

Leasing Industry Based on Internet: A Study of the Bicycle-Sharing Program in China

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Abstract—The bicycle-sharing program has been developed rapidly around the world. Especially in Asia, many developing countries launch their own bike-sharing business to provide transportation convenience for citizens as well as protect the environment. Among these, China's bike-sharing program has won a lot of attention due to a wide range of users and incomparable convenience. From a leasing industry perspective, this paper investigates how bike-sharing programs are developed and how leasing industry is mixed with bicycle-sharing industry. Taking Mobike as an example, the research analyzes its traits and business model, showing an advanced app that leading the bicycle-sharing industry in China. This study finds that bicycle-sharing system has risk in managing users' account and that developing technology is the key to this industry. The results of current research have provided an insight into drawbacks of bicycle-sharing system and offer a more comprehensive understanding of this new leasing industry.

Index Terms—Bicycle-sharing, China, leasing industry, Mobike.

I. INTRODUCTION

The bicycle-sharing has received much attention in recent years due to its convenience and low price, which offers important economic benefits. Bicycle-sharing is one of public transportation vehicle that users can take special bicycles from docking points and return it at other stands [1]. It helps solving short distance among office, home and metro or bus station. Bicycle-sharing economy has been developed in many countries like Paris and London, and also been investigated as a potential popular transportation tool [2].

However, most researchers investigated traditional shared-bikes conducted by government but few studies have focused on latest business conducted by entrepreneurs in China. For example, Nair et al. (2013) took Velib in Paris as an example to provide empirical evidence of the usage patterns of large-scale shared-vehicle systems and more recently [3], Karki et al. (2016) surveyed Suzhou citizens to research how accessible and convenient are the governmental public bicycle sharing programs [4]. However, although the effort of some well-known shared-bicycles systems was demonstrated over past several years, little attention has been paid to the advent

of new type of systems run by companies in China. Furthermore, few researches have studied it from the perspective of leasing industry to analyze its special traits.

The present paper presents a study on two typical bicycle-sharing companies in China, Ofo and Mobike and thinks they are a kind of expansion of leasing industry. The aim of this project was providing new type of leasing industry in bicycle-sharing industry in China and offering advice on development. On the basis of these criteria it then describes leasing industry and analyses business model of two companies. This study found an inspiring model that sharing-vehicle could be developed and richened the theory of leasing industry.

II. LITERATURE REVIEW

The earliest equipment leasing was recorded in the ancient Samarian City of Ur in about 2010 B.C. while modern leasing just started in the 1950s when the first leasing company was founded in the United States. From that time, a lot of attention has been paid on leasing industry [5]. Amemble (1995) found that leasing can preserving credit lines, increasing one's purchasing power, providing fixed-rate financing and so on [6]. Eis and Lang (2012) studied the right of lessors and promoted that he could repossess the leased asset [7]. Halladay et al. (2009) investigated the emerging markets and found that equipment leasing potentially is a major business opportunity for international lessors [8].

In China, leasing industry presents a prosperous after its entry into the World Trade Organization (WTO) [9]. China's entry into WTO stimulated and directly accelerated the recovery of China's leasing industry. Yanping and Xiaolan (2015) focused on China leasing development and suggested that Chinese leasing market had a huge potential and was stepping into its golden era [10]. Zhang and Rao (2016) discussed the electric vehicle market in China, including power companies, battery manufacturers and gasoline enterprises [11].

Studies on shared bicycle and its promotion have been carried on from diverse perspectives and have yielded various results. For example, by studying bicycle sharing model in U.S.A., France and Germany, Demiao (2009) summarized provision models of bike-sharing system and gave advice to further development. Based on history of bike-sharing system [12], Shareen et al. (2010) divided bike-sharing's evolution into three periods: (a) white bikes (or free bike systems), (b) coin-deposit systems, and (c) information technology-based

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systems [13]. Taking nine large cities as examples, Pucher and Buehler (2012) describes the specific accomplishments of the nine case study cities, focusing on their innovations and lessons for other cities trying to increase cycling [14]. By researching literatures of bicycle-sharing system, Zhou et al. (2014) found that improving bicycle rental station and performance value were keys to ensure public bicycle to develop steadily [15].

There are also some researchers paying attention how the public bicycle system influence people's life and its benefits to society. For instance, Zhu *et al.* (2012) analyzed public bicycle system in Minhang district, Shanghai with questionnaire and model, pointing out that most people ride bicycles to replace walking and bus and the main reason of using public bicycle is convenient [16]. Taking Suzhou as an example, Qian et al. (2014) researched factors that influence citizens to use public bicycles. They pointed out that easy to use, comfortable and environmentally-friendly were important factors and cost and deposit were not significant [17]. Based on investigations of low income and less education people, Karki and Tao (2016) suggested that very few females, low-income migrant workers and less-educated people took advantages of public bicycle system because of inconvenience of parking slots. The research also proposed that the system should be optimized to be more accessible to the weaker section of the society [18].

Recent studies on bicycle sharing systems mostly focus on construction and planning, operational management and planning of public bicycle rental stations. By studying Ningbo, Hangzhou and Beijing's public bicycle rental durations, Zhang et al. (2016) indicated that the relationship between rental frequency and rental duration obeyed the decay law, which provided support for the rental station planning of bicycle sharing systems as well as the allocation and dispatch of public bicycles [19]. In addition, Kager *et al.* (2016) researched Netherlands and thought that cycling is a supplement of transportation that connected subway station to destination [20].

However, few studies investigate bike-sharing from leasing industry perspective. For most bike-sharing services, they lend bikes to users and get some charge, which is a rental behavior. Additionally, the new progress and characters have not been reported. Hence, this article aims to fill the theoretical gap and provide inspiration for further research.

III. BICYCLE-SHARING INDUSTRY AND CASE STUDY

Bicycle-sharing, or public bicycle, received growing attention in recent years. The most important reasons are increasing bike usage, better meeting the demand of a mobile public system and less environmental impacts of urban transport activities. Dated from 1960s, Bike-sharing industry has been developed in some countries like French, United States, etc. In Asia, several typical cities like China, South Korea and Taiwan follow this trend and develop their bicycle-sharing system. Recent years, China introduces bike-sharing industry, guiding people to ride instead of

driving. This part begins with the introduction of bike-sharing development stages, before turning to an overview of the development history and present situation in China. It concludes with a case study with a well-known company in China- Mobike-to introduce an innovation of leasing industry in bike-sharing industry.

A. The Development of Bicycle-Sharing

There have been three generations of bicycle-sharing program from in over the past 45 year [21]. The first generation of bicycle-sharing programs began on July, 1965 in Amsterdam, which is called Witte Fietsen. They are ordinary bikes painted white and for public use. People who need to ride a bicycle could find a bike and ride it to his or her destination, where he or she just leaves it there for the next user. However, this program didn't last for a long time because of increasing use of private purpose and intentional vandalism. The program broke down within days.

After this, the second generation of bicycle-sharing program was developed in Denmark in 1991 and 1993 [22]. They are both small programs, like the latter one only had 26 bikes at four stations. About thirty years after bicycle-sharing was invented, the first large amount second generation bicycle-sharing program was launched in Copenhagen many improvements. This kind of bike was designed with non-practical use as it has solid rubber tires, wheels with advertising plates. Additional, it only could be rent and returned at specific spots in central city. The program was run by a non-profit organization and cost a coin as deposit. Although it is more formalized, the bikes still encountered theft as the users were anonymous. This led to the rise of third generation bicycle-sharing program.

The new bicycle-sharing program was launched in 1996 at Portsmouth University in England. Students could rent a bike with a card. From that time, third generation program were attached with various technology, like smartcard, mobile phone access, electronic lock and on-board computers.

The noticeable large scale third generation program was the launch of Velo'v in Lyon, France in 2005, with 15,000 members and bike being used an average of 6.5 times per day. Two years later, Paris launched its own program, Vélib'. It began with 7,000 bikes. This significant undertaking gave a big change of bicycle-sharing industry and many countries followed Paris to carry out different bicycle-sharing systems.

According to research, new programs were implemented consequently in following countries (As shown in Table I in alphabetical order by country and then city) [23].

TABLE I: THE BICYCLE PROGRAMS IN SOME CONTRIES

| Country | City | Name |
|-------------|--------------------|---------------|
| Brazil | Rio de Janiero | Samba |
| Chile | Santiago | b'easy |
| China | Beijing, Hangzhou, | Mobike, Ofo, |
| New Zealand | Auckland | nextbike |
| U.S.A | Washington, D.C. | SmartBike D.C |

B. Bicycle-Sharing Industry in China

China is a well-known country on bike, as 78% families

owns a bike. According to survey, there are about half a billion bikes in China. In old days, Chinese people see bikes as a necessary stuff in family and a main transportation tool, when there weren't many cars and the economy wasn't that flourishing. However, with the development of automobiles and rich living standard, bicycles are not a typical vehicle in China. As a result, the CO₂ emission gets more and more, leading to severe environmental problem such as smog. Many cities faces similar situation, and public frustrations about urban air pollution are increasing. So the Ministry of Transport initiated a public bicycle sharing program as one of the strategies to relieve this situation, which bring bicycles back into people's horizons.

Meanwhile, people's attitude towards bicycles has been changed. Many young Chinese see this sharing bike as a cool and hip activity, and some treat it as another type of owning. What's more, sharing-bicycles companies, for instance, Mobike and Ofo, contributed to environment. The programs they launched are friendly to environment. Therefore users think that riding sharing bicycles is a healthy and green lifestyle.

Highly developed mobile technology and significantly increasing environmental awareness help to revitalize China's bicycle culture. Take three representative cities as examples, Ningbo, Hangzhou and Beijing, the area of coverage of bicycles and the number of public bicycles are large at the initial stage of launch, developing fast and covering almost the whole cities [24]. Table II provides details of three target cities.

TABLE II: DETAILS OF THREE REPRESENTATIVE CITIES

| City name | Beijing | Hangzhou | Ningbo |
|--|----------------------------------|----------------------------------|----------------------------------|
| City type | Metropolis | Large city | Medium-size city |
| Date of construction | 2008 | 2007 | 2012 |
| Area of coverage | About 250 km ² | About 185 km ² | About 145 km ² |
| Number of public bicycles in the area of primary distributed | About 50,000 bicycles | About 40,000 bicycles | About 25,000 bicycles |
| Station density | 8.9 stations per km ² | 9.2 stations per km ² | 8.6 stations per km ² |

C. Case Study: Mobike

Mobike is a typical and large size company in bicycle-sharing industry in China. It provides the platform to users to ride bicycles for a low price. Users need to pay a security deposit of 299 yuan, which can be refund anytime. There are two kinds of bicycles: Mobike and Mobike Lite. Mobike is the first vision bicycle, which uses wheels with five spokes to replace traditional easily-wasted spoke design. Also, the chain drive is substituted by bearing drive, which makes the chain won't be dropped. In addition, to avoid the risk of tire burst, Mobike uses solid wheels which don't need to be inflated. Comparing with Mobike, Mobike Lite uses lighter materials, for example, aluminium alloy basket, to ease the weight. As a new kind of rental business model, Mobike

shows significant progress as following (as shown in Fig. 1).



Fig. 1. Mobike bicycle.

The business model of Mobike is bike rental without guard. Every bicycle is unguarded. The leasee can rent the bike if they find one and return it to almost any location in the city service area. At the same time, informatization and internet technology are inserted in bicycle rental system. The users can rent a bike by scanning QR code on bike labels. After they unlock the bike, the platform begins charging automatically. And when they finish riding, users just need to lock the bike then the system stops charging. This design promotes rental process and highly improves the efficiency, providing a new inspiration for leasing industry (as shown in Fig. 2).

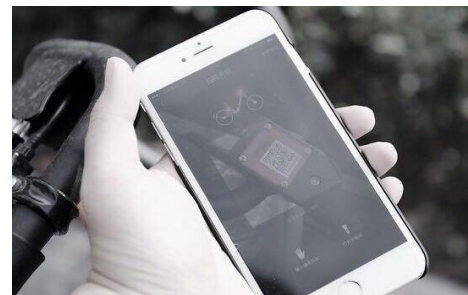


Fig. 2. Scanning the QR code to unlock the bike.

Mobike is a for-profit model, which means it has a private sector company providing the service with limited or no government involvement [25]. It runs the service in a locality with the flexible station bike sharing system. A benefit of this model is that Mobike can start a service as an entrepreneurial activity rather than cooperate with government. Mobike charges for users for two different standards; for Mobike is 1 yuan per half an hour and for Mobike Lite is 0.5yuan per half an hour. Meanwhile, Mobike has just got two hundred million as an investment. This profit model not only brings Mobike sufficient running money but also provide a flexible and efficient income resource.

Mobike also uses innovative technology to manage its station-free bicycles. Mobike bikes are equipped with smart locks and GPS systems, which allow riders to locate and unlock the bikes using their smart phones (as shown in Fig 3). If users find bicycles are broken, they can report it in Mobike app then the workers will collect them back and repair. To reduce improperly parking and intended car damage, Mobike sets a 100-point credit score for each user, with points taken in the case of bad behavior. Once a score drops below 80, bike rental is increased to 100 yuan per 30 minutes, up from 0.5-1 yuan.



Fig. 3. Mobike GPS system.

IV. DISCUSSIONS

Based on this study, the following aspects emerge for discussion. Mobike is a startup and get astonishing success in a short time. This may because the large market in China. Due to the special characteristics of China, people have particular feeling of bicycles. Nowadays, they treat bicycles as a traditional tool and a fashionable vehicle. In addition, most citizens have at least one mile distance between subway station and home or office. Comparing to walking, riding is a faster and more convenient way. All of these motivations make Mobike a popular service in China.

Leasing industry with high technology gives users different usage experience, which decides users choice. Mobike is a new type of leasing industry. Different from sharing economy, Mobike bikes are launched by companies and charge users for a reasonable fee to run the service. With high technology inserted, users would like to choose it as a new way of transportation, which also opens big market for it. This fact also indicates that technology may be the most important aspect in shared bicycles. Hence future leasing industry should pay more attention on technology to develop large consumer market.

Although the bicycle-sharing system is gaining popularity in China, like the rest of the leasing industry, there are challenges and consequences facing Mobike if it wants to be continually successful. Main problems are unregulated operation, irregular parking, unsupervised deposit and bike damage. Mobike could set a special account and keep the public informed of their time limit for refund, returning deposits to users in time. It can also ensure bicycles to meet technical requirements and tested bikes in service regularly. Operators could mark parking area in app and give the leasee guidance to park. Meanwhile, complete credit evaluation

regime of users. Those who violate rules for many times would be involved in blacklist.

V. CONCLUSION

This paper has taken one main bicycle sharing companies in China as examples. To acquiring more popular results, future research may be necessary to study more companies like the Bluegogo in China or the Velib in Paris. Researching international companies may generate more heuristic results and give more practical advice on development. It will also collect different business models and widen the utility of strategy.

Culture and lifestyle are also research limitations. China has different culture and history with other countries, leading to different attitude to new things including sharing bicycles. Future research could compare countries with different regime. Country's area and structure also influences people's intentions to bicycles. With many uphill and downhill paths, citizens may be not willing to choose bicycle as a transportation tool, which will affect the development of this rising industry.

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