The Hong Kong Polytechnic University
Department of Logistics and Maritime Studies
Research Seminar

Coordinating Supply and Demand on an On-demand Service Platform with Impatient Customers

by

Dr Rick SO
Professor of Operations and Decision Technologies
The Paul Merage School of Business
University of California, Irvine

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The Hong Kong Polytechnic University

(Conducted in English)

Abstract:
Consider a situation when an on-demand service platform uses earning sensitive independent providers with heterogeneous reservation price (for work participation) to serve its time and price sensitive customers with heterogeneous valuation of the service. As such, both the supply and demand are endogenously dependent on the price the platform charges its customers and the wage the platform pays its independent providers. In this paper, we present a queueing model with endogenous supply (number of participating agents) and endogenous demand (customer request rate) to model this on-demand service platform. To coordinate endogenous demand with endogenous supply, we use the steady state performance in equilibrium to characterize the optimal price and wage rates that maximize the profit of the platform (as well as the total welfare). We first analyze a base model that uses a fixed payout ratio (i.e., the ratio of wage over price). We then extend our model to allow the platform to adopt a dynamic payout ratio. Based on our analysis, we find that it is optimal for the platform to charge a higher price, pay a higher wage, and offer a higher payout ratio when the potential customer demand increases. Furthermore, when customers become more sensitive to waiting time, the platform should also pay a higher wage and offer a higher payout ratio, but the price rate is not necessarily monotone. We use a set of actual data from a large Chinese on-demand ride-hailing platform in numerical experiments to illustrate some of our main insights.

Bio:

Dr. Rick So is Professor of Operations and Decision Technologies at the Paul Merage School of Business at the University of California, Irvine. His 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. He has served as the Associate Dean of Undergraduate Programs for five years, and has recently won an Excellence in Teaching Award and Faculty Service Award at the School.

Please email to eunice.yt.wong@polyu.edu.hk for enquiries.

All are welcome!