NYU Stern School of Business
Department of Information, Operations & Management Sciences
OPERATIONS MANAGEMENT RESEARCH SEMINAR

TOPIC: Dynamic Inventory Pooling Policies to Deliver Differentiated Service
SPEAKER: Chung-Piaw Teo (NUS)
DATE: Wednesday, April 2, 2014
TIME: 11:00 AM-12:00PM
PLACE: KMC 3-60

ABSTRACT

Inventory pooling is an important operational strategy that has been widely used in the industries to match supply with demand. However, effective implementation of this strategy can be challenging. A major problem is to integrate the heterogeneous service level requirements of different customers into the inventory pooling model, to determine the minimum inventory level required and the associated allocation policy, using a common stock of inventory.

We consider both Type 1 (stock out probability) and Type 2 (fill rate) service level requirement. We derive a set of necessary conditions on the optimal inventory level needed to to meet customized service level requirement for each customer. For a system with fill rate (Type 2) service requirements, we prove that the necessary conditions are also sufficient using Blackwell's Approachability Theorem. This allows us to show that the optimal inventory needed is at most a small constant above the theoretical minimum, demonstrating the full benefits of inventory pooling in this setting. This results hold for arbitrary demand distribution and correlation.

For system with stock out probability (Type 1) requirements, we derive bounds on the optimal pooled inventory needed, and develop efficient policies to allocate the pooled inventory among the customers. Numerical studies show that our allocation policy can accurately deliver the desired service levels to different customers using the minimal level of common inventory.

Finally, we use these results to show that a pricing schedule based on actual fill rate performance can be used to allocate the profits in the centralized system to all members of the supply chain, leading to a Pareto improvement over the traditional supply chains using wholesale-price-only contracts.

This is joint work with Yuanguang Zhong (SCUT), Mabel Chou (NUS) and Zhizhao Zheng (SMU).

BIO

TEO Chung Piaw is Professor and Head of Decision Sciences Department at NUS Business School. Prior to his current appointments, he was Acting Deputy Dean, Vice-Dean of the Research & PhD Program as well as Chair of the PhD Committee in the School.

He received his PhD in Operations Research from Massachusetts Institute of Technology, Cambridge, MA, and his BSc (Hons) degree in Mathematics from the National University of Singapore. He was an Eschbach Scholar in Northwestern University (US), Professor in Sungkyunkwan Graduate School of Business (Korea), and a Distinguished Visiting Professor in YuanZe University (Taiwan).

His research interests lie in service and manufacturing flexibility, discrete optimization, ports container operations, matching and exchange, and healthcare. He is currently an area editor for OR (Operations and Supply Chains), and associate editor of management Science (Optimization). He has also served on several international committee such as the Chair of the Nicholson Paper Competition (INFORMS, US), member of the IMPACT Prize Committee (INFORMS, US), Fudan Prize Committee on Outstanding Contribution to Management (China), and the Hong Kong PhD Fellowship Scheme Selection Panel.