Improvement of Customer Satisfaction and Operational Efficiency by Data-Driven Management — a Case Study of Uber

Shangwei Fang *

Faculty of Forestry, University of British Columbia, Vancouver, V6T 1Z4, Canada

* Corresponding Author Email: fey5@student.ubc.ca

Abstract. With the development of the digital economy, sharing economy platforms are facing challenges of supply and demand matching and the improvement of efficiency. As the representative of sharing economy platforms, Uber's management model possesses vital research value. This research analyzes the improvement of customer satisfaction and operational efficiency by using data-driven management at Uber. The research uses the case study method, focusing on critical technologies of Uber such as dynamic pricing, intelligent scheduling and a two-way rating system. The analysis shows the data-driven management mode helps corporate operations through algorithms and data support. However, the research also finds that there is still controversy remaining in algorithm management, for instance, the order dispatching algorithm lacks transparency, and drivers are forced to accept low-profit orders to maintain their performance levels. The conclusion points that data-driven increases its operational efficiency conspicuously, but still lacks balancing efficiency and equity. In the future, efforts should be made to explore the transparency of algorithms and the establishment of a driver rights protection mechanism to achieve sustainable development.

Keywords: Data-driven management; Case study method; Customer satisfaction; Operational efficiency.

1. Introduction

In the current era of rapid development of the Internet economy, data-driven management has become one of the important means of enterprise management. Existing research illustrates that digital transformation plays an important role in achieving success for enterprises [1]. Under the management of data-driven, the combination of digital and substantial economy boosts the efficiency of enterprise operation and even the social aspect enormously [2][3]. As the world's largest ride-hailing platform and a key player in the global sharing economy, Uber has achieved remarkable success in enhancing customer satisfaction and operational efficiency through information sharing and data-driven operations. Uber has become the global leader in the two long-term growth industries of carpooling and food delivery, and is leveraging its massive scale and technological expertise to rapidly launch and expand new products. However, existing research focuses on Uber's performance growth and its performance, lacking analysis of the economic effects and enterprise management brought about by data-driven approaches. There is also insufficient analysis of Uber's operation model based on data-driven management and the customer satisfaction and operational efficiency that it enhances.

This paper adopts the literature review method, based on the integration of existing articles analyzing Uber's data-driven management model and the analysis of real-time data. Firstly, based on the theory of two-sided markets, it analyzes how Uber balances supply and demand through dynamic pricing algorithms. Secondly, by analyzing the operational examples generated by Uber's data-driven management model and combining them with ESG development strategies, it provides a summary and future development suggestions for Uber.

This research holds significant implications for the improvement of Uber's future management model and its development direction. By integrating Uber's customer satisfaction model and operational efficiency theory, this paper explores the advantages and improvement space of the company's data-driven management model and constructs a more complete data-driven management

analysis framework. This research outcome can also provide management references for other sharing economy enterprises.

2. Improvement of Uber's Operational Efficiency by Data-driven Management

2.1. Data-driven on-demand Allocation

As the dominator of the sharing economy, Uber improves corporation's operational efficiency by data-driven management in multiple methods. This management model relies on real-time data to assist the company in making decisions. In terms of allocation of ride-hailing orders, uber utilizes data-driven technologies such as big data and cloud computing to dispatch vehicles, distribute cars by demand through various requirements in different places and times, satisfying customers' riding demand in rush hour [4]. This management model enables Uber to dynamically adjust the allocation of car resources. For instance, the average proportion of online car-hailing orders at the evening peak period could reach 14.01%, while this number is only 1.52 at night [5]. This data reflects the obvious differences in ride-hailing demands at different time periods, and Uber can effectively address this imbalance through platform dispatching.

Among research in the study of UberX Share (a carpooling service under Uber), 47% of the interviewees had driver's licenses, and about 80% of them had parking facilities at home, but 63% did not have them at their workplaces [6]. This means that UberX Share's carpooling service benefits individuals who prefer taking public transportation or have a personal vehicle but are not inclined to use it for various reasons. This service model precisely identifies different passengers with similar travel routes through data analysis and matches them with the same driver. This travel mode strikes a balance between cost-effectiveness and comfort, and significantly enhances environmental friendliness.

In summary, the logic of Uber's platform dispatch algorithm is to use real-time data as a guide to drive the allocation of car resources, meeting the optimal model for different time periods and locations. This real-time data model combines car and driver resources with time periods and geographical locations through data calculation, significantly improving the platform's resource dispatching ability and the cost-effectiveness of passengers' trips.

2.2. Dynamic Pricing System

Uber's dynamic pricing mechanism is one of the most controversial applications of data-driven management currently. This strategy, which involves selling the same product at different prices to different consumers or market segments based on market demand and the company's supply capacity to achieve maximum revenue, is based on changes in market supply and demand as well as differences in perceived value and willingness to pay [7]. When the number of drivers online in a certain area is detected to be lower than a certain number of demands, the dynamic pricing algorithm will intervene, ensuring that the number of drivers online can be maintained through higher earnings for drivers in special circumstances such as extreme weather. This pricing mechanism has faced some controversy and criticism due to its unbalanced pricing, which also allows competitors to enhance their industry competitiveness through more stable prices [8]. However, this pricing measure takes into account the distance and delay variables of the trip, meaning that higher Uber fees are accompanied by longer distances and longer delays, which is a reasonable price fluctuation within a certain range [9]. This pricing measure avoids the shortage of drivers during peak hours due to the imbalance between earnings and trip distance and delay. In addition, to address the issue of overpricing, Uber has adopted price transparency as a complementary solution, allowing passengers to obtain detailed data on the trip price before the trip begins. This transparency and certainty significantly reduce passenger anxiety caused by a large gap between the price and expectations.

2.3. Reduction in Travel Distance Brought by Algorithms

In terms of operational efficiency, the value created by data-driven management is reflected in many aspects. In densely populated cities, Uber uses algorithms to calculate the optimal route from the starting point to the destination. Theoretically, by managing the number of active ride-hailing vehicles through transportation network companies, the supply of drivers can be more closely matched with the expected passenger demand, thereby reducing the mileage of empty rides by ride-hailing vehicles [10]. These digital technologies not only help improve the operational efficiency of the platform but also create other values for society. A study found that converting traditional taxis to a shared car model with autonomous driving technology could reduce the number of cars by 59%, increase the carpooling occupancy rate by 1.2 to 3, reduce the total mileage by 55%, and reduce carbon emissions by 725 metric tons per day [11]. This algorithm-driven reduction in mileage not only increases the travel efficiency of customers and reduces the mileage of cars but also directly helps municipal governments achieve their emission reduction targets.

2.4. Resource Sharing in Different Fields

In addition, Uber has ingeniously applied big data to achieve cross-industry collaboration. In its Uber Eats (the food delivery service under Uber) business, it shares algorithmic resources, enhancing the efficiency of food delivery orders and ride-hailing services. To meet the demands of restaurant managers for fresh data and low-latency queries when improving operational efficiency, the real-time distributed analytics database Pinot is employed to analyze and process large volumes of data, thereby reducing service time [12]. Like many other OFDP (Optimal Flexible Delivery Path) systems, Uber Eats utilizes gig workers for food delivery services. This approach not only provides users with efficient delivery services but also means that restaurants do not need to hire their own drivers, and it offers Uber Eats and its drivers a flexible operation mode [13]. The shared drivers of Uber Eats and Uber provide both the platforms and food companies with low-cost services, while offering drivers flexible employment and diverse choices. Uber has leveraged a competitive advantage in the flexibility of resource integration that other transportation companies have not explored.

3. Improvement of Uber’s Customer Satisfaction by Data-driven Management

3.1 Unique Two-way Rating System

Uber's unique driver-customer mutual rating system further strengthens the quality control of the platform's services. Unlike the traditional one-way customer-to-driver rating system of its competitors, Uber's two-way rating system allows drivers to rate customers. Through Uber's rating system, drivers and passengers rate each other on a five-point scale after each trip. During this process, both drivers and passengers play the dual roles of observer and observed. Uber regards mutual monitoring as a double guarantee for both drivers and passengers, ensuring that both parties take responsibility and reducing potential bias to a certain extent [14]. This system forms a positive user experience loop and, to some extent, reduces malicious comments from extreme users. The protection of the conduct of passengers and drivers plays a significant role in promoting the driving environment on the platform.

3.2 Algorithmic Decision-making Assists Drivers in Their Work

Platform data and algorithmic decision-making have achieved auxiliary effects in formulating driver norms, monitoring driving activities, and providing feedback to employees. For instance, Uber uses technology to screen drivers' qualifications for platform work, guide drivers in picking up passengers, conduct regular background checks, instruct drivers on how to improve performance, and penalize drivers who fail to meet the minimum standards [15]. Incentive mechanisms are not limited to single-income incentives. Uber also adopts non-cash measures or other means to convey incentive strategies. Uber sends achievement badges, such as rocket launches (borrowing from video games), to drivers who perform well, providing psychological incentives; or indicates high-demand areas

nearby to drivers who are about to log off, helping them achieve new income targets [16]. These algorithm-driven incentive methods can, to a certain extent, motivate drivers from multiple perspectives, making them more willing to serve customers and, as a result, improving customer satisfaction to a certain degree as a form of feedback.

3.3 Customer Service Automation and Intelligent Responses

In addition, in terms of platform operation, Uber has launched an AI-driven customer service system called COTA (Customer Concerns Assistance System), which aims to enhance customer satisfaction through efficient support. COTA utilizes machine learning technology and natural language processing (NLP) to provide responses to common customer questions. By resolving common issues such as fare adjustments, trip cancellations, or lost items through AI, COTA not only reduces the platform's labor costs but also significantly improves the efficiency of problem-solving for customers and shortens response times. A study conducted in a production environment with a control test verified that COTA could reduce the time to solve problems by 10% without lowering customer satisfaction in practical applications [17]. This AI can also standardize the quality of service in a large number of interactions, not only enhancing customer satisfaction through improved efficiency but also increasing customer recognition and reliance on the platform. Customer service automation and intelligent responses.

4. Analyze Challenges Faced by Uber's Data-driven Management from an ESG Perspective

4.1 The Net Energy Consumption Has Increased Instead of Decreasing

Although Uber's data-driven management has improved operational efficiency and customer satisfaction in many aspects, it still faces severe challenges. In terms of environmental impact, the energy savings from Uber's carpooling service are less than the additional commuting and empty mileage it causes, resulting in an overall increase in energy consumption. Data shows that overall energy consumption in California has increased by 96%, ranging from 75% to 123% in each region [18]. Overall, although Uber has achieved certain results in improving travel efficiency and reducing empty mileage, the problem of its negative environmental impact still exists. The increase in empty and commuting mileage and the additional production of transportation vehicles have offset the potential energy-saving benefits of this carpooling service. This means that in the pursuit of sustainability, Uber cannot rely solely on technological optimization and business model innovation. Uber still needs to take more responsibility for the sustainability of the transportation ecosystem and achieve a true green transformation.

4.2 The Order Dispatching Algorithm Lacks Transparency

Moreover, there is still considerable controversy in the social environment, indicating that Uber's order dispatching algorithm lacks transparency. Research shows that from 2019 to 2020, the number of completed trips in Paris via Uber decreased by 52.25%, with the proportion of driver cancellations dropping from 3.4% to 1.8%, while the customer cancellation rate rose to 15.6% [19]. The acceptance rate of drivers has gradually increased over time, and it can be assumed that this is directly related to Uber's algorithmic management of supply and demand [19]. Drivers appear very passive in the face of the algorithm, not knowing how many drivers are competing with them, and some drivers have to accept orders with low profits. Given the decreasing demand for drivers, they may lose earnings while looking for passengers or waiting [19]. Although most people believe that the algorithmic management process makes operations more objective and fairer, most studies show that there are still disputes regarding the fairness of the algorithmic procedures [20]. In conclusion, Uber's data-driven order dispatching system has improved the operational efficiency of the platform to a certain

extent, but at the expense of drivers' interests and rights. The logic of this dispatching system should be made public.

4.3 Problems with the Performance Evaluation Process

There are also issues with Uber's corporate governance. In Uber's performance management system, the company influences drivers' performance based on economic principles and uses nudges to encourage them to stay on the road for longer periods [21]. However, once drivers become aware of these strategies, they no longer respond to them [22]. When data-driven approaches prioritize service efficiency without the calibration of humanistic values, it may lead to the phenomenon of "digital Taylorism". Uber should improve its performance management system, establish uniform standards, and use a fair and impartial evaluation system to assess drivers' performance levels.

5. Opportunities and Future of Uber

From the data perspective, Uber's data-driven management has once again defined the value of big data in platform decision-making. Traditional bilateral market theory focuses on market size, but Uber has proven through practice that data quality and algorithms are equally important. Uber's data mining and application in urban transportation have even changed the operation mode of government departments. This model of data serving the government indicates a transformation in the role of digital platforms in society: from a single service provider to a digital infrastructure builder for cities. In the future, when Uber implements data-driven management to operate its platform, it should focus on three development directions: first, the sustainability and green transformation determined by the net change in energy consumption; second, the reconstruction of the existing driver dispatching algorithm due to the popularization of autonomous driving technology; third, how to fairly formulate the algorithm framework to balance the inequality in the platform's treatment of customers.

6. Conclusion

This study analyzed how Uber's data-driven management enhances customer satisfaction and operational efficiency. The research results show that Uber's data-driven management approach can significantly improve customer satisfaction, increase driver resource utilization, and enhance driver travel efficiency. However, issues such as algorithmic bias and driver satisfaction highlight the importance of human-machine collaboration in the gig economy platform.

Theoretically, this study validates the core value of data elements in the platform economy and provides a reference for the digital transformation of sharing economy enterprises. In practical terms, it is recommended that enterprises establish a more transparent algorithm explanation mechanism and improve the driver rights protection system.

Future research can be approached from the following aspects: first, the sustainability and green transformation determined by the net change in energy consumption; second, exploring the reconstruction of existing driver dispatch algorithms with the popularization of autonomous driving technology; third, how to formulate a fair algorithm framework to balance the inequality in platform treatment of customers. Do not number your paper: All manuscripts must be in English, also the table and figure texts, otherwise we cannot publish your paper. Please keep a second copy of your manuscript in your office. When receiving the paper, we assume that the corresponding authors grant us the copyright to use the paper for the book or journal in question.

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