On-demand service platform operations management: a literature review and research agendas

Xiaoyu Yan and Weihua Liu
Tianjin University, Tianjin, China

Victor Shi
Lazaridis School of Business and Economics, Wilfrid Laurier University, Waterloo, Canada, and

Tingting Liu
Tianjin University, Tianjin, China

Abstract

Purpose – The literature review aims to facilitate a broader understanding of on-demand service platform operations management and proposes potential research directions for scholars.

Design/methodology/approach – This study searches four databases for relevant literature on on-demand service platform operations management and selects 72 papers for this review. According to the research context, the literature can be divided into research on "a single platform" and research on "multiple platforms". According to the research methods, the literature can be classified into "Mathematical Models", "Empirical Studies", "Multiple Methods" and "Literature Review". Through comparative analysis, we identify research gaps and propose five future research agendas.

Findings – This paper proposes five research agendas for future research on on-demand service platform operations management. First, research can be done to combine classic research problems in the field of operations management with platform characteristics. Second, both the dynamic and steady-state issues of on-demand service platforms can be further explored. Third, research employing mathematical models and empirical analysis simultaneously can be more fruitful. Fourth, more research efforts on the various interactions among two or more platforms can be pursued. Last but not least, it is worthwhile to examine new models and paths that have emerged during the latest development of the platform economy.

Originality/value – Through categorizing the literature into two research contexts as well as classifying it according to four research methods, this article clearly shows the research progresses made so far in on-demand service platform operations management and provides future research directions.

Keywords On-demand platform, Platform operations management, Service platform, Literature review

Paper type Research paper

1. Introduction

Taking advantage of information technology and the increase of Internet users, service platforms have emerged and developed rapidly (Wu *et al.*, 2020). The European Commission (2015) reported that between 2001 and 2011, online platforms impressively accounted for over

50% of GDP growth in the United States and about 30% of GDP growth in the European Union (Chen *et al.*, 2020). PricewaterhouseCoopers predicted that service platforms would generate over US$330 billion in revenues worldwide by 2025 (Federal Trade Commission, 2016). Notably, in the last decade, the on-demand economy has experienced rapid growth and accumulated a large consumer base (Zhong *et al.*, 2019). The on-demand economy is supported by online platforms that match consumers' demands with service offerings upon receiving the order of consumers (Taylor, 2018). Typical examples include Uber, Airbnb in the United States, Didi-Chuxing, Eleme, Ctrip in China, Deliveryhero in Germany and Deliveroo in the United Kingdom (Yan *et al.*, 2021). On-demand platforms nowadays continue to grow and attract more consumers (Steinbach, 2020). Therefore, the on-demand service platform enterprise has become a hot research object in the field of operations management in recent years.

In operations management, scholars have begun to conduct rich discussions on on-demand service platforms. In the early stage of research, scholars paid more attention to the pricing of on-demand service platforms (Bimpikis *et al.*, 2019; Guda and Subramanian, 2019; Kung and Zhong, 2017). Related research on service platforms has also been extended to other management issues, such as regulatory policies, service menu formulation, quality management and risk management (Hong *et al.*, 2019; Yu *et al.*, 2020; Jacob and Roet-Green, 2021). According to the observations of the industry, there are many unique characteristics of on-demand service platforms that are different from traditional enterprises, such as network externalities, innovative business models and supply-demand matching. In addition, there is increasing competition or collaboration in the on-demand service platform space, encouraged by successful platforms.

However, no research has been done to review the literature on on-demand service platforms in the field of operations management. Such a review is critical to support scholars to understand the progresses in this field, clarify research gaps and identify valuable future research directions. We do find three literature reviews that are related to this study to some extent. Wang and Yang (2019) conducted a comprehensive review of the literature on ride-sourcing platforms from different perspectives. Benjaafar and Hu (2020) described three types of sharing platforms that have attracted much attention in operations management through a literature review. Chen *et al.* (2020) discussed the strategic and operational issues arising from five types of online platforms (resource sharing, matching, crowdsourcing, reviewing and crowdfunding) and pointed out some research opportunities for operations management scholars. Different from these three literature reviews, we focus on the issues in on-demand service platform operations management, dividing the existing studies into "Single platform" and "Multiple platforms", as well as categorizing them according to their research methods.

2. Paper selection and research method
2.1 On-demand service platform
The initial definition of a platform in the field of economics is a bilateral or multilateral market that allows multiple end-users to trade (Armstrong, 2006). However, with the spread of Internet technology, platforms are more generally regarded as structures that facilitate value interaction and value creation between providers and consumers. Platforms can be classified differently. State Administration for Market Regulation in China divided platforms into six categories for management: online sales platforms, life service platforms, social entertainment platforms, information platforms, financial service platforms and computing application platforms. Chen *et al.* (2020) focused on "virtual" online platforms that "do not own inventory of physical goods or contents", divided the online platforms into five types: resource sharing, matching, crowdsourcing, review, and crowdfunding platforms. Different from Chen *et al.* (2020), this paper focuses on on-demand platforms and does not consider technology platforms, digital platforms, e-commerce platforms, content platforms, crowdfunding platforms, contest platforms and crowdsourcing platforms. Combined with

the definition of on-demand service platforms by Taylor (2018) and Benjaafar and Hu (2020), the on-demand service platforms involved in this paper can be divided into two types. The first type is the on-demand instant service platform. When experiencing a need for service, customers expect immediate service and are sensitive to delays. Examples include restaurant food delivery (e.g. Caviar, DoorDash), consumer goods delivery (e.g. UberRush, Go-Mart), taxi-style transportation (e.g. Fasten, Go-Jek, Lyft, Uber; Taylor, 2018) and bicycle sharing (e.g. Hellobike, Mobike). The second type is the on-demand booking service platform. Customers get the experience after pre-booking the service on the platform. Examples include travel service (e.g. Ctrip), accommodation rental (e.g. Airbnb) and home healthcare service (e.g. Amazon Home Services).

2.2 Research method

To conduct a systematic literature review, this paper follows a classic literature review method (Fredriksson and Liljestrand, 2015). It identifies four stages of an effective literature review, namely planning, selection, extraction and execution. Figure 1 shows the relationship between the literature review and these four stages. During the planning stage, the purpose of the paper is defined. We first determine that the content involved in this literature review is the research on the on-demand service platform operations management. Eligible literature must contain two main elements. On the one hand, the decisions need to happen in the context of operations management. On the other hand, selected research needs to take the on-demand service platform as a decision-maker rather than studying the introduction of the platform as a variable. During the selection stage, four commonly used databases are selected: Wiley, Web of Science, Informs and ScienceDirect. Although four databases lead to a lot of overlap and we need to do a lot of work to eliminate these overlaps, relying on four databases ensures that no study is omitted.

Since the on-demand service platform is a relatively broad concept, it includes a variety of sub-type platforms. Some studies may not directly appear the keyword "on-demand
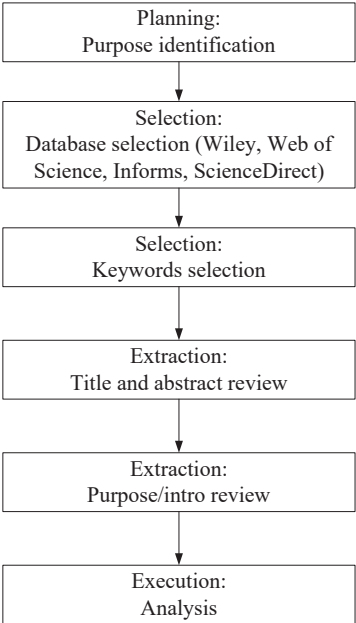

Figure 1.
Research process of the
literature review

platform", but use sub-type keywords, such as "ride-hailing platform", "rental platform". There are also some papers that study on-demand service platforms, but use keywords such as "sharing platform" and "service platform" to describe them. Therefore, the keywords searched in this paper include not only "on-demand platform" but also "service platform", "sharing platform", "ride-hailing platform", "ride-sourcing platform", "rental platform" and "delivery platform".

We search the databases of Wiley, Web of Science, Informs and ScienceDirect for papers containing the above keywords and further refine and screen them according to three principles. First, these papers may be double-counted. For example, the same paper may be retrieved using "sharing platform" or "on-demand platform" as a keyword. Duplicate papers screened by different keywords were eliminated. Second, we retain studies with on-demand service platforms as decision-makers. Studies that analyzed the introduction of a platform as a variable are excluded. Third, we only retain peer-reviewed published journals, excluding conference papers, working papers, commentaries, news and book reviews (Liu *et al.*, 2019a). To obtain a more authoritative research status and propose research agendas with a better reference value, we select the top journals in the field of operations management, including Management Science, Operations Research, Manufacturing and Service Operations Management, Production and Operations Management. In addition to these journals, we select authoritative journals that paid more attention to platform research in recent years, including Decision Sciences, European Journal of Operational Research, Omega, International Journal of Production Economics, and Transportation Research Part B: Methodological, Transportation Research Part E: Logistics and Transportation Review. For topics with a small number of studies, to present the research status more comprehensively, we also present some papers published in other than the above journals. According to the above principles, this paper finally selects 72 papers that are more consistent with the themes discussed in this paper as the analysis basis.

3. Literature overview

We conduct an analysis of the above literature by publication years, journals, authors and research methodology. As shown in Figure 2, with the increasing importance of platforms to economic development, the attention of on-demand service platform operations management has also increased in the past five years. As shown in Figure 3, top journals in the field of operations management also have related research on on-demand service platforms. For example, there are six related papers in Management Science, nine related papers in Manufacturing and Service Operations Management, two related papers in Operations Research and four related papers in Production and Operations Management. This also reflects the importance of the research topic of on-demand service platforms in the field of operations management. As shown in Figure 4, we conduct a summary analysis of the first author of the literature. We find that Ke, J., Zhong, Y., Li, Y., Benjaafar, S., Besbes, O., Choi, T. M. and Sun, L. have carried out more explorations in this field.
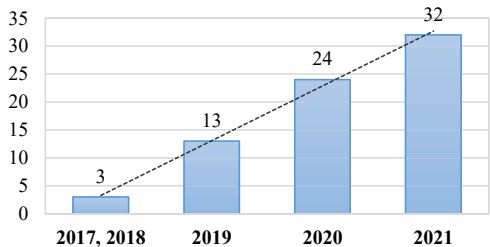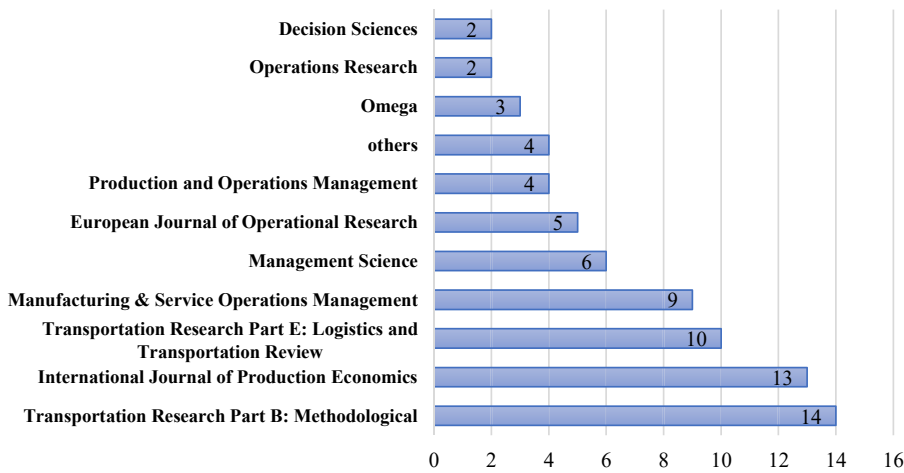

Figure 2.
Publication years analysis of the literature

Figure 3.
Journals analysis of the
literature

Figure 4.
Author analysis of the
literature

More deeply, we analyze the research contents and research methods of each research stream. In recent years, there has been an increase in competition or cooperation in the field of on-demand service platforms. For example, Uber launched its Uber Eats app to compete with local delivery platform Deliveroo in the UK Gaode-Map has cooperated with Didi-Chuxing to provide travel services to consumers. Therefore, the related research contents in this paper are divided into "Single platform" and "Multiple platforms". According to the classification of research methods, the selected studies can be divided into "Mathematical Models", "Empirical Studies", "Multiple Methods" and "Literature Review". As shown in Table 1, using mathematical model methods, most studies (47) are based on a single platform as the research object. The number of studies on collaborative research is far fewer than those on a single platform. In particular, four studies have been conducted by using multiple methods (Mathematical Models + Empirical Study), which have played an excellent guiding role in the in-depth study of on-demand service platform operations management.

	Mathematical models	Empirical study	Multiple methods	Literature review
Single platform	47	7	4	3
Multiple platforms	10	1	–	

Table 1.
Research methods
analysis of the
literature

4. Literature discussion

According to the review of Section 3, we find three literature reviews related to the research of on-demand service platforms. Wang and Yang (2019) proposed a general framework to describe ride-sourcing platforms. They conducted a comprehensive review of the literature on ride-sourcing platforms from different perspectives, including (1) demand and pricing, (2) supply and incentives, (3) platform operations and (4) competition, influence and regulations. Benjaafar and Hu (2020) described three types of sharing platforms that have attracted much attention in the field of operations management through a literature review: P2P resource sharing platforms, on-demand instant service platforms and on-demand rental networks. Existing studies are summarized, and future research opportunities are identified. Chen *et al.* (2020) discussed the strategic and operational issues arising from five types of online platforms (resource sharing, matching, crowdsourcing, reviewing and crowdfunding) and pointed out some research opportunities for operations management scholars.

Unlike the above literature review, we focus on the on-demand service platform and divide the related literature of on-demand service platform operations management into two categories: single platform and multiple platforms. As shown in Figure 5, we further refine the subcategories.

4.1 Single platform

4.1.1 Mathematical models. Through the analysis in Section 3, we find that there are many more studies (47) that take a single platform as the research object and use mathematical models as research methods. We divide this part into pricing-related research and non-pricing-related research according to the reading and arrangement of the literature contents.

4.1.1.1 Pricing-related research. On-demand instant service platforms face randomness that leads to excess demand during peak periods and excess capacity during off-peak periods, and they need to deal with customers with different price and time sensitivities – some are willing to pay a premium for expedited service and others are willing to wait longer in exchange for a discount. To effectively manage consumers and providers, platforms need to access real-time information and react dynamically. By sorting out the literature, we find a total of 12 studies on the dynamic pricing of the on-demand instant service platform considering the uncertainty of the time and space requirements (Cachon *et al.*, 2017; Bai *et al.*, 2019; Bimpikis *et al.*, 2019; Guda and Subramanian, 2019; Wu *et al.*, 2020; Yang *et al.*, 2020b; Abhishek *et al.*, 2021; Besbes *et al.*, 2021a, b; Chen *et al.*, 2021a; Dong and Leng, 2021b; Zhu *et al.*, 2021). For example, Bimpikis *et al.* (2019) explored spatial price discrimination in the context of ride-hailing platforms serving a network of locations. They highlighted the impact of demand patterns on platform prices, profits and consumer surplus. Yang *et al.* (2020b) proposed a novel incentive scheme combined with surge pricing to address situations where constrained surge pricing strategies may not balance demand and supply. They found that passengers, drivers and platforms all get better with a rewards program combined with surge pricing in some cases. Wu *et al.* (2020) considered the different distributions of passenger demand and car supply in different times and regions, established an intermediary pricing model for the
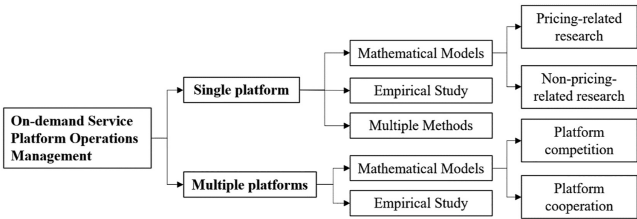

Figure 5.
Themes of this
literature review

transportation service market and evaluated the impact of spatial heterogeneity and network externalities on the pricing mechanism of online car-hailing platforms. Besbes *et al.* (2021a) and Besbes *et al.* (2021b) consider the pricing issues faced by revenue-maximizing platforms that match price-sensitive customers with flexible providers in geographic regions.

In addition to the above research on dynamic pricing, there are also two important aspects related to the pricing strategy of on-demand service platforms. On the one hand, scholars have analyzed the impact of different influencing factors on platform pricing, including customer delay sensitivity, customer congestion sensitivity, order response mechanism, value-added services and risk attitudes. Taylor (2018) examined how two defining characteristics of on-demand service platforms, latency sensitivity and provider independence, affect the platform's optimal service prices and wages. Liu *et al.* (2019b) studied the pricing strategies of a profit-maximizing platform, considering the impact of providers' threshold participating numbers, value-added services and matching capability on platform pricing decisions. Sun *et al.* (2019b) considered two types of driver selection: first to respond or closest to the customer. They took both ride details and driver location into account and assumed that drivers and customers maximize utility. Choi *et al.* (2020b) applied the mean-risk theory to explore how customers' risk attitudes affect optimal service pricing decisions for on-demand platforms, customers' consumer surplus, expected profits and profit risk of the platform. They also evaluate that the value of blockchain-mediated customized service pricing strategy. Zhong *et al.* (2020) focused on congestion sensitivity and classified customers into two types according to congestion sensitivity. Two pricing strategies are proposed for the platform to classify the customers.

On the other hand, existing studies have analyzed the choice of pricing strategies for on-demand service platforms from different perspectives. Kung and Zhong (2017) studied three pricing strategies: membership-based pricing, transaction-based pricing and cross-subsidization and analyzed the optimal pricing strategies of platforms under different conditions. Zhou *et al.* (2019) introduced a dynamic non-equilibrium ride-sourcing model that tracks the time-varying number of riders, vacant ride-sourcing vehicles and occupied ride-sourcing vehicles. They assessed three pricing strategies where the fare and wage are (1) time-varying and unconstrained, (2) time-varying and constrained so that the fare is higher than the wage such that the instantaneous profit is positive and (3) time-invariant and fixed. Nourinejad and Ramezani (2020) introduced a dynamic unbalanced riding model to track the number of passengers, vacant vehicles, and occupied vehicles over time. This paper evaluates three pricing strategies where fares and wages are (i) time-varying and unconstrained, (ii) time-varying and constrained, and (iii) time-invariant and fixed.

4.1.1.2 *Non-pricing-related research.* In addition to pricing decisions, according to our reading and sorting of existing literature, we find that the current research on on-demand service platform operations management also involves service optimization, quality management, demand management, provider management, policy supervision and other issues.

In terms of service optimization, some scholars have studied the supply-demand matching problem of on-demand instant service platforms (Ke *et al.*, 2020a; Yang *et al.*, 2020a; Guo *et al.*, 2021; Kong *et al.*, 2021; Lin *et al.*, 2021a). Such problems are biased toward the modeling, simulation and optimization of complex situations. For example, Yang *et al.* (2020a) proposed a model based on a ride-sourcing platform to examine the impact of matching time interval and matching radius on the system performance, and jointly optimize these two variables under different supply and demand levels. This paper also conducts numerical experiments to demonstrate how the proposed modeling and optimization method can improve the real-time matching of ride-sourcing platforms. Lin *et al.* (2021a) used mixed-integer linear programming models and a branch-and-price approach to study demand-supply matching strategies for home healthcare service platforms, considering the heterogeneity of clients and

service providers in need of care. In addition to the supply-demand matching problem, Zhan et al. (2021) and Li et al. (2020) studied the problem of route optimization in the ride-hailing field. Ke et al. (2020b, 2021b) and Jacob and Roet-Green (2021) focused on the ridesharing problem in the online platform and analyzed the impact of the existence of ridesharing services and the size of ridesharing vehicles on the overall system. Jiang and Fan (2020) studied how to model and optimize the problem of inaccurate parking in a shared parking space platform. Tang et al. (2021) modeled a two-stage queuing game, studied a "hybrid" system with "women-only" options and analyzed whether such a hybrid system would lead to win-win outcomes for all parties involved.

In terms of provider management, Dong et al. (2021) consider the case where ride-sourcing platforms recruit not only freelance/self-scheduling drivers but also some contractual drivers. They developed an aggregate modeling framework to examine the practicability of such a dual-sourcing strategy. Wang and Wu (2020) developed and analyzed a driver dispatching system for a control center that aims to minimize passengers' waiting time. They test the performance of the system with a simulation study based on actual past taxi order data. Sun et al. (2020a) considered two matching systems of platform operating: multiple drivers receive ride information and choose the first response; the platform assigns the driver closest to the customer. Using approximate queuing analysis, they derived optimal system allocation decisions on the platform and on the drivers' side. Avinadav et al. (2020) studied the contract design of a platform company in the platform service supply chain, where the quality of service delivered to consumers is jointly made by the quality decisions of the platform company and the service provider.

In terms of demand management, Chakravarty (2021) studied a ride-sourcing platform with a mix of driver types: full-time employees with a fixed salary and independent drivers with a revenue share. They analyzed two different demand rationing strategies: preference for full-time employee drivers and equal opportunity for all drivers. Wang et al. (2020b) explored the influencing factors of the average customer order cancellation rate based on the dataset provided by Didi-Chuxing. Furthermore, they proposed a system of nonlinear equations to depict the complex interactions between the ride-sourcing and taxi markets and highlighted the potential improvement of platform profit that can be achieved by appropriately designed penalty/compensation strategies. Zhang et al. (2021) proposed a dynamic repositioning model with predicted demand, where the repositioning time interval is fixed. They introduced a data-driven neural network to forecast the bicycle-sharing demand and used real-world cases to conduct data analysis.

In terms of quality management, Hong et al. (2019) developed an analytical framework to manage two different types of perceived risks associated with shared platforms: physical risks caused by security issues and performance risks caused by unsatisfactory service quality. Wen and Siqin (2020) used the mean-variance theory to model the risk-averse attitude of decision-makers. They deduced the best average quality level and price that the platform should provide the market through analysis and discussed the impact of product quality uncertainty and risk sensitivity on the platform's equilibrium decisions and consumer surplus. Sun et al. (2020b) studied the optimal investment strategy in terms of product quality, input quantity and dynamic advertising for a free-floating sharing platform that owns durable products and leases them to consumers. Li and Mu (2021) studied a platform's response decisions, such as fines, when there are offline transactions in the field of shared accommodation. They find that, contrary to conventional wisdom, consumers may be harmed by the introduction of offline transactions.

In terms of policy regulation, the existing literature has discussed the impact of external regulatory policies on a platform's profit, the consumers' utility and the providers' utility in on-demand service platforms (Li et al., 2019; Yu et al., 2020; Benjaafar et al., 2021; Ke et al., 2021a). For example, Benjaafar et al. (2021) examined whether providers are harmed by the

expansion of the labor pool size, analyzing optimal wage floor regulation and whether consumers are harmed by implementing wage floors. Yu *et al.* (2020) constructed a two-period game model to study the impact of regulatory policies on the welfare of different stakeholders (i.e. consumers, taxi drivers, on-demand ride-hailing companies and independent drivers). Li *et al.* (2019) assessed the impact of three proposed regulations for transportation network companies such as Uber, Lyft and Didi-Chuxing: (1) minimum wages for drivers, (2) maximum number of drivers or vehicles and (3) a congestion tax. Ke *et al.* (2021a) investigated the regulatory outcomes of various representative government regulations, including price cap regulation, vehicle size control, wage (per order) regulation, revenue (hourly earnings) regulation and vehicle utilization supervision.

4.1.2 Empirical studies. Compared with the research using mathematical models, there are relatively few empirical studies on on-demand service platform operations management. Through our reading and sorting of the literature, we find that for empirical research with a single platform as the research object, field experiments and natural experiments are the most common empirical research methods (Sun *et al.*, 2019a; Cui *et al.*, 2020; Wang *et al.*, 2020a; Huang *et al.*, 2021; Mejia and Parker, 2021; Xu *et al.*, 2021; Yan *et al.*, 2021). Such studies are often based on actual data provided by large, well-known platforms. Therefore, field experiments and natural experiments can go deeper into the industry, conduct research on the basis of actual data in the industry and obtain relevant management inspiration. Sun *et al.* (2019a) proposed an econometric framework with closed-form measures to estimate both the participation elasticity (i.e. extensive margin elasticity) and working-hour elasticity (i.e. intensive margin elasticity) of labor supply. On this basis, a natural experiment with exogenous shock was conducted using the data of Didi-Chuxing. Cui *et al.* (2020) explored ways to reduce racial discrimination using online reputation systems. They conducted four random field experiments among 1,801 hosts on Airbnb and found positive reviews on guest pages significantly reduced discrimination. Wang *et al.* (2020a) leveraged a unique dataset of a large-scale sample of Airbnb listings from New York City. They empirically examined the impact of unstructured emotional information that service providers offer on the popularity and sales of services in space-sharing platforms. Huang *et al.* (2021) investigated the impact of online–offline service integration on demand and reputational outcomes for e-healthcare. Using quasi-natural experiments on e-healthcare platforms, they investigated the moderating role of provider-specific characteristics by performing a differential analysis combined with different matching strategies. Mejia and Parker (2021) examined the impact of a rider's gender, race and perception of support for lesbian, gay, bisexual and transgender (LGBT) rights on cancelation rates. Xu *et al.* (2021) studied the effect of four aspects of information disclosure on the consumers' purchase behavior on the sharing platform through empirical evidence from Airbnb in eight major cities in the United States. Yan *et al.* (2021) used empirical evidence from an on-demand service platform (i.e. Meituan) to study the different determinants of consumer complaints against the platform and merchants.

4.1.3 Multiple methods. Multi-method research has been increasingly advocated by scholars in recent years (Jiang *et al.*, 2021). Through an in-depth reading of the existing literature, we find that there are also papers using multiple methods to research on-demand service platform operations management. Tong *et al.* (2020) deduced the impact of a platform's dynamic pricing strategy through a mathematical model. On this basis, the data of the three most commonly used on-demand catering service platforms in China are collected, and the impact of pricing strategies on platform performance is verified through data analysis. Chen *et al.* (2021b) studied the optimal bonus setting decision for a ridesharing platform. They modeled the driver's decision-making process and platform optimization problem as a Stackelberg game model, and conducted an empirical analysis using comprehensive data obtained from leading ridesharing platforms to calculate optimal bonus rates for different scenarios. Jiang *et al.* (2021) used a combination of behavioral modeling and

controlled laboratory experiments to explore how behavioral biases such as regret aversion affect employees' transfer decisions and system performance between under-supply and over-supply regions. Li *et al.* (2021) studied the optimal pricing problem for platforms with two service models, customized transit and ridesharing. They developed a questionnaire to measure the subjective value of the time of passengers, determined the relevant parameter values in the model according to the questionnaire results and conducted a sensitivity analysis to study the impact of different parameters on the optimal price and profit.

4.2 Multiple platforms
Through the analysis in Section 3, we find that the literature on multiple platforms (11) is far less than the literature on a single platform (58). Among these 11 studies, only one study adopted the method of empirical research. That is, Yu *et al.* (2021) explored the multi-homing behavior of ride-sourcing drivers with sensitivity to income and time/cost changes on multiple ride-sourcing platforms by using real-world data based on multinomial logistic regression. Existing research has taken competition as the research background and quantitatively considered platform decision-making in a competitive environment. For example, Zhong *et al.* (2019) determined the subsidy level of temporary providers and/or the employment level of permanent providers in monopolistic and duopoly competitive environments and analyzed the impact of the employment level of permanent providers and platform competition on the platform's subsidy strategies and profitability, participant surplus and social welfare. Zhong *et al.* (2021) studied how on-demand ride-hailing platforms that compete with the traditional taxi industry design their pricing strategies under irregular and regulated pricing scenarios and focused on government regulatory strategies to develop the transportation industry.

The research on competition of on-demand service platforms often involves the single-homing and multi-homing problems of different participants (Bernstein *et al.*, 2021; Wu and Chamnisampan, 2021; Zhang and Nie, 2021). For example, Bernstein *et al.* (2021) examined equilibrium prices resulting from competitive interactions between platforms in single- and multi-homed settings and explored possible supply and demand outcomes at equilibrium. Furthermore, based on these equilibrium results, they studied the impact of surge pricing on demand surges and examined the incentives for drivers to participate in multi-homing. Wu and Chamnisampan (2021) studied the interaction between two platforms competing in a two-sided market with cross-network effects and analyzed their entry and attribution strategies. Zhang and Nie (2021) studied two platforms competing with each other under different supply and regulatory conditions. Depending on whether the driver's working relationship with the platform is exclusive, duopoly has a single-homed or multi-homed supply model. They found that multi-homing can lead to catastrophic outcomes in an unregulated duopoly and demonstrated this through numerical experiments.

In addition to the homing issue, the issue of information disclosure between competing parties is also an essential factor in the competition of on-demand service platforms. Belleflamme and Peitz (2019) explored the motivations of platform operators to disclose price information to the other side of the market. They found that while monopolies always have an incentive to inform all participants about prices, platforms may be reluctant to disclose information in the context of two-sided single-homing and competitive bottlenecks. Pandey *et al.* (2019) simulated cooperation and competition among multiple ridesharing companies in a real-time on-demand setting. They solved the optimal linear allocation problem based on the cooperative model and derived the amount of information that companies need to share. They then studied how realistic competitive models deviate from this optimality and provided worst-case bounds. Choi *et al.* (2020a) analyzed the Nash game of product information disclosure (supported by blockchain technology) between two leasing service platforms to determine the conditions for information disclosure.

In terms of platform cooperation, no study has been done on the cooperation between on-demand service platforms. Only Jian *et al.* (2020) and Lin *et al.* (2021b) studied the cooperation between on-demand service platforms and other non-platform entities from the perspective of operations management. Jian *et al.* (2020) examined how an operator's profit and social welfare differ under the existing carsharing-only service scheme and a bundled carsharing and parking-sharing service scheme. Lin *et al.* (2021b) studied a platform's cooperation decision with car rental companies to rent cars to car-free drivers. They found that when the commission rate is high or the fixed payout rate is low, cooperation can lead to a win-win-win outcome for platforms, customers and drivers.

4.3 Discussion
In the above literature review, we analyze the research content and methods of the 69 papers (excluding the three literature reviews) involved in this review. Accordingly, we identify five research challenges as below.

First, from the perspective of research direction, a number of studies have been conducted on the pricing decisions of platforms considering the time uncertainty and spatial uncertainty of the demand (Cachon *et al.*, 2017; Bai *et al.*, 2019; Wu *et al.*, 2020; Yang *et al.*, 2020b; Zhu *et al.*, 2021). Although those studies may also involve service optimization, quality management, demand management, provider management, policy supervision and other issues, most of them still relied on mathematical modeling, simulation and optimization.

Second, from the perspective of research content, the existing studies investigate the dynamic and steady-state operations decisions (Zhong *et al.*, 2019; Wu *et al.*, 2020). These studies can provide platform managers with insights from different perspectives. Similar future research can be pursued.

Third, from the perspective of research methods, multi-method research can combine the advantages of quantitative and qualitative research and has been increasingly promoted by academia in recent years (Tong *et al.*, 2020; Chen *et al.*, 2021b; Jiang *et al.*, 2021; Li *et al.*, 2021). However, there is still a lack of research on multi-method studies on on-demand service platform operations management.

Fourth, from the perspective of research objects, we find many more studies on multiple platforms than those on a single platform. This may be due to the challenge of obtaining data from two or more platforms. However, as the industry further develops, research in this area is also essential.

Fifth, from the perspective of the development trend of the platform industry, as the platform market continues to grow, platform business modes are also constantly innovating. A significant challenge of academic research is how to keep up with the latest development in the industry and provide managerial insights for managers' decision-making.

5. Research agendas
First, future studies are encouraged to combine classic research problems in the field of operations management with platform characteristics. In addition to pricing decisions, service optimization, quality management, demand management, provider management and policy supervision, there are also many classic research problems in operations management, such as strategy selection, contract design, sustainable management, channel management, policy supervision. How to combine classic research problems with platform characteristics is one of the feasible research directions in the future. For example, Yu *et al.* (2020) constructed a two-period game model to study the impact of regulatory policies on the welfare of different stakeholders (i.e. consumers, taxi drivers, on-demand ride-hailing companies and independent drivers).

Second, more research can be done on both the dynamic and steady-state issues of on-demand service platforms. Dynamic research focuses on an uncertain, complex and

changing state, which helps to solve the various problems such as matching and optimization for the on-demand service platform in the short term. For example, Wu *et al.* (2020) considered the different distributions of passenger demand and car supply in different time and regions, established an intermediary pricing model for the transportation service market and evaluated the impact of spatial heterogeneity and network externalities on the pricing mechanism of online car-hailing platforms. Steady-state research focuses on deterministic and stable states, which helps solve the strategic and planning problems encountered in the long-term development of on-demand service platforms. For example, Zhong *et al.* (2019) determined the subsidy level of temporary providers and/or the employment level of permanent providers in monopolistic and duopoly competitive environments and analyzed the impact of the employment level of permanent providers and platform competition on the platform's subsidy strategies and profitability, participant surplus and social welfare. Future research should focus on both the dynamic and steady-state issues of on-demand service platforms to provide comprehensive management implications for platform operations.

Third, the research method of "Mathematical Models + Empirical Study" should be advocated. Although empirical research can analyze and obtain relevant management insights based on actual data in the industry, it cannot quantitatively analyze the causes and effects of the platform's decision-making process and obtain forward-looking mathematical insights. Therefore, multi-method research has been increasingly promoted by academia in recent years (Jiang *et al.*, 2021). In our literature review, it is found that several studies adopted the method of "Mathematical Models + Empirical Study". For example, Chen *et al.* (2021b) studied the optimal bonus setting decision for a ridesharing platform. They modeled the driver's decision-making process and the platform optimization problem as a Stackelberg game model. They also conducted an empirical analysis using comprehensive data from leading ridesharing platforms to calculate optimal bonus rates for different scenarios. This is an excellent example of in-depth studies on on-demand service platform operations management.

Fourth, it is necessary to pay more attention to the interaction between two or more platforms and explore related problems and solutions. We find many more studies on multiple platforms than on a single platform. On the one hand, it is because the related research on the on-demand service platform operations management has gradually emerged in recent years, and there are still many related research problems that need to be solved with a single platform as the research object. On the other hand, whether using mathematical models or empirical studies, research involving two platforms is more difficult than research on a single platform. However, in business practice, there is increasing competition or cooperation among on-demand service platforms. Therefore, future research needs to further analyze the interaction of two or more platforms and explore related research problems and solutions.

Fifth, scholars should pay attention to the new models and paths that have emerged during the latest development of the platform economy. In recent years, there have been more types of resources managed by platforms. The ability to manage resources has become stronger, and many new development models have emerged, such as the aggregation mode centered on open access. Aggregation mode refers to the mode in which an aggregation platform with Internet technology does not directly match service providers and consumers, but indirectly provides services to consumers by accessing a third party. For example, in Shenzhen, China, Gaode-Map not only has integrated Didi-Chuxing but also cooperated with Shenzhen-Taxi Company to provide travel services (Huanqiu.com, 2017). The related research on the on-demand service platform under the context of this emerging model can provide important managerial insights for the innovation and development of the platform.

In conclusion, we propose five future research agendas according to the literature review. For clarity, they are summarized in Figure 6.
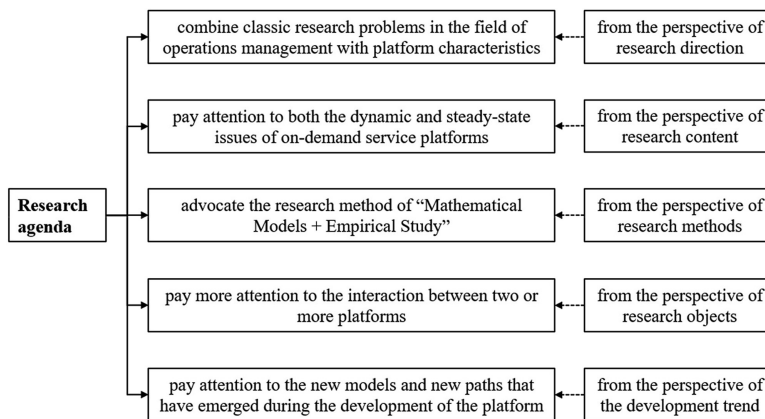
Figure 6.
Future research
agendas

6. Conclusions

With the increasing popularity of information technology and the increase of Internet users, service platforms have developed rapidly worldwide (Wu *et al.*, 2020). Especially in the past ten years, the on-demand economy has developed and accumulated a huge consumer group (Zhong *et al.*, 2019). As a result, on-demand service platform enterprises have become a hot research object in the field of operations management in recent years. This paper conducts a literature review of 72 papers on on-demand service platform operations management. According to the relevant research content, the above literature can be divided into "Single platform" and "Multiple platforms". According to the research methods, the above literatures can be classified into "Mathematical Models", "Empirical Studies", "Multiple Methods" and "Literature Review". Based on the analysis of the literature, we find that the research of on-demand service platform operations management has been increasing in the past five years.

According to the analysis of the literature and the observation of industrial practice, we propose five research agendas for the research of on-demand service platform operations management: 1) combining classic research problems in the field of operations management with platform characteristics; 2) paying attention to both the dynamic and steady-state issues; 3) advocating the research method of "Mathematical Models + Empirical Study"; 4) paying more attention to the interaction between two or more platforms; 5) paying attention to the new models and new paths that have emerged during the development of the platform.

Although we present the above main conclusions, this study still has the following limitations. First, this paper focuses on on-demand service platforms, ignoring other platform types such as social entertainment platforms, information platforms and computing application platforms. Second, this paper classifies the related studies on platforms according to their research method. Future scholars can try other classification methods to propose research agendas from different perspectives. Third, this paper proposes agendas for future research. Scholars could propose more subdivided research questions based on this literature review.

References

Abhishek, V., Dogan, M. and Jacquillat, A. (2021), "Strategic timing and dynamic pricing for online resource allocation", *Management Science*, Vol. 67 No. 8, pp. 4880-4907.

Armstrong, M. (2006), "Competition in two-sided markets", *The RAND Journal of Economics*, Vol. 37 No. 3, pp. 668-691.

Avinadav, T., Chernonog, T., Fruchter, G.E. and Prasad, A. (2020), "Contract design when quality is co-created in a supply chain", *European Journal of Operational Research*, Vol. 286 No. 3, pp. 908-918.

Bai, J., So, K.C., Tang, C.S., Chen, X. and Wang, H. (2019), "Coordinating supply and demand on an on-demand service platform with impatient customers", *Manufacturing and Service Operations Management*, Vol. 21 No. 3, pp. 556-570.

Belleflamme, P. and Peitz, M. (2019), "Price disclosure by two-sided platforms", *International Journal of Industrial Organization*, Vol. 67, p. 102529.

Benjaafar, S. and Hu, M. (2020), "Operations management in the age of the sharing economy: what is old and what is new?", *Manufacturing and Service Operations Management*, Vol. 22 No. 1, pp. 93-101.

Benjaafar, S., Ding, J.Y., Kong, G. and Taylor, T. (2021), "Labor welfare in on-demand service platforms", *Manufacturing and Service Operations Management*, Vol. 24 No. 1, pp. 110-124.

Bernstein, F., DeCroix, G.A. and Keskin, N.B. (2021), "Competition between two-sided platforms under demand and supply congestion effects", *Manufacturing and Service Operations Management*, Vol. 23 No. 5, pp. 1043-1061.

Besbes, O., Castro, F. and Lobel, I. (2021a), "Surge pricing and its spatial supply response", *Management Science*, Vol. 67 No. 3, pp. 1350-1367.

Besbes, O., Castro, F. and Lobel, I. (2021b), "Spatial capacity planning", *Operations Research*. doi: 10. 1287/opre.2021.2112.

Bimpikis, K., Candogan, O. and Saban, D. (2019), "Spatial pricing in ridesharing networks", *Operations Research*, Vol. 67 No. 3, pp. 744-769.

Cachon, G.P., Daniels, K.M. and Lobel, R. (2017), "The role of surge pricing on a service platform with self-scheduling capacity", *Manufacturing and Service Operations Management*, Vol. 19 No. 3, pp. 368-384.

Chakravarty, A.K. (2021), "Blending capacity on a rideshare platform: independent and dedicated drivers", *Production and Operations Management*, Vol. 30 No. 8, pp. 2522-2546.

Chen, Y.J., Dai, T., Korpeoglu, C.G., Körpeoğlu, E., Sahin, O., Tang, C.S. and Xiao, S. (2020), "O.M. Forum—innovative online platforms: research opportunities", *Manufacturing and Service Operations Management*, Vol. 22 No. 3, pp. 430-445.

Chen, M., Zhao, D., Gong, Y. and Hong, Z. (2021a), "Reference-dependent preferences in the on-demand service newsvendor with self-scheduling capacity", *International Journal of Production Economics*, Vol. 234, p. 108043.

Chen, X., Li, Z., Ming, L. and Zhu, W. (2021b), "The incentive game under target effects in ridesharing: a structural econometric analysis", *Manufacturing and Service Operations Management*. doi: 10. 1287/msom.2021.1002.

Choi, T.M., Feng, L. and Li, R. (2020a), "Information disclosure structure in supply chains with rental service platforms in the blockchain technology era", *International Journal of Production Economics*, Vol. 221, p. 107473.

Choi, T.M., Guo, S., Liu, N. and Shi, X. (2020b), "Optimal pricing in on-demand-service-platform-operations with hired agents and risk-sensitive customers in the blockchain era", *European Journal of Operational Research*, Vol. 284 No. 3, pp. 1031-1042.

Cui, R., Li, J. and Zhang, D.J. (2020), "Reducing discrimination with reviews in the sharing economy: evidence from field experiments on Airbnb", *Management Science*, Vol. 66 No. 3, pp. 1071-1094.

Dong, Z. and Leng, M. (2021), "Managing on-demand ridesharing operations: optimal pricing decisions for a ridesharing platform", *International Journal of Production Economics*, Vol. 232, p. 107958.

Dong, T., Xu, Z., Luo, Q., Yin, Y., Wang, J. and Ye, J. (2021), "Optimal contract design for ride-sourcing services under dual sourcing", *Transportation Research Part B: Methodological*, Vol. 146, pp. 289-313.

European Commission (2015), "Communication from the commission to the European parliament, the council, the European economic and social committee and the committee of the regions. A digital single market strategy for Europe. COM/2015/0192 final", available at: https://ec.europa. eu/digital-single-market/en/news/digital-single-market-strategy-europe-com2015-192-final (accessed 27 November 2017).

Federal Trade Commission (FTC) (2016), *The "Sharing" Economy: Issues Facing Platforms, Participants, and Regulations*, A Federal Trade Commission Staff Report, November 2016.

Fredriksson, A. and Liljestrand, K. (2015), "Capturing food logistics: a literature review and research agenda", *International Journal of Logistics Research and Applications*, Vol. 18 No. 1, pp. 16-34.

Guda, H. and Subramanian, U. (2019), "Your uber is arriving: managing on-demand workers through surge pricing, forecast communication, and worker incentives", *Management Science*, Vol. 65 No. 5, pp. 1995-2014.

Guo, C., Thompson, R.G., Foliente, G. and Kong, X.T. (2021), "An auction-enabled collaborative routing mechanism for omnichannel on-demand logistics through transshipment", *Transportation Research Part E: Logistics and Transportation Review*, Vol. 146, p. 102206.

Hong, J.H., Kim, B.C. and Park, K.S. (2019), "Optimal risk management for the sharing economy with stranger danger and service quality", *European Journal of Operational Research*, Vol. 279 No. 3, pp. 1024-1035.

Huang, N., Yan, Z. and Yin, H. (2021), "Effects of online–offline service integration on e-healthcare providers: a quasi-natural experiment", *Production and Operations Management*, Vol. 30 No. 8, pp. 2359-2378.

Huanqiu.com (2017), *Gaode Map Aggregate Ride-Hailing Experience: One Account, Multiple Services*, (in Chinese), available at: https://tech.huanqiu.com/article/9CaKrnK55Bz 2017-09-07.

Jacob, J. and Roet-Green, R. (2021), "Ride solo or pool: designing price-service menus for a ridesharing platform", *European Journal of Operational Research*, Vol. 295 No. 3, pp. 1008-1024.

Jian, S., Liu, W., Wang, X., Yang, H. and Waller, S.T. (2020), "On integrating carsharing and parking sharing services", *Transportation Research Part B: Methodological*, Vol. 142, pp. 19-44.

Jiang, B. and Fan, Z.P. (2020), "Optimal allocation of shared parking slots considering parking unpunctuality under a platform-based management approach", *Transportation Research Part E: Logistics and Transportation Review*, Vol. 142, p. 102062.

Jiang, Z.Z., Kong, G. and Zhang, Y. (2021), "Making the most of your regret: workers' relocation decisions in on-demand platforms", *Manufacturing and Service Operations Management*, Vol. 23 No. 3, pp. 695-713.

Ke, J., Yang, H. and Zheng, Z. (2020a), "On ride-pooling and traffic congestion", *Transportation Research Part B: Methodological*, Vol. 142, pp. 213-231.

Ke, J., Yang, H., Li, X., Wang, H. and Ye, J. (2020b), "Pricing and equilibrium in on-demand ride-pooling markets", *Transportation Research Part B: Methodological*, Vol. 139, pp. 411-431.

Ke, J., Li, X., Yang, H. and Yin, Y. (2021a), "Pareto-efficient solutions and regulations of congested ride-sourcing markets with heterogeneous demand and supply", *Transportation Research Part E: Logistics and Transportation Review*, Vol. 154, p. 102483.

Ke, J., Zhu, Z., Yang, H. and He, Q. (2021b), "Equilibrium analyses and operational designs of a coupled market with substitutive and complementary ride-sourcing services to public transits", *Transportation Research Part E: Logistics and Transportation Review*, Vol. 148, p. 102236.

Kong, X.T., Kang, K., Zhong, R.Y., Luo, H. and Xu, S.X. (2021), "Cyber physical system-enabled on-demand logistics trading", *International Journal of Production Economics*, Vol. 233, p. 108005.

Kung, L.C. and Zhong, G.Y. (2017), "The optimal pricing strategy for two-sided platform delivery in the sharing economy", *Transportation Research Part E: Logistics and Transportation Review*, Vol. 101, pp. 1-12.

Li, Y. and Mu, L. (2021), "The role of offline trade in sharing accommodation", *Decision Sciences*. doi: 10.1111/deci.12523.

Li, S., Tavafoghi, H., Poolla, K. and Varaiya, P. (2019), "Regulating TNCs: should Uber and Lyft set their own rules?", *Transportation Research Part B: Methodological*, Vol. 129, pp. 193-225.

Li, Y., Liu, Y. and Xie, J. (2020), "A path-based equilibrium model for ridesharing matching", *Transportation Research Part B: Methodological*, Vol. 138, pp. 373-405.

Li, Y., Li, X. and Zhang, S. (2021), "Optimal pricing of customized bus services and ridesharing based on a competitive game model", *Omega*, Vol. 103, p. 102413.

Lin, M., Ma, L. and Ying, C. (2021a), "Matching daily home healthcare demands with supply in service-sharing platforms", *Transportation Research Part E: Logistics and Transportation Review*, Vol. 145, p. 102177.

Lin, X., Sun, C., Cao, B., Zhou, Y.W. and Chen, C. (2021b), "Should ridesharing platforms cooperate with car-rental companies? Implications for consumer surplus and driver surplus", *Omega*, Vol. 102, p. 102309.

Liu, W., Wang, D., Long, S., Shen, X. and Shi, V. (2019a), "Service supply chain management: a behavioural operations perspective", *Modern Supply Chain Research and Applications*, Vol. 1 No. 1, pp. 28-53.

Liu, W., Yan, X., Wei, W. and Xie, D. (2019b), "Pricing decisions for service platform with provider's threshold participating quantity, value-added service and matching ability", *Transportation Research Part E: Logistics and Transportation Review*, Vol. 122, pp. 410-432.

Mejia, J. and Parker, C. (2021), "When transparency fails: bias and financial incentives in ridesharing platforms", *Management Science*, Vol. 67 No. 1, pp. 166-184.

Nourinejad, M. and Ramezani, M. (2020), "Ride-Sourcing modeling and pricing in non-equilibrium two-sided markets", *Transportation Research Part B: Methodological*, Vol. 132, pp. 340-357.

Pandey, V., Monteil, J., Gambella, C. and Simonetto, A. (2019), "On the needs for MaaS platforms to handle competition in ridesharing mobility", *Transportation Research Part C: Emerging Technologies*, Vol. 108, pp. 269-288.

Steinbach, R. (2020), *2020 Growth Trends for on Demand Service Platforms*, Google Scholar, available at: https://www.bluelabellabs.com/blog/2020-growth-trends-for-on-demand-service-platforms/ (Accessed 29 August 2020).

Sun, H., Wang, H. and Wan, Z. (2019a), "Model and analysis of labor supply for ridesharing platforms in the presence of sample self-selection and endogeneity", *Transportation Research Part B: Methodological*, Vol. 125, pp. 76-93.

Sun, L., Teunter, R.H., Babai, M.Z. and Hua, G. (2019b), "Optimal pricing for ride-sourcing platforms", *European Journal of Operational Research*, Vol. 278 No. 3, pp. 783-795.

Sun, L., Teunter, R.H., Hua, G. and Wu, T. (2020a), "Taxi-hailing platforms: inform or assign drivers?", *Transportation Research Part B: Methodological*, Vol. 142, pp. 197-212.

Sun, X., Tang, W., Chen, J. and Zhang, J. (2020b), "Optimal investment strategy of a free-floating sharing platform", *Transportation Research Part E: Logistics and Transportation Review*, Vol. 138, p. 101958.

Tang, Y., Guo, P., Tang, C.S. and Wang, Y. (2021), "Gender-related operational issues arising from on-demand ride-hailing platforms: safety concerns and system configuration", *Production and Operations Management*, Vol. 30 No. 10, pp. 3481-3496.

Taylor, T.A. (2018), "On-demand service platforms", *Manufacturing and Service Operations Management*, Vol. 20 No. 4, pp. 704-720.

Tong, T., Dai, H., Xiao, Q. and Yan, N. (2020), "Will dynamic pricing outperform? Theoretical analysis and empirical evidence from O2O on-demand food service market", *International Journal of Production Economics*, Vol. 219, pp. 375-385.

Wang, T. and Wu, D. (2020), "Data-driven driver dispatching system with allocation constraints and operational risk management for a ridesharing platform", *Decision Sciences*, Vol. 51 No. 6, pp. 1490-1520.

Wang, H. and Yang, H. (2019), "Ridesourcing systems: a framework and review", *Transportation Research Part B: Methodological*, Vol. 129, pp. 122-155.

Wang, X., Jiang, M., Han, W. and Qiu, L. (2020a), "Do emotions sell? Impact of emotional expressions on sales in space-sharing economy", *Production and Operations Management*, Vol. 31 No. 1, pp. 65-82.

Wang, X., Liu, W., Yang, H., Wang, D. and Ye, J. (2020b), "Customer behavioural modelling of order cancellation in coupled ride-sourcing and taxi markets", *Transportation Research Part B: Methodological*, Vol. 132, pp. 358-378.

Wen, X. and Siqin, T. (2020), "How do product quality uncertainties affect the sharing economy platforms with risk considerations? A mean-variance analysis", *International Journal of Production Economics*, Vol. 224, p. 107544.

Wu, C.H. and Chamnisampan, N. (2021), "Platform entry and homing as competitive strategies under cross-sided network effects", *Decision Support Systems*, Vol. 140, p. 113428.

Wu, T., Zhang, M., Tian, X., Wang, S. and Hua, G. (2020), "Spatial differentiation and network externality in pricing mechanism of online car hailing platform", *International Journal of Production Economics*, Vol. 219, pp. 275-283.

Xu, X., Zeng, S. and He, Y. (2021), "The impact of information disclosure on consumer purchase behavior on sharing economy platform Airbnb", *International Journal of Production Economics*, Vol. 231, p. 107846.

Yan, N., Xu, X., Tong, T. and Huang, L. (2021), "Examining consumer complaints from an on-demand service platform", *International Journal of Production Economics*, Vol. 237, p. 108153.

Yang, H., Qin, X., Ke, J. and Ye, J. (2020a), "Optimizing matching time interval and matching radius in on-demand ride-sourcing markets", *Transportation Research Part B: Methodological*, Vol. 131, pp. 84-105.

Yang, H., Shao, C., Wang, H. and Ye, J. (2020b), "Integrated reward scheme and surge pricing in a ridesourcing market", *Transportation Research Part B: Methodological*, Vol. 134, pp. 126-142.

Yu, J.J., Tang, C.S., Max Shen, Z.J. and Chen, X.M. (2020), "A balancing act of regulating on-demand ride services", *Management Science*, Vol. 66 No. 7, pp. 2975-2992.

Yu, J., Mo, D., Xie, N., Hu, S. and Chen, X.M. (2021), "Exploring multi-homing behavior of ride-sourcing drivers via real-world multiple platforms data", *Transportation Research Part F: Traffic Psychology and Behaviour*, Vol. 80, pp. 61-78.

Zhan, X., Szeto, W.Y., Shui, C.S. and Chen, X.M. (2021), "A modified artificial bee colony algorithm for the dynamic ride-hailing sharing problem", *Transportation Research Part E: Logistics and Transportation Review*, Vol. 150, p. 102124.

Zhang, K. and Nie, Y.M. (2021), "Inter-platform competition in a regulated ride-hail market with pooling", *Transportation Research Part E: Logistics and Transportation Review*, Vol. 151, p. 102327.

Zhang, J., Meng, M., Wong, Y.D., Ieromonachou, P. and Wang, D.Z. (2021), "A data-driven dynamic repositioning model in bicycle-sharing systems", *International Journal of Production Economics*, Vol. 231, p. 107909.

Zhong, Y., Lin, Z., Zhou, Y.W., Cheng, T.C.E. and Lin, X. (2019), "Matching supply and demand on ridesharing platforms with permanent agents and competition", *International Journal of Production Economics*, Vol. 218, pp. 363-374.

Zhong, Y., Pan, Q., Xie, W., Cheng, T.C.E. and Lin, X. (2020), "Pricing and wage strategies for an on-demand service platform with heterogeneous congestion-sensitive customers", *International Journal of Production Economics*, Vol. 230, p. 107901.

Zhong, Y., Yang, T., Cao, B. and Cheng, T.C.E. (2021), "On-demand ride-hailing platforms in competition with the taxi industry: pricing strategies and government supervision", *International Journal of Production Economics*, Vol. 243, p. 108301.

Zhou, Y.W., Lin, X., Zhong, Y. and Xie, W. (2019), "Contract selection for a multi-service sharing platform with self-scheduling capacity", *Omega*, Vol. 86, pp. 198-217.

Zhu, Z., Ke, J. and Wang, H. (2021), "A mean-field Markov decision process model for spatial-temporal subsidies in ride-sourcing markets", *Transportation Research Part B: Methodological*, Vol. 150, pp. 540-565.

Corresponding author

Xiaoyu Yan can be contacted at: tjuyanxiaoyu@163.com