

Analysis on Current Situation and Problems of Shared Bicycles in China*

Hang Gao

Business School

Shandong University of Political Science and Law

Jinan, China

Abstract—Shared bikes have sprung up in a short period of time, gaining market and capital recognition and igniting a new flame of sharing economy. As a new model of sharing economy, shared bicycle meets the demand of short distance travel and alleviate the city pressure of traffic congestion and environmental pollution. It also meets the development concept of "innovation, coordination, green, openness and sharing". However, as a new thing, the development of shared bicycles is accompanied by problems such as insufficient supervision, disorderly competition, high operating costs, low management efficiency and many risks. In order to solve these problems, this paper puts forward reasonable suggestions from the perspectives of government, industry, enterprises and users.

Keywords — *shared bicycle; sharing economy; sharing traffic; internet*

I. INTRODUCTION

Sharing economy, also known as collaborative consumption, it refers to the use of the Internet and other modern information technology to integrate and share a few stages of idle resources, in order to meet the demand of diverse economic activities. Shared bicycles are bicycle sharing service provided by enterprises in a public area of the city. Nowadays, shared bicycles are in full swing and gradually spread across all corners of China. Shared bicycles can be seen everywhere in some third-tier, fourth-tier cities and even local counties. Youon, ofo and Mobike start a new era of shared bicycles. They dominate the no-pile shared bikes that mesh with the internet thinking. They have built a business model of shared bicycles with Chinese characteristics. The "Internet + bicycle" service has become one of the mainstream services of the public, providing the most efficient and convenient transportation service for our citizens. At the end of 2017, under the fierce competition in the market, ofo, Mobike and Kuqi respectively by 51.9%, 45.2%, 4.6% have occupied the top three positions of active users of Chinese shared bicycle APPs, becoming an indispensable transportation tool for the public.

II. THE DEVELOPMENT HISTORY AND CURRENT SITUATION OF SHARED BICYCLES IN CHINA

A. The Development History of Shared Bicycles in China

The development of China's Shared bicycle market has gone through three historical stages. The first stage is from 2007 to 2010. The main characteristic of this stage is that under the government-led, one of the few big cities such as Beijing, Hangzhou introduced public bike from foreign countries and included them in the urban public traffic system. The second stage is from 2011 to 2014. The main feature of this stage is that companies specializing in bicycle operation began to emerge, and public bikes were still dominated by piles. However, due to China's lack of industry standards and quality standards for public bikes, the social benefits of public bike projects are not objectively reflected. The cost of building public bike systems has also been questioned, and public bike has quickly gone into recession. The third stage is from 2015 to today, and it is the stage of explosive growth of shared bicycles. With the rapid development of mobile internet, shared bicycles led by Mobike and ofo have emerged as a more convenient way to replace public bicycles with a stake.

In 2014, Daiwei, a graduate of Peking University, co-founded ofo with four partners to solve the problem of travel on campus. In May 2015, more than 2,000 shared bicycles appeared on the campus of Peking University. In January 2015, Huweiwei founded Mobike Technology Company as the founder and the business grew rapidly.

When shared bicycles first appeared, they were hot in the market. Companies that operate shared bicycles are springing up all the time. By the end of 2017, there have been at least 23 brands of shared bicycles in China. In addition to the two larger companies, Mobike and ofo, which occupy about 90 percent of the market, others companies such as Xiao Ming and Xiao Lan have also achieved good results. By the end of 2017, the total number of users in China's shared bicycle market has reached 50 million.

Shared bicycles can be popular in a short period of two years, while the key is that they have solved the problem of the "last mile" of citizen travel. The demand for short trips within five kilometers is also fully released, and it is in line with the country's green travel concept. At present, the city government management department with the high popularity of shared

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bikes has made clear the management regulations to promote their healthy development.

B. The Development Status of Shared Bicycles in China

1) *The growing market size and user scale:* Shared bicycle market in China is still in its infancy. In 2015, the concept of sharing bikes began to rise, and capital and the giants began to lay out their plans. The year 2016 can be designated as the first year of the development of shared bicycle. In 2016, shared bicycles that were originally located on campus began to move to the town, and more and more shared bicycle startup teams were able to get financing, which caused the market war to start. In terms of market size, the market share of shared bicycles in 2017 has reached 101 million, more than doubled in 2016, and the growth rate of the market will continue to increase in the following years. The huge potential of the new economic model has allowed capital to see its value, and more than 1 billion yuan being raised in the bicycle industry alone in 2017.

On the scale of users, there are 18 million bicycle users in 2016 and 50 million in 2017. Among them, the shared bicycle users are mainly based on college students and young professionals, and concentrated in first-tier cities, second-tier cities and other densely populated cities. Shared bicycles near schools, bus stations, subway stations provide the fastest "last mile" travel plan for users. This not only provides convenience for users to take short trips, but also promotes the city's green traffic.

2) *Mobike and ofo becomes the leaders in shared bicycle market:* Although shared bicycle market is in its infancy, there are already more than a dozen companies in the market. From the downloads of the shared cycle APP, Mobike and ofo are far ahead in the market, just like Didi and Kuaidi in the ride-hailing market. Mobike and ofo have been downloaded 21 million and 17 million respectively. In the third place, there were fewer than 3.9 million downloads. Youon was the third most downloaded, with less than 3.9 million.

Ofo mainly relies on low cost and low deposit to quickly spread the number of bicycles in the city. Mobike adopted the model of heavy assets, although the body weight of its shared bicycle was criticized, but the product iteration was soon carried out. Although ofo and Mobike occupy most of the market today, and the future market structure is still very variable. There will be a new round of market action after other brands have been raised.

3) *Young people become the main users:* The age distribution of young people aged 21-40 becomes the main force of shared bicycle users, while cycling is a form of travel and exercise which younger people are more receptive. Users under the age of 20 are more concentrated in universities and high schools, while those over the age of 20 are in universities, office workers and city workers. For these users, they can only pay a low deposit and a low fee for a bike ride. There are two reasons for their choice: one is convenience, and the other is to save the cost of buying a bicycle.

4) *The overall score of shared bicycle is not high:* The overall evaluation of users is not very high, judging from the current user evaluation of the sharing cycle APP. The score of Yibu is more than 9, and the score of Smallblue bike is more than 8, and the scores of other shared bicycle apps are not high. Shared bicycles are in unattended condition for a long time, and it is difficult to control directly through the platform. Government regulation and corporate governance must be carried out at the same time, and users need to find the problems and feedback most of the time. Although the platform has been increasing efforts to promote standardization, but user feedback is difficult to solve in the short term.

5) *The use frequency is not high:* Most users do not have a fixed use habit for shared bicycles in terms of frequency. 29.3 percent of users use shared bicycles every 5-7 days, 22.6 percent for every 3-5 days, compared with 18.6 percent for 1-3 days and 10.1 percent for each day. Most users just sign up on the platform and choose a bike ride according to their needs. Users who use it every day form a habit of using it in school and work and become sticky users of shared bicycles. Currently, shared bicycle enterprises are also getting users and training users in the form of subsidies.

Under the action of big data, the shared bicycle platforms easily form a clear user portrait according to the user's frequency, time and location. It is more likely to make a bicycle profit from social, advertising and other ways.

6) *The diffusion of users from big cities to small and medium-sized cities:* The urban hierarchical distribution ladder is obvious, and shared bicycle users are mainly in first-tier cities and second-tier cities. First-tier cities and second-tier cities have concentrated a large number of schools and companies, with more young people. First-tier cities and second-tier cities are the primary target areas for shared bicycle brands. In addition, the density of population in developed cities is large, increasing the average use of each shared bicycle. This is more conducive to the flow of bicycles and the marginal cost of shared bicycle.

III. STAKEHOLDERS OF THE SHARED BICYCLE INDUSTRY

In the development process of the shared bicycle industry, stakeholders involved can be divided into the following categories: the shared bicycle enterprises, government, users, bicycle manufacturers and so on.

A. Shared Bicycle Enterprises

Shared bicycle captures the "pain points" needed by people for short trips. Urban public transport and existing government have provided the market space for the promotion of shared bicycles, such as insufficient supply of public bikes, single form and inconvenience. Entrepreneurs are keenly aware of this business opportunity and exploit the characteristics of the internet to open up a whole new market. Due to the environmental protection concept of green and low-carbon travel, shared bicycles are widely supported by users.

At present, shared bicycles are still in the blue sea period of industry development. Shared bicycle enterprises enhance their

power on capital, technology, services and other aspects and improve technical service quality. They adjust the industrial layout to stabilize the existing users and further attract non-users and seize market share. On the other hand, they actively promote the formation of industry norms in practice, and use industry norms to promote the healthy and orderly development of the whole industry. At the same time, they actively seek opportunities for cooperation between government and enterprises, and promote the government's laws, policies and systems to protect and support the development of the industry. In the process of the current development and standardization, as the two leaders with the highest development level and the highest market share.

Mobike and ofo shared bicycles have greater discourse power. As a result, other bicycle companies that follow the line are relatively weak, and their demand for government related laws and policies is actually more urgent. Otherwise, in the complete market conditions, these vulnerable groups will not escape the elimination of the exit.

B. Bicycle Manufacturers

The emergence of shared bicycles will inevitably lead to a decline in the long-term per capita bike ownership. People's demand for bicycles has plummeted. And for all the bicycle manufacturers, it's a huge revolutionary change. The larger brands may still be able to make money from the production and sales of high-end production lines. And with a high degree of strength, they can rapidly promote scientific and technological innovation to achieve cooperation with the shared bicycle enterprises, and obtain large orders. However, the low-end production lines of big brand manufacturers will still be badly hit.

For small and medium sized bicycle production enterprises, they have just focused on bicycle low-end products, through a high-volume, low-margin business strategy to earn profits. The development of shared bicycles may be a fatal blow to small and medium-sized bicycle manufacturers. Therefore, from the long-term development of the market, the bicycle production is likely to be concentrated in the existing batch of large bicycle manufacturers. These large bicycle manufacturers are actively engaged in scientific and technological innovation, seeking to cooperate with shared bicycles, and compete for large orders from them. Large bicycle manufacturers also adjust their own production structure, focus on sharing bicycle supply, reduce input and production of low-end products, and focus on the development of high-end production lines. From the whole bicycle market, the overall structure of the bicycle industry has undergone a great adjustment. Low-end production will shrink dramatically, and small and medium-sized enterprises may go bankrupt and be bought out of the market.

C. Users

In the shared bicycle industry, consumers play a single role, just as a user of a shared product. Although the role of users is single, the center of all kinds of behavior of government and shared bicycle enterprises is to provide users with a better consumption experience. The shared bicycle enterprises are the main stakeholders that have direct contact with consumers, and all the activities of the shared bicycle enterprises are organized

around the following two points: First, consumers choose to use our products; second, consumers use our products as much as possible.

When choosing a shared bicycle brand, consumers consider many factors such as comfort, beauty, convenience, low deposit, brand effect, selectivity. The questionnaire survey shows that when consumers choose to shared bicycle brands, the first three factors are convenient, comfortable and deposit. Therefore, it is not difficult to see that consumers give priority to convenience, which is mainly for the convenience of searching, unlocking and parking.

D. Government

The government's legal system for shared bicycle industry should focus on these problems such as responsibility identification of safety accidents, user identity restrictions, use and safety standards. For important issues that may involve people's lives and property security, the government should rise to the level of laws and regulations. The government should make it clear through relevant systems, policies, opinions and methods for these problems which are less important and more specific. In a situation where demand is very urgent, it can be fixed by establishing a system to deal with the actual problems. Later, the government gradually upgrades it to a higher and more binding law.

The government promotes the innovation and upgrading of related technologies in the field of shared bicycles, such as internet service technology, non-site storage technology, energy-saving technology, etc. Technological innovation is an independent choice made by the enterprise itself for long-term development and profit, and also reflects the government's guidance and support for industrial development. The government promotes industrial development which is conducive to industrial transformation and upgrading, in favor of improving social welfare, enhance the people's welfare. The important role of government is to foster, cultivate and guide industrial development through policy construction. Through the establishment of innovation fund, official field inspection and other means, the government directly and indirectly reflects the support of the shared bicycle industry. The government promotes the shared bicycle enterprises to accelerate the upgrading of technical level and technical service quality, so as to break through the threshold of "single loan comprehensive cost less than 1 yuan" at an early date. The government has stimulated and maintained the industry's long-term vitality, so as to better meet the needs of the public, to leverage the construction of low-carbon cities, and to promote the development of ecological civilization.

IV. THE PROBLEMS IN THE DEVELOPMENT OF SHARED BICYCLES IN CHINA

A. Imperfect Market Supervision Mechanism

Under the constant promotion of "internet +" and innovation and entrepreneurship, a large number of new business models have emerged in sharing economy. These new sharing models based on internet technology are characterized by openness, interactivity and networking and the practice of

rapid innovation makes the existing market supervision less effective and content. After the emergence of sharing economy, the lack of supervision content and means of the industry norms can neither regulate the development of sharing economy, nor can effectively solve the disputes arising from the sharing economy in the course of development.

On the one hand, while the new model of sharing economy is booming, all kinds of illegal behaviors are hidden in the dark, and traditional supervision measures are difficult to carry out timely and effective supervision. In the development period of new business mode, the illegal cost of exploiting regulatory loopholes is low and concealment is strong. There are legal and operational risks in the two-way fraud and the second-hand transaction of stolen shared bicycles. These potential violations will seriously damage the interests of users and enterprises and affect the smooth development of sharing economy.

On the other hand, the existing market supervision is difficult to deal with the relationship between the new business model of sharing economy and the original traditional enterprises in the industry. The new business mode of sharing economy reduces transaction costs by means of information technology, and squeezes the profit space of traditional industries, which inevitably leads to the dissatisfaction and confrontation of traditional industry bodies.

B. Blind Expansion with Hidden Dangers

Shared bike is favored by the capital market for its convenience and greening of the "last mile" of travel, and the financing rhythm and the amount of funds are constantly updated. For example, in 2016, 15 rounds of financing were completed by Mobike, ofo, U-Bicycle and Xiaoming. In 2017, more than 3 billion yuan has been invested in the field of shared bicycles. Under the frenzied influx of capital, the shared bicycle platform is keen to increase bike coverage, but the city's "enclosure movement" is a hidden risk.

On the one hand, the "subsidy wars" and "price wars" have been constantly staged to seize market share. For example, after Mobike and ofo introduced the price of cycling at 1 yuan for half an hour, the prices of Small Blue and Kuqi were set at 0.5 yuan and 0.3 yuan for half an hour respectively. In turn, Mobike and ofo launched activities such as "free ride on active day" and "recharge 100 yuan for 100 yuan". This scenario is the same as the capital war when the ride-hailing car industry is engaged in "enclosure movement". By reducing the price and subsidizing the market share, it will be a hidden trouble for the future development of the shared bicycle industry and enterprises.

On the other hand, in the absence of unified planning and coordination, the respective launching activities of multiple shared bicycle companies have resulted in excessive delivery of shared bicycles in some areas. Take the number of shared bicycles in Shenzhen as an example, the number of permanent residents in Shenzhen is about 11.7 million according to official statistics. According to the current scientific calculation means of the city capacity of shared bicycles, Shenzhen can only accommodate up to 80,000 shared bicycles. Mobike and ofo have already put 120,000 shared bicycles in the city of Shenzhen, exceeding the limit of 80,000.

C. High Operating Costs

The manufacturing cost of shared bicycles is high. Taking Mobike for example, in order to improve the recognition degree, the IoT chip and GPS are placed in the bicycle. The bearing drive replaces the chain drive. Non-inflatable explosion-proof solid tires are used, etc. These designs improve the identification of bikes, but lead to the cost of each shared bicycle is more than 2,000 yuan. According to the rent of 1 yuan per hour and 10 hours per day, a shared bicycle needs to be used for 200 days in a row to earn back the cost. The above calculation does not include the loss rate and the cost of enterprise operation and bicycle maintenance, etc.

The high loss rate is another factor leading to the high cost of shared bicycles. Although shared bicycle company say their bicycles can last up to five years. However, in reality, the annual loss rate of shared bicycle caused by theft and vandalism is up to 10%. In order to maintain market share, the shared bicycle companies can only add more bicycles, and the cost will naturally increase.

The other big dilemma that the shared bicycle companies have to deal with is the staggering cost of bike maintenance and company operations. For example, in the case of Mobike, it is estimated that every bicycle should be around 1100 yuan, even if only the loss and operation costs are calculated. This does not include virtually additional scheduling costs due to arbitrary parking.

The fourth factor closely related to the cost of shared bicycle is the registered user scale. Take Mobike for example, with the bicycle manufacturing cost of 2000 yuan, the deposit of 299 yuan and the loss of 10%, each vehicle must support more than 9 registered users to achieve the basic break-even point. However, according to the current user coverage of the shared bicycle companies, there is still a lot of distance. At the end of 2016, Qbike announced that it was the first shared bicycle company which didn't need user's deposit. At present, shared bicycle companies, such as ofo, U-Bicycle, Youon and Qibei, have cooperated with Zhima Credit, and users are able to ride bicycles without deposit in more than 200 cities around the country. Riding a bike without a deposit is an irresistible trend. For now, there is no doubt that it is a huge challenge for the shared bicycle companies which are led by deposit operation.

D. Disordered Parking and Malicious Damage

The numbers of market launches of shared bicycles are large, and there is a need for large enough space to park. A large number of shared bicycles are launched in most areas of the city. This will be a great challenge for bicycle parking, maintenance, repair and transportation. Because there is no fixed stop point, shared bicycles are randomly parked on the sidewalk, blind road, motor vehicle road, green belt and other places. This has seriously affected public order, damaged the image of the city and violated other people's rights, which has caused problems for urban management.

When shared bicycles are put into the market, the loss is inevitable. However, the loss of handlebars and seats, flat and broken tires and altered two-dimension codes are often seen as malicious damage. Some users even lock and possess shared

bicycles for their convenience. In the efficient flow, shared bicycles can help enterprises realize the maximization of benefits and the optimization of cost. However, malicious damage and self-possession are frequent, which seriously violates the design intention of the profit maximization of shared bicycles.

Whether it is a disorderly halt or a disruption of shared bicycles, the reason is the action taken by its users and other stakeholders to seek best interests for them. The reason why so many sharing bicycles are not shared is that people's awareness of sharing is not strong enough. The appearance of shared bicycles shows that we have reached a sharing state in material terms. However, the phenomenon of non-sharing during the use of sharing bicycles shows that the development of our sharing spirit is lagging behind.

E. Safety Performance Needs to Be Strengthened

No new thing, no industry can ignore safety. Shared bicycles as a vehicle for human service, it is obvious that the most important thing is safety.

First of all, the quality of the Shared bicycle body needs to be safe. China's current compulsory standard for bicycle products is "bicycle safety requirements", but this standard is aimed at household bikes, and the standard is not specific to the safety of shared bicycles. Shared bicycles are stored outdoors, often experienced bad weather damage. They are also used daily with high frequency, and the loss is larger than household bicycles. In view of the special use and storage conditions of shared bicycles, the quality and standard of shared bicycles should be redefined. After shared bicycles put on the market, how long will it take to scrap it? After which extent of damage, shared bicycles can no longer be repaired and released into the market. There are many similar issues, and the country has not yet released targeted industry standards. This could lead to industrial chaos of shared bicycles, and affects the healthy development of shared bicycles.

Secondly, users' information and capital should be secure. Shared bicycle is a new thing that is derived from the combination of Internet and transportation. To use a Shared bike, the user must first real-name register and recharge. Then, how to protect the user's personal information and fund security is a big problem after the user is registered. How will the balance be refunded after user recharge? What are the refund methods? How do the enterprises protect the user's personal information and financial security? How does the government regulate corporate behavior effectively? The solution of these problems requires the joint efforts of enterprises and the government.

Finally, the cycling should be safe. Shared bicycle is a new kind of vehicle which is a part of the city traffic, and it inevitably faces the problem of driving safety. In China, there is a widespread problem of uneven distribution of road space in many cities. The car lane is shared with the bike lane or the sidewalk, and the safety hazard cannot be ignored. If the user has an accident in the use of a shared bicycle, how the responsibility is divided and whether the company should bear the relevant responsibilities should be made in relevant provisions.

V. PROPOSALS TO IMPROVE THE DEVELOPMENT OF SHARED BICYCLES IN CHINA

A. Actively Playing the Regulatory Role of the Government

The government should play the regulatory function, clarify the responsibilities of the government, enterprises, users and other entities, and guide and regulate the healthy development of the shared bicycle industry. Firstly, the government should strengthen the management of shared bicycle enterprises. The government should clarify the access system and industry standards, give legal status to the shared bicycles, and strengthen regulation and control in the approval, planning, implementation and other links of the shared bicycles. Secondly, the government should also issue rules and regulations to restrain the behavior of users and promote users to regulate the use of shared bicycles. The government should promulgate the corresponding management rules to stipulate the parking and use of shared bicycles. The management rules should give penalties for disorderly parking, violations of traffic regulations and deliberately sabotage. Thirdly, the government should advocate the spirit of sharing, improve the public's awareness of contract, and further improve the social credit system. Finally, the government should enforce the law strictly and reward and punish clearly. For enterprises with high operation level and good service, the government shall reward them through bonuses or other means. The government should increase penalties for enterprises that only focus on maximizing profits but neglect safety management, causing hidden dangers to urban safety and management problems.

B. Strengthening the Guidance and Specification on Shared Bicycles by Industry Association

Firstly, the industry association should increase the publicity and education for users, improve users' safety and legal awareness from the moral and legal level, and guide everyone to use shared bicycles safely, legally and in a civilized way. Secondly, the industry risk guarantee fund system should be established to ensure the safety of consumer deposits. The industry association or the transportation department shall take the lead to collect a certain guarantee fund in proportion from the consumer deposit, and operate the independent account in a closed way, so as to refund the consumer deposit when shared bicycle enterprises go bankrupt. Thirdly, the industry association strengthens the cooperation with local government to fight for the right of road for the development of shared bicycles. The industry associations need to push the government to expand non-motorised lanes and promote shared bicycles operate without breaking traffic rules. This can effectively reduce the problem of disorder and traffic accidents, protecting the lives of citizens. Finally, the industry association should innovate sustainable development models. They should enrich the types of bicycle investment, explore competitive approaches other than price wars, study new profit models, and achieve a virtuous cycle of capital and business models.

C. Improving the Operation and Management Level of Shared Bicycle Enterprises

Shared bicycle enterprises should provide a better user experience and enhance the sense of user acquisition. Firstly, shared bicycle enterprises need to provide more bicycles, so that users can find bicycles anytime and anywhere, and avoid the trouble of having no bike to ride. Moreover, it can also reduce the privatization of shared bicycles to a certain extent. Secondly, shared bicycle enterprises should improve their market management capabilities. With the help of big data, enterprises can reasonably arrange the placement points and quantities of shared bicycles, so as to ensure a good user experience. At the same time, enterprises can reduce unnecessary investment, reducing production and management costs. Thirdly, shared bicycle enterprises need to further improve the quality of their products and service. For APP vulnerabilities, enterprises should timely discover, quickly repair and reduce the bicycle failure rate and damage cost. Fourthly, shared bicycle enterprises should increase the intensity of treatment of derivative problems. Enterprises strengthen the management of shared bicycles which have been put in place to ensure orderly parking and smooth traffic.

D. Improving Users' Civilization and Usage Habits

Firstly, users should ride shared bicycle s in a civilized and safe way. Users should consciously abide by urban traffic rules and enhance their safety awareness. Secondly, in the three-level mechanism of "government guidance — enterprise operation — user cycling", users should take the initiative to accept and learn the user manual issued by shared bicycle platforms, standardize the usage habits, and make their own contributions to the construction of green and environment-friendly transportation system. Thirdly, users need to expose the illegal use of shared bicycles through WeChat, Weibo, phone, email and other ways. The phenomenon of deliberately damaging, randomly parking and concealing bicycles should be exposed.

VI. CONCLUSION

The development of sharing economy in our country is in full swing, and shared bicycles are the most typical representative of sharing economy. The development aim of shared bicycle is to solve people's problem of last kilometer travel. Shared bicycles have the characteristics of convenience, economy, green and low carbon, which have gradually been pursued by people and become the "new favorite" under the sharing economy model. While providing convenience for the travel of Chinese consumers, shared bicycles still have many problems in supervision, management, parking, cost, customer satisfaction and other aspects. In order to promote the better development of shared bicycles, this paper constructs a new "four-in-one" development strategy, from perspectives of government, industry, enterprises and users .As a new thing, although the development process twists and turns, but the development of sharing bicycles is conducive to reducing the cost of social operation, with broad prospects for growth.

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