A Prologue to the Special Issue on Not-for-profit Operations Management

The rise of the non-profit sector as the "third sector", after the public sector (i.e., government and its agencies) and the business sector (i.e., for-profit corporations), in the last few decades have made it an important part of modern economy. In the production and operations management community, a growing attention is being paid to address issues arising in not-for-profit operations and nonprofit organizations. This special issue is intended to present the state-of-the-art research progress on related subjects and to foster additional research into this important emerging area in production and operations management.

In summarizing the contributions of papers in this issue, we will follow the taxonomies and typologies presented by the recent handbook, "*The Routledge Companion to Production and Operations Management,*" edited by M. K. Star and S. K. Gupta (2017). Specifically, Chapter 27 "*Not-for-Profit Operations Management*" and Chapter 29 "*POM for Disaster Management*" provide a thorough framework for research developments and directions on related topics, which we adopt in this prologue.

As we walk through the papers presented in this issue, the reader can quickly realize that each study presents some unique features associated with not-for-profit operations that are different from those with for-profit operations. Papers are grouped into different major topics relevant in nonprofit operations.

1. A nonprofit supply chain

An interesting example is given by Geismar, Sriskandarajah and Zhu ("*A Review of Operational Issues in Managing Physical Currency Supply Chains*"), who comprehensively review the management of currency supply chain and identify many unique operational aspects involved in the interactions among the central bank, commercial banks and third party logistics providers.

2. Fundraising

Different from for-profit operations, philanthropic or donative funds consist of the major support for not-for-profit operations to achieve their value (e.g., religious, political, humanitarian, moral, etc.). Donations, typically coming from foundation support, corporate support, individual support, government support and planned giving, are heavily affected by fluctuations in the economy, leading to uncertainty in operating budget. This is reported in the study by Gallien, Rashkova, Atun and Yadav ("*National Drug Stockout Risks and the Global Fund Disbursement Process for Procurement*"). They find the unpredictability of fund disbursement induces frequent stockout of life-saving drugs, despite the substantial financial aid from international donors. Natarajan and Swaminathan ("*Multi-Treatment Inventory Allocation in Humanitarian Health Settings under*

Funding Constraints") make a similar observation that uncertainty in periodic funds poses challenges in patient treatment decisions.

The dependence of operational efficiency on funding flow can also be reversed in many contexts. In particular, donors may want to evaluate the past operational performance before providing further support. Such a reverse dependence creates endogeneity in fundraising process. Devalkar, Sohoni and Arora ("*Ex-post funding: How should a resource constrained non-profit organization allocate its initial funds*?") explicitly discuss such a scenario where the donors choose to fund projects showing early positive outcomes. They analyze how social development projects could be staged so that endogeneity of funding stream can be created.

3. Revenue Management

Though the major support of not-for-profit operations comes from donative funds, revenue raised by charging for the product or service offered is becoming increasingly a large portion of the budget. Fee-charging helps to mitigate the uncertainty in fundraising and supplement funding deficiency. In addition, paying a modest price for the product or service can create ownership or buy-in for the customers, increase the quality of the product or service perceived by the customers, and preserve the dignity of the customer.

To optimize the use of products and services, a portfolio of fee structures or prices can be used to segment the customers into specific characteristics. Tereyagoglu, Fader and Veeraraghavan ("*Pricing Theater Seats: The Value of Price Commitment and Monotone Discounting*") propose a pricing segmentation based on customers arrival times to theaters. They show that when the customers' valuations exhibit certain dependence on their arrival times, committing a decreasing price path overtime can improve revenue, sales and customer visits.

4. Resource Management

Resource management for not-for-profit operations shares many similarity with its for-profit counterparts. Both aim at achieving a certain objective by efficiently utilizing and allocating resources involving budget and operating capacity (e.g., manpower, vehicles, equipment, rooms). Celik, Loca, Ergun and Keskinocak ("*An Optimization-Based Decision Support Tool for Post Disaster Debris Operations*") study debris removal and recycling after a major disaster. They formulate a comprehensive decision model involving resource management of work teams for collection and transportation, landfill capacities, and debris processing capacities.

When resources are limited, whether or not a not-for-profit operation can achieve its intended goal depends largely on the way resources are allocated to various activities. Kohnke, Mukherjee and Sinha ("*Towards Reducing Global Inequity in Surgical Care Delivery: NPOs as Enablers*") investigate a delicate interactions among awareness, access and care delivery efforts in children congenital heart surgery to underserved communities. Even with ample resources, operational efficiency can be dampened without appropriate coordination. An example is discussed by Mun, Rafique and Zhao ("*Designing Energy Supply Chains for Economic Prosperity and Environmental Sustainability*"). They propose efficient solutions for a coal-fired energy

supply chain involving coal mining and transmission to design location and energy flow under the restriction of government policies.

5. Distribution

Like in any other operations, the process of distributing product and service in not-for-profit operations concerns offering choice, supplier and inventory management, market distribution and allocation.

The objective of procurement and inventory management in not-for-profit operations is generally not cost minimization. Other considerations can dominate. For example, in the process of disaster relief, reducing response time become an important goal in supply management; In the event of epidemic, time to eradicate the disease is a crucial consideration for vaccine inventory distribution. Natarajan and Swaminathan ("*Multi-Treatment Inventory Allocation in Humanitarian Health Settings under Funding Constraints*") analyze drug distribution to patients classified into different health states. They identify the optimal procurement and inventory management policy to minimize the disease-adjusted life periods lost. Atasu, Toktay and Yeo ("*Effective Medical Surplus Discovery*") suggest that medical inventory allocation among different facilities should consider the medical profiles of the patients. They focus on identifying fair allocation of limited products like vaccine and antibiotics for contagious disease by taking into account the recipients' needs. Karaer, Kraft and Khawam ("*Buyer and Nonprofit Levers to Improve Suppliers Environmental Performance*") present a model to understand the effect of supply contract and supplier competition on supplier's environmental performance.

Distributions of product and service to underserved communities are often subsidized by governments and nonprofit organizations. Subsidy programs are offered to allow access to needed products for low socioeconomic population or to popularize products with improved social value. Berenguer, Feng, Shanthikumar and Xu ("*The Effects of Subsidies on Increasing Consumption through For-Profit and Not-For-Profit Newsvendors*") compare the efficiency of administering subsidy programs through for-profit and not-for-profit channels.

Not-for-profit operations often involve a fragmented supplier base, consequently coordination among suppliers is often a determinant for the success. This is discussed explicitly in two papers in this issue. Liao and Chen ("*Farmers' Information Management in Developing Countries - A Highly Asymmetric Information Structure*") study supply decisions made by farms. They analyze the effect of information asymmetric on agriculture outputs and farmer's welfare. Toyasaki, Arikan, Falagara and Silbermayr, ("*Disaster Relief Inventory Management: Horizontal Cooperation between Humanitarian Organizations*") investigate inventory coordination among multiple agents in the United Nation Humanitarian Response Depot network.

We hope that the studies reported in this issue can bring increased interest and further research work in the area of not-for-profit operations management.

References

Starr, M. K. and S. K. Gupta. 2017. The Routledge Companion to Production and Operations Management, Routledge, New York, NY

Feng, Q. and J. G. Shanthikumar. 2017. Not-for-Profit Operations Management, Chapter 27, pp 510-526, The Routledge Companion to Production and Operations Management, Starr, M. K. and S. K. Gupta (eds), Routledge, New York, NY

Robertson, P. W., S. K. Gupta and M. K. Starr. 2017. POM for Disaster Management, Chapter 29, pp 543-556, The Routledge Companion to Production and Operations Management, Starr, M. K. and S. K. Gupta (eds), Routledge, New York, NY

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