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Introduction to the Special Issue on Sharing Economy and Innovative Marketplaces

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The last decade has seen rapid growth in business models built around digital platforms that bring together buyers and sellers to interact and trade in new and innovative ways. This growth has been fueled by pervasive internet and increased access to smart, connected, and mobile devices. Some of these platforms have been successful in overcoming the inefficiencies of peer-to-peer interactions by reducing transaction and search costs, facilitating payments, reducing moral hazard, and enabling trust among strangers. Others have been successful in reducing the costs of providing services on demand by harnessing economies of scale, tapping into idle assets, or leveraging the crowd. This has also led to the adoption of business models of products as services built around selling a product's functionality instead of the product itself. These business models have ushered in new forms of economic interactions that have been alternatively referred to as the "sharing economy," "on-demand economy," and "platform economy." In all cases, these new forms of economic interactions are moving economic activity away from traditional firms to innovative marketplaces where the buyers and sellers of products and services are *many* and engage in *many* small transactions.

This special issue features emerging research in operations management (OM) that is beginning to study these new forms of economic activity, the associated business models, and the underlying operational processes. For the OM community to be at the forefront of the study of this new economy is perhaps natural, given that the central challenge for these innovative marketplaces is one involving the efficient matching of supply and demand. It has been exciting to see the rapid growth in research in this area over the last five years and the growing consensus that this area will be core to the development of OM research in the future.

The call for papers for this special issue was announced in August 2017. We received 73 submissions. Ten of those papers were accepted in time to be included in this special issue, with four more still in the review process and may be published in a future regular issue. The papers included in this issue cover a lot of ground and illustrate the wide range of applications, research questions, and research methodologies being deployed, including papers grounded in analytical modeling, empirical evidence, and laboratory experiments.

Below, we briefly comment on each of the papers.

Impact of the Sharing Economy

A vital research stream in the literature explores the impact of the sharing economy on society and the welfare of various market participants (see, for example, Benjaafar et al. 2019). In this issue, Tian et al. (2021) take this perspective by investigating the impact of peer-to-peer product sharing on whether manufacturers should offer business-to-consumer rental services and the resulting implications on consumer surplus and social welfare. They identify two factors that affect the manufacturer's entry decision: production cost and the peer-to-peer transaction cost. They characterize conditions under which the manufacturer's participation in the sharing market is profitable and beneficial to both consumers and society.

Moderating Role of the Platform

Another critical research stream studies the intermediary role of a platform in a marketplace that connects buyers and sellers. The platform's decisions may include pricing decisions applied to either the supply or demand side (or both), detailed matching decisions

of connecting buyers to sellers at the operational level (see, e.g., Hu and Zhou 2021), and decisions about matching capacity, information disclosure, and payment schemes. Papers in this issue explore several of these decisions.

• *Transaction fee design*. Although a platform may not always be able to dictate transaction prices, it can influence the transactions by, for example, charging commission rates (fees proportional to the transaction prices) or subscription fees (fees that are fixed and independent of transaction prices). Birge et al. (2021) study the optimal commission/subscription design in a marketplace where there exists an underlying network governing the compatibility between different types of buyers and sellers. They show that it is generally optimal to charge network-position-dependent commissions/subscriptions. Under the assumption that all traders on the same side are charged the same commissions/subscriptions, they provide bounds on the revenue loss in terms of the supply-demand imbalance induced by the network structure.

• *Rating system design*. Peer-to-peer marketplaces often rely on a rating system to evaluate and reveal the quality of the goods and services listed as well as the quality of the providers. These ratings, in turn, influence future matching outcomes in the market. However, the prevalent rating systems, which are typically based on numeric scales (e.g., five-star ratings), have been shown to lead to rating inflation. Garg and Johari (2021) adopt a combined experimental and analytical approach to show, in the context of an online labor market, that positive-skewed verbal rating scales with more positive choices than negative ones lead to more informative ratings.

• *Information moderation on a retail platform*. E-commerce platforms, such as Amazon Marketplace and Alibaba's Taobao, have superior market information than the individual sellers that sell through these platforms. The platform can influence the pricing decisions of competing sellers through its information disclosure strategy. Liu et al. (2021) study whether, with whom, and with what accuracy the platform should share demand information among individual sellers. The authors show that such information sharing is beneficial to the platform and the sellers. However, it may not be optimal to share all the information with every seller.

• *Interventions in an online labor market*. In a two-sided marketplace, there are typically frictions in the form of search and screening costs that participants face that lead to a loss in welfare. Arnosti et al. (2021) adopt the notion of mean-field equilibrium to study equilibrium outcomes in a labor market consisting of job seekers and employers. The authors show that simple market interventions, such as limiting the number of applications a job seeker can send, making it more costly to apply, or setting an appropriate market-wide wage, can significantly improve welfare for participants on one or both sides of the market.

The Management of Crowdsourcing

A growing body of literature considers settings where supply, such as workers, goods, funds, and even ideas, is crowdsourced. Three papers in this issue study the design and operations of crowdsourcing in the context of innovation contests and crowdfunding.

• *Crowdsourcing contest*. Online crowdsourcing contests are increasingly being adopted by seekers to solicit innovative solutions to their problems. Jiang et al. (2021a) study how seekers should specify their problems, considering contestants' participation decisions and responses to the problem specification if contestants do participate. Using a combination of theoretical and empirical approaches, the authors show that participation decreases in the number of conceptual objectives disclosed in the specification, whereas more effort is exerted by participants if there are more execution guidelines disclosed in the specification. The best solution's quality increases in the number of more execution guidelines but suffers from too many conceptual objectives.

Körpeoğlu et al. (2021) use a theoretical model to study the optimal duration and award scheme of an innovation contest, taking into account contestants' participation decisions up-front and, if any, their decisions about effort over the contest duration. The authors show that the optimal contest duration increases in the novelty of solicited solutions and decreases in the agents' productivity over time. They also show that offering multiple awards is optimal if seekers are patient enough. Otherwise, the winner-takes-all award scheme is optimal.

• *Crowdfunding*. Reward-based crowdfunding is a form of financing that allows entrepreneurs to raise funds from potential backers. Burtch et al. (2021) study how entrepreneurs should allocate their marketing campaign efforts of sending out referral links to their contacts throughout the pledging process. Using a dynamic programming formulation, the authors show that the optimal strategy depends on whether future contributions, as a function of current funding levels, are concave, convex, or S-shaped. They use data from a crowdfunding website to calibrate the model and show that the S-curve model provides the best fit with the data.

Other Context-Based Operational Problems

A growing body of literature focuses on operational features that are specific to particular applications. For example, in the context of vehicle sharing systems, such as car, bike, and scooter sharing systems, an essential operational decision is the repositioning of vehicles in response to unbalances that arise because of the randomness in trip characteristics (e.g., randomness in trip origins, destinations, and durations); see, for example, Benjaafar et al. (2021b). Two papers in this issue address application-specific features in the context of ride hailing and online advertising.

- *Ride hailing*. Ride-hailing, arguably the most studied sharing economy application, has presented the OM community with a rich set of problems. This includes the issue of how best to match supply and demand as they vary spatially and temporally, a problem whose difficulty is compounded by the agency of drivers who can decide when and how much to work and where to position themselves; see, for example, Cachon et al. (2017), Taylor (2018), Bai et al. (2019), Bimpikis et al. (2019), Besbes et al. (2019), Benjaafar et al. (2021a), Bernstein et al. (2020), and Hu et al. (2021). In this issue, Jiang et al. (2021b) take a behavioral perspective and examine how behavioral biases, such as regret aversion, may influence drivers' relocation decisions. Using a combination of behavioral modeling and controlled laboratory experiments, the authors show that regret-averse workers are more willing to relocate to areas with a supply shortage than rational workers and propose platform interventions to improve system performance.
- *Online advertising*. In online advertising, advertisers acquire impressions via a network of intermediaries with multiple tiers. Balseiro et al. (2021) study how intermediaries should bid on behalf of their customers under the choice of a mechanism by an upstream intermediary and how the structure of the intermediation network affects the intermediaries' profits. Using a game-theoretic model, the authors characterize the intermediaries' equilibrium bidding policies and show that an intermediary's position in the intermediation network significantly impacts its profit.

We hope that the papers in this special issue spur even greater interest in topics related to the sharing economy and innovative marketplaces and help advance research in this area. Interested readers may refer to Hu (2019) for a collection of earlier works and to Benjaafar and Hu (2020), Chen et al. (2020), and Hu (2020) for a discussion of opportunities for future research.

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