

Editorial

Service Optimization and Control

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Service operations are critical in modern business. Service providers, such as those in the telecommunication industry and other retailing sectors, are providing services to the market with a goal of optimizing their own profit. However, a service operation is different from the operations which manage the “physical products.” For example, many traditionally critical decisions such as the optimal “physical product” production quantity and optimal “product” quality control are no longer relevant [1, 2]. This calls for a totally new engineering mindset and novel analytical models in order to optimize the performance of the respective service systems.

This special issue is devoted to publishing the latest and significant results on scientific research in service optimization and control. This special issue puts high emphasis on the advance of optimization methods and real world applications from a systems engineering perspective. Thus, there are both analytically focused studies as well as empirical analyses. It is also interesting to note that a couple of papers are adopting both the analytical and the quantitative empirical approaches. Thus, we can see the multidisciplinary as well as multimethodological nature of the service optimization related research.

After conducting rigorous peer review, this special issue has accepted 14 technical papers related to service optimization and control. We describe each one of them concisely as follows.

In “*A capacitated location-allocation model for flood disaster service operations with border crossing passages and probabilistic demand locations*,” motivated by the consequences of flood disasters, S. A. Mirzapour et al. explore the proper locations of relief rooms to provide the needed service.

They formulate the problem as a p-center location problem. They model the problem as a mixed integer nonlinear optimization problem with the capacitated facility location-allocation consideration. They simultaneously consider the probabilistic distribution of demand locations and the line barrier in the given region. They try to minimize the maximum expected weighted distance from the relief rooms to all the demand regions. This optimization objective helps to decrease the evacuation time of people from the affected areas before flood occurrence. To illustrate the applicability of their model, they present a real case study.

In “*Service quality of online shopping platforms: a case based empirical and analytical study*,” T. M. Choi et al. study the service business model of online shopping platforms (OSPs). They focus on customer service aspect of OSPs and examine the specific case on http://www.taobao.com/index_global.php. They identify the customer perceptions of the service quality associated with Taobao's functions. They also explore these functions' impacts on customer loyalty. From an empirical study, they find that the “fulfillment and responsiveness” function is most significantly related to the customer loyalty. Based on this empirical finding, they conduct an analytical study and derive the optimal service level on this most critical function. By employing the safety first optimization objective, they prove that the optimal service level uniquely exists. Their further analysis reveals that a bigger optimal service level results if the customer loyalty is positively correlated to the service level. In addition, they find that the optimal service level is independent of the respective profit target under the safety first objective, the source of uncertainty, and the risk preference of the OSP company.

In “*Performance analysis and optimization of an adaptive admission control scheme in cognitive radio networks*,” S. Jin et al. study the cognitive radio networks with the secondary user (SU) packets. To be specific, they propose an adaptive admission control method with a system access probability for the SU packets. They introduce an adaptive factor which helps to adjust the system access probability. By building a discrete-time preemptive queueing model with adjustable joining rate, they conduct analytical exploration. To derive the steady-state distribution of the queueing model, they construct a two-dimensional Markov chain model. They conduct a computational study and present numerical findings on the impacts brought by the adaptive factor. They further derive an optimal pricing mechanism for the system.

In “*Emergency department staffing: a separated continuous linear programming approach*,” X. Wang explores overcrowding problem in the emergency department of hospital. She argues that the shortage of staff members in the emergency department is the root problem. Based on this argument, she constructs a new analytical model to address the emergency department staffing problem. To be specific, she models the problem as a separated continuous linear programming problem. She develops an efficient algorithm to determine the optimal emergency department staffing level under the total cost minimization objective.

In “*A model for assessing the service quality of university library websites*,” C. M. Wu et al. explore the criteria for assessing the service quality of library websites. They examine the problem from university students’ viewpoints. Based on the fuzzy Delphi method, they employ the ANP approach to generate the priority weights of criteria. In total, a list of 12 web-based service criteria is identified according to the empirical inputs from over 3000 university students. These criteria include choices for searching for information, protection of personal information, website availability, and so forth. Different from prior research which ignores the important interdependence among criteria, C. M. Wu et al. propose the ANP approach which can capture this interdependence and they argue that their proposed results are more accurate.

In “*Crowdsourcing new product design on the web: an analysis of online designer platform service*,” X. Dai et al. study the business model called the Designer Platform Service (DPS). In fact, DPS is a combined mechanism of crowdsourcing and group buying on the web. It helps boost the growth of entrant fashion designers and links designing tasks with the real world market. They conduct an analytical optimization study on how the optimal pricing and minimum production quantity decisions are made in the DPS. They consider factors such as the entrant designer’s objective, the specific decision sequences, and the structures of demand. They investigate the problem by developing the model as a Stackelberg game and derive the respective equilibrium solutions.

In “*Review on the research for separated continuous linear programming: with applications on service operations*,” X. Wang conducts a technical review on the research for Separated Continuous Linear Programming (SCLP). She examines several important formulations of SCLP. She discusses the SCLP related duality theory and solution method.

She argues that most results on duality theory can provide the analytical conditions for SCLP to exhibit strong duality. She further reveals that most solution approaches for SCLP belong to either the simplex-like or the discretization-based category. She finds that the simplex-like approach helps to get the exact optimal solution but is computationally very time-consuming whereas the discretization-based methods are fast but can only lead to the approximate solutions.

In “*Cooperative advertising in a supply chain with horizontal competition*,” Y. He et al. examine the advertising strategies for a supply chain with two suppliers and one buyer. They study the supply chain system in three different cases: (i) each supply chain agent makes individual decisions independently, (ii) the retail buyer is integrated with one manufacturer, and (iii) both manufacturers are horizontally integrated. They analytically find that the manufacturer’s optimal advertising efforts are independent of the participation rates offered to the retail buyer in all three cases. They argue that when the retail buyer is integrated with one manufacturer, the other manufacturer’s optimal advertising efforts will not be affected. For the case when both manufacturers are horizontally integrated, they reveal that these two manufacturers would reduce the advertising efforts to avoid conflict.

Incentive alignment contracting is an important measure in supply chain management. In “*Contract strategies in competing supply chains with risk-averse suppliers*,” B. Li et al. study analytically the equilibrium contracting strategies in the presence of two competing supply chains. In their model, each supply chain includes one risk-averse supplier and one risk-neutral retailer. The supplier in each supply chain acts as the Stackelberg leader and can choose either the wholesale pricing contract or the revenue sharing contract to offer to the retailer. They study the impacts brought by factors such as competition density and degree of risk aversion on the suppliers on the equilibrium contract choices. They interestingly find that it is always an optimal decision for the first-moving supplier to choose the revenue sharing contract if the second-moving supplier chooses the wholesale pricing contract. They further reveal that the optimal retail price under the revenue sharing contract is lower than the one under the wholesale pricing contract. They also find that there is a threshold policy on the degree of risk aversion for the suppliers which influences their optimal choice on the individual contract types. These ultimately would affect the contract strategies under the competing supply chains scenario.

In “*Congestion service facilities location problem with promise of response time*,” D. Hu et al. study the congestion service facilities location problem in which there is a response time promise. They explore the problem via a queueing model which assumes the customer demands are generated at each node and requests for service arrive as a random variable following the Poisson process. They consider the response time to include sojourn time and travel time. They propose a mixed integer nonlinear programming model for locating service facility with the promise of response time. They take the locations of the service facilities and the number of servers at each facility as the control variables. In their optimization model, the objective function is to maximize

the demand being served within the promised response time. They propose a hybrid algorithm which combines greedy and genetic algorithms to solve the problem. They conduct a number of computational experiments to test the performance of the algorithm and propose that the response time promise has a critical effect on the optimal location decision.

In “*On advertising games and spillover in service systems*,” L. Xu et al. analytically model the advertising competition game between a dominant service provider and some smaller service providers. They consider the scenario when the dominant service provider enjoys a larger market share, and the other smaller service providers only share the remaining “smaller” market share equally. They explore three advertising game models, which include the cooperative game, the Boxed Pig game, and the Prisoner’s Dilemma game. For each game, they derive the conditions for having an equilibrium. They reveal that the advertising spillover and the number of the smaller service providers affect substantially the equilibria. They also discuss the research implications.

In “*Order allocation research of logistics service supply chain with mass customization logistics service*,” W. Liu et al. observe that customers have a high demand for specialized and customized logistics services. Motivated by the industrial practice in logistics service supply chain (LSSC) management, they study the order allocation between a logistics service integrator (LSI) and several functional logistics service providers (FLSPs). They focus on the logistics service under mass customization. They formulate a multiobjective order allocation model of LSSC. The problem is constrained with respect to factors such as customer demand, customer order decoupling point, and order difference tolerance coefficient. Their analysis reveals that the LSI prefers FLSPs in the presence of a higher scale effect coefficient. They also show that setting a high relationship cost coefficient does not necessarily yield enhanced results. They further demonstrate that for the FLSPs, a continuous improvement of large-scale operational capacity is desirable. Moreover, they argue that if the LSSC’s comprehensive order allocation performance is high, then the LSI will offer cost compensation in order to improve the LSSC’s level of satisfaction.

Motivated by industrial practices price comparison service (PCS) websites, in “*The impact of price comparison service on pricing strategy in a dual-channel supply chain*,” Q. Xu et al. examine the pricing strategies of retailers and supplier in a dual-channel supply chain influenced by the presence of PCS. They categorize the problem with respect to the signal availability of PCS and formulate three specific cases. For each case, they analytically derive the corresponding optimal pricing strategy. They further conduct a numerical analysis. Their study shows several important insights, which include the following: when the retailers are all affected by the PCS, the supplier is more willing to reduce the availability of price information.

In “*Sales forecasting for fashion retailing service industry: a review*,” N. Liu et al. conduct a comprehensive literature review on the topic of fashion retail sales forecasting. They focus on exploring the advantages and the disadvantages of different kinds of fashion retail sales forecasting models. They

also study the real world applications of the fashion retail sales forecasting models. From the reviewed literature, they comment that, over the past 15 years, the pure statistical methods are not popularly examined in the literature. In fact, most studies are focusing on the deployment of artificial intelligence methods and some hybrid models. They argue that the use of hybrid methods for fashion retail sales forecasting is trendy and timely, and it is still a promising area for further explorations.

We believe that this special issue presents many interesting and innovative research on service optimization and control related problems. We hope the published papers will provide a good foundation for future scientific research related to service optimization and control.

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