrate that the long chain compares favorably with other sparse flexibility designs. Furthermore, motivated by the plant cover index, we propose a heuristic that finds sparse flexibility designs performing well numerically in both average-case and worst-case.

Speaker's biosketch:

Yehua Wei is a 5th year Ph.D. student in the Operations Research Center at MIT. He received a bachelor's degree in Mathematics at Waterloo. He is broadly interested in operations management strategies that deal with uncertainties, and is currently focusing on the areas of process flexibility. His paper, "Understanding the Performance of the Long Chain and Sparse Designs in Process Flexibility", was awarded 2nd place in the 2011 George Nicholson Student Paper Competition

Full paper is available for download at
<http://www.mcombs.utexas.edu/Departments/IROM/Speakers-and-Seminars.aspx>