Licensing Contracts: Control Rights and Options

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Operations Management Summer Camp 2012

Date: **Friday, 17 August 2012**

Venue: **Singapore Management University**
                Lee Kong Chian School of Business
                Level 1, Seminar Room 1.1

Programme	
8.30am- 8.45am	**Registration**
8.45am- 9.00am	**Opening Speech by Professor Howard THOMAS**, Dean of Lee Kong Chian School of Business, Singapore Management University
9.00am- 10.00am	**Paper I** Presenter: Lieven DEMEESTER Discussant: Saif BENJAAFAR **Title: Plant Networks for Processing Recyclable Materials** Abstract: We use a modified optimal market area model to examine how links between material recycling and other aspects of operations strategy can shape plant networks for the processing of recyclable materials. We show that the recyclate ratio, defined as the maximum recycled content, is complementary to material versatility and mini-scaling of recycling plants. We also find it is beneficial to coordinate investments in recycling- and production-related competencies because co-located recycling and production plants (mini-mills) eliminate recyclate transport. We therefore consider versatile mini-plants, defined as a competency that factors in both material versatility and coordinated mini-scaling of recycling and production plants, and we find that it complements both the recyclate ratio and localization of production plants, a competency that takes advantage of local adaptation and customer proximity. Comparing numerical examples for rolled aluminum and nylon resins in Europe, we find that the

	relative impact of the complementarities is large, as it is for nylon resins, if recycling is nascent and challenging economically and if the plant network is too centralized at first to benefit much from an increased recyclate ratio or increased localization. We find that, for the nylon resins network, considering an investment in the recyclate ratio as part of a coordinated investment plan drives the emergence of a decentralized and localized mini-mill network, even though an increased recyclate ratio does not link directly with either decentralization or localization. We conclude that material recycling, versatile mini-plants and localization can fit well together in a forward-looking, sustainable, operations strategy.
10.00am- 10.15am	**Tea Break**
10.15 am- 11.15am	**Paper II** **Presenter: WEE Kwan Eng** **Discussant: Stephen Graves** **Title: To Pool or Not to Pool – The Effect of Waiting Time Related Costs on Queue Configuration** Abstract: We consider a two-server queuing system in which the servers choose their service rate based on a customer allocation scheme offered by the demand generating entity. We study the effect of waiting time related cost associated with a customer order on the choice of queue structure (pooled systems versus split queue systems). Our results suggest that the pooled system or the split queue system may be the better system depending on system parameters.
11.15am- 11.30am	**Tea Break**
11.30am- 12.30pm	**Paper III** **Presenter: LIM Yun Fong** **Discussant: TEO Chung-Piaw** **Title: Dynamic Pricing for Hotels Considering Multiple-Day Stays** Abstract: We study a dynamic pricing policy that maximizes the expected revenue of a hotel with a single type of rooms. The demand for these rooms is stochastic and nonstationary. Our model captures the capacity requirement of customers staying for multiple days and allows us to determine the optimal booking price for each individual day. We find that to maximize the revenue, the hotel should not only substantially raise the booking prices for high-demand days, but also substantially lower the booking prices for those low-demand days that are

	immediately adjacent to the high-demand days. This ensures an attractive average daily booking price for customers staying for multiple days. For large-size problems we develop two heuristics that determine the booking prices almost instantly when a customer makes a request. Numerical experiments suggest that these heuristics generate significantly more revenue than the fixed-price heuristic found in the literature.
12.30pm- 2.00pm	**Lunch**
2.00pm- 3.00pm	**Paper IV** **Presenter: Pascale CRAMA** **Discussant: Yi XU** **Title: Licensing Contracts: Control Rights and Options** Abstract: The rise of the open innovation paradigm creates the opportunity and need for research and development (R&D) collaborations. R&D collaboration, however, can be challenging to manage because of the high degree of technical and market uncertainty as well as the difficulty in measuring research effort. We investigate how the contracts between the innovating parties structure the R&D collaboration and jointly optimize the payment terms and launch control rights, to offer the correct incentives to the innovator and the marketer. We find that the nature of the impact of the research effort matters as milestone payments are not always effective in encouraging research effort. To improve the effectiveness of milestones, it can be optimal for the innovator to grant the launch control right to the marketer to create a credible threat that marginally profitable research outcomes will not be launched. Adding flexibility to the contracts refines these results. First, buy out contracts allow to grant launch control to the marketer while still launching all profitable outcomes. Second, allowing the parties to renegotiate the contract after observing the outcome of the research phase further increases the contract value and can often achieve first-best.
3.00pm- 3.15pm	**Tea Break**
3.15pm- 4.15pm	**Paper V** **Presenter: Onur BOYABATLI** **Discussant: Volodymyr BABICH** **Title: The Impact of Budget Constraints on Flexible versus Dedicated** **Technology Choice** Abstract:

	This paper analyzes the impact of financial constraints in a capacity investment setting. We model a two-product firm that decides on its technology choice (flexible versus dedicated) and capacity level under demand uncertainty, and the production quantities after this uncertainty is resolved. Differing from the majority of the stochastic capacity investment literature, we assume that the firm is budget-constrained both in the capacity investment and production stages. Each technology incurs a variable investment cost, a fixed proportion of which is the capacity investment cost. We define this proportion as the capacity-intensity of the technology. When the capacity-intensity of the dedicated technology is larger than a threshold level, we demonstrate that the technology with the lower capacity-intensity is favored when compared to the budget-unconstrained case. An increase in the capacity-stage (production-stage) budget favors the technology with the higher (lower) capacity-intensity. In contrast to the budget-unconstrained case, we show that flexible technology may have value when the product markets are perfectly positively correlated. When the capacity-intensity of the dedicated technology is smaller than the threshold level, dedicated technology may enjoy a capacity-pooling benefit due to the limited budget available in the production stage. When this pooling benefits exists, dedicated technology is favored compared to the budget-unconstrained case. We also find that, due to this pooling benefit, the optimal capacity investment level with the dedicated technology can be larger than the budget-unconstrained level; and may decrease with a higher capacity- or production-stage budget.
4.15pm- 4.30pm	**Concluding Remarks by Professor Brian RODRIGUES**, Deputy Dean of Lee Kong Chian School of Business, Singapore Management University

Discussants' Profile:

Volodymyr BABICH is an associate professor of Operations and Information Management at the McDonough School of Business, Georgetown University. He earned his Ph.D. in Operations Research from Case Western Reserve University, Weatherhead School of Management, in 2003. He also holds M.S. degrees in Management Science and Mathematics, both from Case Western Reserve University, as well as a B.S. in Applied Mathematics from Kiev Polytechnic Institute. Prior to joining Georgetown University, he was an assistant professor at the University of Michigan, Ann Arbor, Industrial and Operations Engineering department. His research interests are the interface of operations and finance, supply risk management, supply chain management, stochastic modeling, and risk management. His research has been supported by grants from the National Science Foundation, University of Michigan, and industry. His papers have been published in top-tier Operations Research, Operations Management, and Industrial Engineering journals. Volodymyr Babich is a member of editorial boards for *Management Science* and *Production and Operations Management.* He is the Chair of the MSOM Special Interest Group on the "Interface of Finance, Operations, and Risk Management (iFORM)" and an active member of INFORMS and the MSOM society.

Saif BENJAAFAR is Head of Engineering Systems and Design at Singapore University of Technology and Design. He is Distinguished McKnight University Professor at the University of Minnesota where he was Founding Director of Industrial & Systems Engineering, Director of the Center for Supply Chain Research, and a Faculty Scholar with the Center for Transportation Studies. He was a Distinguished Senior Visiting Scientist at Honeywell Laboratories and a Visiting Professor at universities in France, Belgium, Hong Kong, China and Singapore. He Holds PhD and MS degrees from Purdue University and a BS degree from the University of Texas at Austin. His research is in the areas of supply chain management, service and manufacturing operations, and production and inventory systems, with a current focus on sustainability and environmental modeling. He is on the editorial board of several journals including *MSOM*, *POM*, *NRL*, and *IIE*. His papers have been published in various journals including *Management Science*, *Operations Research*, and *MSOM*. His research has been funded by NSF, DOT, DHS, and DARPA and other agencies and industry. He has consulted widely with leading companies and organizations such as Honeywell, General Mills, 3M, and the World Bank, among many others. He is a Fellow of IIE.

Stephen GRAVES is the Abraham J. Siegel Professor of Management Science at MIT. He received his A.B. and M.B.A. from Dartmouth College and completed his Ph.D. in operations research from the University of Rochester. Since 1977 he has been a faculty member at the MIT Sloan School of Management. He has served as a deputy dean at the MIT Sloan School, 1990 – 1993 and the co-director of the MIT Leaders for Manufacturing (LFM) Program (1989- 1990 and 1994 – 2001) and the System Design and Management (SDM) Program (1999 – 2001). He served a two-year term as the Chair of the MIT Faculty, 2001 – 2003. He has joint faculty appointments with both the Mechanical Engineering Department and the Engineering Systems Division at MIT. He is a Faculty Fellow of the Singapore-MIT Alliance.

TEO Chung-Piaw is currently a Professor, and Head of the Department of Decision Sciences in NUS Business School. He was the former Acting Deputy Dean and Vice Dean of Research in the Business School. He graduated from MIT with a PhD in Operations Research, and has taught in NUS and Sungkyunkwan University (Korea). He was a fellow with the Singapore-MIT Alliance Program, an Eschbach Scholar with Northwestern University (US), and a Distinguished Visiting Professor in YuanZe University (Taiwan). He is currently a department editor with Operations Research and an associate editor with Management Science. His research interest is in the interface of operations, analytics and optimization. In operations, he is looking at issues of flexibility and sustainability. In analytics and optimization, he is looking at choice inferences and predictive analytics using distributionally robust models.

Yi XU is an Assistant Professor of Operations Management at the Robert H. Smith School of Business at the University of Maryland. He received his Ph.D. in Operations Management from The Wharton School, University of Pennsylvania. He teaches and conducts research in the areas of operations management with an emphasis on product development and innovation, product variety/assortment planning, and Marketing and Operations Interfaces. He is particularly interested in exploring mechanisms that spur innovations and developments of new technologies which transform competitive dynamics and enable novel operational strategies. His articles have appeared in *Management Science*, *Marketing Science*, and *Manufacturing and Service Operations Management (MSOM)*, among others. He is a Senior Editor of *Production and Operations Management.*