

Mobike: to what extent dockless design and digital technology impact mobike

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Abstract. Now the sharing economy has impacted the entire Chinese market, including car sharing, bicycle sharing, umbrella sharing, and so on. The advent of the Internet era has brought hope to many of these emerging industries, and various digital technologies have provided many companies with the premise of free development. But as far as Mobike shared bikes are concerned, when they are more freely and easy to park, the impact of the dockless design combined with digital technology will be worth pondering. This paper analyzes the dockless design of Mobike, at the same time, it also focuses on the impact of Mobike digital technology (online payment, GPS system, app data). Finally, it proposes a solution for the Chinese-style sharing economy that evolved from dockless and digital. Overall, the dockless design and the Digital technology have a huge impact on Mobike, both positive and negative. Now Mobike has been acquired by Meituan, but I still discuss this article under the original name of Mobike, thinking that it is the first sharing-bicycle brand in the Chinese market, and although it has been acquired, it is still a successful brand.

1 Introduction

From 2015 to 2018, there was an unprecedented phenomenon in China's economic market. With the rapid development of the sharing economy, all industries have joined the shared market (Figure 1). It is this brand that has set off the storm -- MOBIKE. This bike-sharing brand was founded in 2015 by weiwei Hu, who has worked as a journalist in the traditional automotive industry for more than ten years. The creation of Mobike has led to a shared economic market, and many companies have followed suit, like, OFO, Bluegogo. But after a long period of market filtering, now in China, the two largest sharing bicycle enterprises in China are Meituan (this company has acquired Mobike) and Hellobike. But at the beginning of China's sharing economy, the two giants were Mobike and OFO. The two brands have similarities in the shape and colour design of the bike, using a dockless bicycle system, online payment system, and GPS (Global Positioning System) system. Mobike body is bright orange (Figure 2), OFO body is bright yellow. Using bright colors as the theme color of a brand always makes people recognize them when they need to use them. Nowadays the existing sharing bicycle brands in the Chinese market also maintain these characteristics, with bright appearance and color, and simple system operation.

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Fig. 1. Station-free bike sharing and bike sharing system with docking station [1].



Fig. 2. Mobike Appearance. <https://www.bikebiz.com>.

The earliest sharing-bike system was coin-operated and used a docking design to manage each bike, but now, the newest sharing bike adopt dockless (station-less) design system, due to the high degree of freedom and convenience, the bicycle sharing system attracts a large number of riders. In the past, most people only used bicycles as recreational activities. Now sharing bicycles also has commuting functions [1]. At the same time, With the development of digital technology, each sharing-bike develops a GPS positioning system and an online payment system for them [2]. The GPS system helps users know the specific location of available shared bicycles nearby through apps, while the online payment system allows users to quickly and conveniently process bills after the trip. In March 2017, more than 4 million bicycles have been shared in China [3]. Although Mobike was acquired in 2018, Dockless (station less) design sharing bike systems have always been favoured by the market, and their application and development are increasing. By 2020, the number of users of China shared bicycle system will have exceeded 250 million (Figure 3), and the number of bicycles will also increase a lot compared with that year. Koglin [4] pointed out in his paper that, so far, 813 bike sharing systems are in operation around the world, and 221 are planned or under construction.



Fig. 3. The scale of bike-sharing users in china from 2016 to 2020. [https:// data.iimedia.cn](https://data.iimedia.cn).

Using the Mobike app, users can search and unlock nearby bikes from the app. When the user arrives at the destination, they do not have to return to the docking bike station. Instead, they can park their bikes in a more convenient place. Therefore, users are more likely to rent and return bicycles than traditional bicycle sharing systems. Dockless (no station) design and

digital technology have brought huge commercial value to Mobike, dockless design and digital technology have no doubt about the promotion of Mobike in the market, but there are also some negative views that the waste of resources caused by sharing industry is incalculable.

2 Mobike dockless design

First of all, the bike with dockless design system is easier to park. Nowadays, citizens are dependent on the travel function of the car, it is easy to cause traffic jams and limited public parking space. More and more people choose public transport to travel. We can find that parking and congestion are complementary, when the public uses cars but they can not find a parking space, when looking for parking spaces, they are likely to cause energy consumption and traffic jams [5]. However, the subway is restricted by traffic flow and traffic jam is at rush hour. The emergence of shared bicycles meets the needs of some short-distance travellers. Despite the inadequate coverage of bicycle lanes, shared bicycles allow people to avoid rush hours and traffic jams, and of course faster than walking. Unlike traditional cars, which need to find parking space after use, sharing-bike system is easier to be accepted, take and use, and park on the sidewalk after use.

In 2014, Seattle implemented its bicycle sharing system Pronto. However, the system eventually stopped operating on March 17th, 2017 [10]. Pronto used dockless station design, that means, after using the bicycle, the user still needs to find a docking station to park the bicycle. And insufficient site design is a big impact to Pronto. The use of bicycle sharing is closely related to the planning of urban bicycle lanes and docking stations, and the development and implementation of shared bicycles also involve the influence of various sectors, such as government, users, manufacturers, citizen, etc [3]. Pronto ignored these important factors during development, Pronto's traditional sharing-bike docking station design cost users a lot of time, and waste government funds, thus losing the support of the government and the attention of users.

Furthermore, dockless design help people save a lot of time. The increase in shared bicycle use is due to the reduced demand for pedestrians and buses [6]. If users have a not so long but also not too short way to go, sharing bicycles everywhere can help them solve many problems, dockless sharing bikes put forward the idea of "the last mile". The sharing bicycles can be seen everywhere, and dockless design has played a great role. With the increase in docking stations and the use of public space in ancillary facilities, the user in almost all countries with bicycle sharing systems has declined over the past few years until 2015, in China, Mobike integrates mobile payments and GPS tracking to improve Ease of use and management [3]. In particular, most of the target groups of bike sharing come from people who commute by public transport [4], they are always on a tight schedule, and there is not much time to waste on the commute, the design of the non-station shared bicycle allows people to easily complete the bicycle rental behavior with the smart-phone, and the Mobike's dockless design does not require people to return the bicycle to the specific station, which greatly saves user's time.

Dockless design is convenient but also it is too easy to operate, which may let some users forget to lock the bike on the phone, some people argue that the dockless sharing-bike design allows many children or those without cycling experience to take advantage of shared bicycles, which can lead to some traffic accidents. Although many bicycle-sharing users maybe are inexperienced riders and rarely wear helmets, the safety of sharing-bike is better than that of leisure bicycles. One of the reasons is that sharing bicycles is so big and slow that avoid user ride too fast [7].

On the other hand, most of the shared mobility business models promise green and affordable transportation in cities. However, their rapid scale process often leads to great

destruction and the pressure of urban governance. Dockless sharing-bike system is highly praised in lot of cities in china, bringing this low-carbon and environmentally friendly way of travel back to the city. Despite dramatic changes in the public in a short period, dockless design did not require site docking and soon oversupply resulted in a large area of street occupancy, uneven distribution and user behaviour misconduct, which endangers the environmental and social sustainability of innovative activities [9]. Because of the dockless design, those bikes allow people to park at will, which makes those bicycles, messing around, disrupting public order, and occupying sidewalks. There are many damaged bicycles that are neither used nor recycled (Figure 4). They have been parked in unreasonable places, seriously affecting pedestrian travel. In the past few years of Mobike bicycle development, there have been negative news about Mobike in the newspapers and TV. There are even rumors that Mobike is not accepting government intervention, refused to recycle and deal with a large number of shared bicycles on the sidewalk. But these negative effects can not stop the increasing trend of shared bicycles, there are still many people using bicycles every day. There is no doubt that the emergence of sharing-bicycle really helps us to solve the “the last mile” problem.



Fig. 4. Current status of bicycle parking. www.Wikipedia.com.

With the rise and fall of the sharing economy, the current sharing bike giants in the Chinese market have become Meituan (acquired Mobike) and Hellobike. Hellobike has survived the fierce war in China's sharing economy for several years [8]. It also tries to solve the resource waste caused by these vehicles with a new method, such as encouraging users to report bicycle defects and other users' violations through apps, by taking advantage of consumers' behavior habits, the operating costs are reduced to customers, which saves a lot of time and energy for employees of the enterprise. The mutual norms of these behaviors also remind customers that these bicycles are not personal goods and emphasize the importance of personal obligations in the sharing economy [12]. However, the effects of these norms of user behavior are limited after all.

3 Mobike digital technology

3.1 Online payment system

In China, with the development of digital technology, traditional methods are not limited to cash and credit cards. Online payment is becoming more and more popular, and people can actually consume in the virtual network world, such as online shopping. Alipay originated in 2003 and in 2013 Alipay accounted for more than 80% of the market share of online payments [11]. Mobike is also keeping up with the online payment trend, in addition to developing your own app, Mobike also works with Alipay. Online payment is convenient and fast. Just open the online payment app, scan the QR code on the bike (Figure 5), and you will find the shared bikes available nearby, and at the end of the journey, you can immediately

lock the bike in phone's apps, pay online and even takes no time to operate deliberately. The Hellobike bicycle mentioned above is a shared bicycle brand directly affiliated to Alipay. Based on Alipay's strong background on the payment side, Hellobike's survival can also be traced.

From yanli Pei (2015) [11] research, it can be found that electronic payment allows users to enjoy lower costs, and the easy access is the key to electronic payment. The availability of payment systems makes users feel less complicated, easier to learn, and easier to navigate. The online payment system on the Mobike is quick and easy, easy to register, and can be used every moment. And online payments often have rewards, such as discount links, money packets and other benefits. Qing Yang (2015) [13] has done a research in 2015. they interviewed 870 online payment users. The results show that in China, most people paying online are younger generations, which means that most of these systems are targeted at young people's group. The young people are under work pressure and their daily life is always in a hurry. In the era of fast-paced culture, Mobike follows this rule. When it comes to sharing bicycles market, it follows the footsteps of digital payment and uses Chinese mature online payment system to attract a large number of customers. And in the younger market, the advantage of online payment is often used to provide users with maximum bonus benefits and low cost, the fast and convenient online system brings profits for shared bike. Because of its simple operation, this makes shared bike users continue to increase and become more and more popular.



Fig. 5. Mobike QR code. <http://www.techvoid.com>.

3.2 The GPS system

The lack of large-scale investment in bicycle-sharing infrastructure may not stimulate substantial profit growth, but sustainable development and users need equipment experience to maintain, digital technologies such as the Internet and GPS system and phones online payment help shared bike alleviate the pressure [14]. Convenient bike positioning search and payment app has attracted a large number of users, which has greatly changed people's traditional way of travel. In the absence of investment in traditional industries, Mobike has received considerable funds through on-line user's bike deposits and bike fees. For an emerging industry, digital technology brings a glimmer of hope to Mobike.

In addition, for the users, although digital technologies are risky, it still has huge value. In the Internet era, user information is becoming more and more readily available, random online shopping records will expose a lot of personal information, people still want to protect their privacy. Mobike's online system has also been questioned, especially privacy information risks [11]. which means that users' information may be leaked and abused during the transaction process. According to the adjustment of Sun, Chenb, Jiao [10], when the user uses these apps, the user's itinerary information and personal information are recorded, including the user's geographical location, gender, and travel date, even the social relationship network. However, except collect personal information of users, these data also have certain positive effects. For example, some users after using the sharing-bike, their mobile phone sharing bicycle app will pop up a small window asking the user to score the

bike-tour's experience, which helps Mobike or other sharing-cycling company collect customer feedback [6]. These user feedbacks are the key to a company's sustainable development, and it will be used to improve the user experience.

Although digital technology brings great profits to Mobike, it can not ignore its cost. GPS positioning, user service system, and maintenance of various IT technologies require a lot of costs. For example, the re-positioning of a lost bicycle is a huge loss. In the Vélib system in Paris, it takes 3\$ each time to re-position a bicycle [15]. The average amount of money spent on each car may be negligible, but recalling the 4 million shared bikes in China, the cost is huge for any company. This is also a good explanation of why in the follow-up development of Mobike, and it still crazy production sharing-bicycles charge customer deposits, but do not repair old bike. The New York City Department of Urban Planning (2009) reports that the total cost of capital for sharing-bike systems varies from \$3,000 per vehicle to \$4,400 per vehicle in different US cities [15]. The functions of these virtual networks might seem easy to operate, convenient and fast, but the human and capital costs are also huge.

4 Sharing-bike economic system

Dockless design and digital technology have largely led to the success of Mobike. However, it is precisely because of this combination of design that a Chinese-style shared economic operation system has been formed. Mobike was successful in business, its emergence has revolutionized the way people travel, and it has created a miracle when the Chinese market economy is not optimistic. Aside from commercial success, the value of Mobike's sustainable development in society is becoming more and more negative, breaking the environment, wasting resources, and wrongly leading the self-destructive production of bicycle manufacturing factories which makes sharing-bike oversupply.

In April 2018, Mobike was acquired by Meituan (Online payment fast food takeaway platform). Currently as of 2022, Meituan and several new shared bicycle brands have taken over the market, the report of market prospective and investment strategy planning on china shared bicycle industry (2022-2027) points out that daily short-distance trips rank first among shared bicycle users' usage scenarios, accounting for 73.5%, followed by outings, accounting for 43.4%. The average daily demand for bike-sharing trips in China continues to fuel the growth of the shared mobility market. According to the "China Sharing Economy Development Report (2022)" released by the State Information Center, the transaction size of China's sharing economy market in 2021 was about 368.8 billion yuan, up about 9.2% year-on-year. The scale of direct financing was about 213.7 billion yuan, an increase of about 80.3% year-on-year.

In terms of the overall market, China's bike-sharing is dominated by first-, second- and third-tier cities, whose markets have basically been divided up and are extremely saturated. For the fourth-tier and even fifth-tier cities, it requires huge human and material resources to maintain and cultivate the market, which is still difficult for the current bike-sharing companies. Currently, many local governments in China have issued policies to support the development of shared bicycles and regulate the use of shared bicycles. For example, the "Guidance on Encouraging and Regulating the Development of Internet Rental Bicycles" helps improve shared bicycle services and regulate shared bicycles to achieve sustainable development.

5 Conclusions and solutions

The rapid development of Mobike in China market is due to the perfect integration of dockless sharing-bike design and digital technology, which complement each other and are

indispensable. For this ending of Mobike, Churchill's famous quote just applies: "Now this is not the end, it is not even the beginning of the end, but it is, perhaps, the end of the beginning." So far, Meituan replaced Mobike in the market, but at the same time the two technologies we mentioned (dockless design and digital technology) have greatly affected the development of shared bike, both positive and negative. Sharing bicycles are easy to locate, find and use, not only because dockless design makes them ubiquitous, but also because digital technology can help users locate bicycles information and facilitate online payment. This new generation of shared bicycle system make those sharing-bike easy to park and save time. Now that shared bike is considered part of the sharing economy, a growing body of literature and data is analyzing how shared bike can be sustainable and innovative, including different forms of shared mobility services are also being mentioned [4]. However, like the traditional bicycle sharing system, when the bicycle is oversupply, it also causes various problems. The bicycle is not recycled, user information risk, the bicycle re-positioning is unscientific, and the bicycle sharing re-balance operation is too expensive.

In order to solve these problems and keep enterprises in a valuable and sustainable development state, firstly, these enterprises need to spend their time to understand waste disposal and recycling, promote manufacturers and developers to develop and share bicycle recycling and reuse technologies [3]. In addition to this, it is a good idea to encourage consumers to use the app to give feedback or report in order to better repair and locate the bikes. Although this approach plays a limited role, this approach is also reminding every user that the essence of the sharing economy is not privatization, but to achieve sharing usufruct.

Secondly, focus on user's subsequent use experience, attach importance to the relationship between government and society and enterprises [9]. Bicycle sharing is no longer simply a business model, from the data analysis above, it is clear that the bicycle sharing system can already be considered as part of the public transportation system, and it directly serves those who commute and travel short distances on a daily basis, and if the bicycle sharing system is considered as part of the urban bicycle transportation system, then many road infrastructures may be improved, away from the business perspective, this is more likely a demand for urban infrastructure by residents. And the more people who ride bicycles, the more political pressure will be generated to improve the city's bicycle infrastructure [7]. Businesses should not only focus on branded productivity growth, sustainability in the area of transportation policy is the thing that is difficult to advance, which is much more important than blind business expansion [16]. In addition, municipalities should also develop strict documents stating their plans and requirements for future urban development and transport infrastructure, thus acting as a guide for companies. Examples include sustainable urban transport plans, bicycle strategies, environmental strategies, etc.

Thirdly, understanding China's unique development situation, considering its sustainable development, and realizing that shared bike has endangered social and environmental changes at some conveniences [9]. The rapid development of shared bike has advantages and disadvantages, but we should not forget that its original intention is to facilitate people's travel and low-carbon travel, and can not let capital destroy the core value of enterprises. These solutions are all from the perspective of environmental protection and user experience. Sustainable development requires long-term planning and long-term maintenance.

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