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Study on Activating Neighbourhood Space under the Impact of Shared Cycling Mode

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Abstract. This paper focuses on the response mechanism of self-organization and planning management of urban neighborhood space in Chengdu of China under the impact of shared cycling mode aiming at providing theoretical support for the study of urban management and development of shared traffic patterns based on empirical research. For this new thing, the corresponding research literature is scarce and mostly simple commentary, lacking in-depth study. But its rapid development and particular influence make it a research object worth studying. Gaoshengqiao Neighborhood (covering an area of 1.6 square kilometers) in Chengdu is selected as the research object and the data were collected by personal riding experience, pictures taken at certain periods of time and random interviews with stakeholders to conduct the research plan. Through the comparative study of spatial and behavioral data, the paper expects to analyze the human-centered law and scientific response mechanism of the change of neighborhood space under the shared cycling mode to promote the development of the shared traffic in the city.

1. Introduction

In 2006, the emergence of the shared bicycles brought a lot of surprises and topics to local citizens in Chengdu. People all joined the crowd of cyclists, enjoying the convenience of cycling and at the meantime, receiving the baptism of the sharing ideas. [1] Through the analysis of the search results from Baidu, Microsoft's Bing and Google, we can find: the search information about shared bicycles in China began to increase rapidly since October, 2016 and the one that can be retrieved has increased dramatically since the first quarter of 2017 and it is increasing rapidly in 2018. As of May 25, 2018, Baidu can retrieve about 19,400,000 pieces of information by searching the Chinese keyword "shared bicycles". Microsoft can retrieve 1,690,000 pieces of information in China, and Google can retrieve 1,350,000 pieces of information. It is worth noting that the search results of the corresponding Chinese keyword "shared bicycle" in Microsoft Bing are very small in the four quarters of 2016, only about 30-40, but in the first quarter of 2017, the pieces of information that can be retrieved have increased dramatically to 185,000, and in the first quarter of 2018, the amount of information retrieved was 108,000. In general, people who use Bing are more international, reflecting the internationalization of shared bicycles from one aspect.

With the appearance of shared bicycles, however, many new problems including the issues of capital, morality and technology come along which question the society, the government and the public. [2][3] Of all these hotly-debated questions, the one with regard to how the neighbourhood space positively respond to the change of society is less talked about. Therefore, the small



communities with Chengdu characteristics in Gaoshengqiao Neighbourhood (covering an area of 1.6 square kilometres) in Chengdu is selected as the research object to analyse how the neighbourhood should be changed to better accept the shared bicycle model from the perspective of city planning.

2. Shared Bicycles and the Ideas of sharing

The sharing of bicycles arises from the promotion of shared ideas. One of the great challenges facing the world today is the complex cultural system and the excess of information. The industrialization and the information technology have greatly optimized our living environment, and enhanced our viability and quality of life, but the negative effect is that our cultural system is becoming increasingly large and complex. There is more and more resource consumption and the deteriorating natural environment. we need to pay more energy and cost to deal with the excessive information and maintain our huge and complex cultural system. In order to cope with the negative effects of the traditional growth model and to reduce the unnecessary social burden, people have put forward the concept of sharing, that is, enhancing efficiency, reducing costs and making people work and live easier and more efficiently through the social sharing model. The concept of sharing has a long history. Ever since ancient times, the thought of “the Unity of the World” has been widely accepted in China and the communist goal of "doing everything we can and getting everything we need" is also advocated by Marxism, the core of which is that we can enjoy the material and spiritual wealth that we need and the key is the emphasis on the ownership by all. However, less has been referred to the efficiency problem. In fact, a shared model has long been developed to improve the efficiency in our traditional life, that is shared use, namely to separate the ownership from the right of use, the concept of which can be used in car rental, accommodation, parks, public transport, family and so on. [4]

According to the characteristics of time and space as to the owner’s management of the right to use, the shared model can be divided into two ways: time sharing and space compression sharing. Car rental and accommodation belong to the time sharing, while parks, public transport and the family is space compression sharing. Both of the methods can avoid the inefficiency and waste of the artificial environment in time and space and reduce unnecessary repetitive efforts. However, the shared model has long been limited by the maintenance costs, information exchange costs and uneven spatial distribution, thus can not be shared at low cost, free and widely. It is encouraging to note that with the development of information technology, the ability and efficiency of time sharing and space compression sharing have been greatly enhanced. The shared bicycles came into being under this context. Through the model of internet plus internet of things plus public space, the shared bicycles have partly reduced the cost of information exchange and solved the problem of uneven distribution of space that help to realize the goal of time sharing of bicycles and that of traffic space compression sharing and reduce the short-distance travel costs and improve the efficiency and accessibility of urban traffic micro-operation, thus the concept of bicycle-sharing has been quickly recognized and popularized.[5]

3. Spatial Activity Characteristics of the Shared Bicycles

3.1 Public Space Immersion

The popularization of shared bicycles is based on the use of public space. All of a sudden, a large number of colorful and fashionable bicycles appeared in the streets of Chengdu overnight. There was once even a big headline: “The city management confiscated the shared bicycles illegally parked and then returned.” These bicycles are parked in a way either concentrated, scattered or concealed, or prominent in every corner of the public space. They are wandering around, like water in the public space constantly immersing various small and hidden street space. In order to understand the characteristics of its distribution and activities, we selected Gaoshengqiao neighborhood in Chengdu as a key research object. Which is shown in Figure. 1



Figure 1. Gaoshengqiao Neighborhood of Chengdu China (from Gao De map satellite images and Shooting investigation).

It is a traditional small neighborhood whose peripheral traffic includes a metro station and the main road of Chengdu (the first ring road and the second ring elevated road) and inside the neighborhood, there is a second main road and the rest are narrow side roads and alleys. The residential areas and their supporting facilities account for the majority of the neighborhood with centralized business in some sections. Based on the above information, it is safe to say the distribution characteristics of shared bicycles are representative to some extent.

Through the survey, we found the law of bicycle distribution and riding in the neighborhood. The characteristics of the bicycle distribution and cycling are shown in table. 1 and table.2 respectively.

Table 1. The characteristics of the bicycle distribution

S/N	Characteristics
1	The parking places are mainly the side of the sidewalks near the roadway, between the street trees.
2	At the densely-populated traffic transfer points near the primary and secondary main roads(such as subways, bus rapid transit points) or in the case where there are no public transit near the primary and secondary main road, only the public service sites(such as banks, hospitals, shopping malls, middle and cheap hotels), the parked bicycles are centralized.
3	In the rest regions, the parking places are scattered in small public places, at the big gates of the residential areas, near the ordinary shops(such as hot pot stands, small supermarkets), in shops favored by the young people (such as hairdressing shops), near telecom business offices, beside the bus stations and so on. The vegetable markets and the community parks which are thought to be the centralized parking places turn out to be less parked.
4	The places where there are no bicycle parked are mainly inside the working places and the residential areas as well as the passageways with walls on both side of the road.

Table 2. The characteristics of the cycling

S/N	Characteristics
1	the average riding speed of the shared bicycles is 4km / h.
2	the traffic distribution basically corresponds to the road level, about 348v / h on the primary and secondary main roads, about 174v / h on the side roads, and about 66v / h in the alleys where the flow of traffic used to be few but is now becoming active;
3	The sections where cycling and driving are mixed dominate the roads but the space where it is safe to ride is far from enough. In the typical section where we observed, the designated bicycle riding place accounted for only 6.5% of the public transport area.

We can come to the following reasons through the combination of the results from the on-site observations and the questionnaires: Firstly, the traditional residential neighborhood in Chengdu is featured by a small-scale road network, complete supporting facilities, convenient ways of transportation thus the demand of cycling is low and the traffic flow within the neighborhood is small and there is little centralized distribution (except for the centralized delivery areas); Secondly, the public transport transit point and large-scale public service sites near the peripheral primary and secondary main roads radiate a large area. Due to the large flow of vehicles, strict traffic management and the parking difficulties on the primary and secondary main roads, driving is greatly limited and at the meantime, the destinations are sometimes far from the public transport transit point which, to some extent, hinders people's means of travel by bus or metro. Thus, shared bicycles are warmly welcomed. That's why there is a large flow of bicycles and centralized parking places Thirdly, the need for mobile internet and e-payment limit the groups of bicycle users to the young and middle-aged people and the cheapness of cycling also rule out people of high consumption. So beside the shops welcomed by the young and the ordinary shops, there are scattered distribution of bikes. Fourthly, in front of a shop where it is the semi-private space, or in the private space of the working places or the residential areas, in the negative street space, such as the places where there are walls on both sides of the road, or on the roads where cycling and driving are mixes, the shared bicycles are seldom used and parked.

3.2 Reconstruction of Spatial Behavior Chain

The biggest impact of the shared bicycles on people's lives is the change and reorganization of their behavior chain. According to the "2017 Shared Bicycle and Urban Development White Paper", before and after the emergence of shared bicycles, the proportion of people who choose to travel by bikes were 5.5% and 11.6%; For cycling users, the number of car trips have decreased by 55% and the number of times taking illegal motorbikes decreased by 53%; there has been some more flexible short-distance means of transportation, namely the combination of shared bicycles with the subway or shared bikes with the bus. The generation after 70s, 80s and 90s account for more than 70% of the groups of bicycle users.

According to the spatial investigation of Gaoshengqiao Neighborhood in Chengdu, 52.5% of local residents believe that the emergence of shared bicycles has occasionally changed their way to travel, 40% of people think it has made a great change to their life. The table. 3 shows the characteristics in terms of the change of behaviour chain in travel.

Table 3. The change of behavior chain

S/N	Characteristics
1	The parking places are mainly the side of the sidewalks near the roadway, between the street trees.
2	The use of traffic space has changed from the detour mode driving on the primary and secondary main road into the direct route with the combination of primary and secondary main roads with alleys.

- 3 It has also changed from the original mode of less choices, more transfer into the mode of a variety of options, less transfer
- 4 The traffic transfer and parking have changed from the long-distance skip mode to the continuous, flexible and slow contact mode.

The change of travel behavior chain mainly comes from the unique convenience and low cost of shared bicycles, which is rooted in the traditional memories of cycling and the demand of healthy sports for the modern people. As a city boasts of its tasty food and leisurely lifestyle, Chengdu whose slow pace of life perfectly matches the concept of cycling. On the main and secondary main roads, the convenience brought about by the large-capacity public transport transit, the pleasant shade created by green trees and the comfort generated by the free walk through the small streets and alleys with delicious food all have become a good reason to ride.

3.3 The Conflict of Spatial Interests

The emergence of new things is always accompanied by frustrations and struggle. The appearance of shared bicycles directly led to the conflict of spatial interests throughout the city. Many shared bikes were confiscated, damaged, or hidden. It is said that the shared bicycles serve as a magic mirror that the moral qualities of the dwellers in a city can be reflected in their true form. But in fact, what brought about by the emergence of shared bicycles is the game of spatial rights and interests, the conflict triggered by the inherent concept and the concept of sharing, and the pains caused by the transformation from the traditional industries to innovation industries.

The spatial investigations of Chengdu and Gaoshengqiao Neighborhood mainly show the following characteristics of the shared bicycles in terms of the conflict of spatial interests. Which is shown in table.4.

Table 4. The conflict of spatial interests

S/N	Conflicts	Characteristics
1	with street space	including poor riding passage and limited parking space.
2	with government administration	Taking into consideration the look and appearance of the streets, the urban management has designated parking space but almost no bikes are parked in accordance with the designated parking spots. More are parked at any place the riders like. In the course of riding, there are bikes ridden against the traffic, going along the roadways, on the sidewalks, running red lights and other violations of the traffic management regulations.
3	with semi-private space	The bicycles are basically excluded from the working places and the residential areas. 64% of the residential areas reported that shared bicycles are not allowed to enter, 31% agreed to let them in and 5% did not show a clear attitude.
4	with pedestrians	As the random parking of shared bicycles has led to the obstruction of normal passage of public space, the blind tracks and the pavements, for example, are blocked and the orderly public order and the natural scenery are disrupted by random parking of bicycles.
5	with private space	The shared bicycles can have no access to the supervised non-motor vehicle parking places and the pavements which are now turned into the pay parking lots occupied by the shops nearby.
6	with motor vehicles	The motor vehicles and bicycles begin to compete for public parking space. The motor vehicle parking space along the road occupies the original non-motor vehicle lanes, squeezing the bicycles into the

		roadway. The waddling way of cycling also increases the risks of driving motor vehicles.
7	with business space	The bicycles compete with shops for gray space and with the illegal motorbikes for the crowd-intensive parking and waiting space.
8	with the green space.	There is high green coverage ratio in traditional Neighborhood where there are dense street trees and large areas of unaccessible lawns that occupy quite a lot of public space, reducing the parking areas for the bicycles.

The conflicts in the neighborhood, to be specific, are derived from the spatial pattern of the streets and the socioeconomic relations in behavioral activities. For one thing, on the motor vehicle-oriented urban road, all serve the cars, so the space for walking and non-motor vehicle has been compressed to an extreme and the limited space inside and outside the residential areas and along the roads are full of motor vehicles. For another, out of business considerations, the shop owners along the streets always leave some clearance in front of their shops and sometimes even expand the business space far beyond. Thirdly, the semi-private space inside the residential areas have reduced the possibilities of bicycle sharing. Once bicycles enter the residential areas, they will also occupy the public space therein, disrupting the environment of the areas and increasing the workload of the property management.

4. Reflections on the Scientific Response Model of Neighborhood Space

4.1 *The response model of existing street space*

In the face of the surging shared bicycles, a document entitled “Tentative Suggestions On the Encouragement of the Development of Shared Bicycles” was introduced in Chengdu in March 2017 which made clear the management attitude and style mainly from the government level but there is only one consideration from the perspective of the street space, namely, to designate the parking spots of shared bicycles as soon as possible. As for the neighborhood planning, as early as September 2016, Chengdu Urban and Rural Construction Committee has released “Construction Technical Guidelines On Small Neighborhood Planning and Regulations (2016 version)” but the planning and supporting facilities related to the bicycle lanes are less mentioned, only that of the road pavement, color and the separation methods of the bicycle lanes. In contrast to the initial policy and planning guidance, the self-organized response within the street is more abundant: On the one hand, the narrow streets with dense green coverage and the traditional neighborhood full of vitality become attractive to the cyclists and the original small negative space by the side of the streets has gradually been used for cycling parking; On the other hand, entry and parking have been prohibited in some neighborhood space so as to avoid the conflicts from the use of space.

In general, the development of neighborhoods in Chengdu has had a relatively suitable direction and the original street pattern has laid a good foundation for cycling but from the policy management, planning and design guidance and neighborhood self-organization, a good response model of neighborhood space in Chengdu is still in great need of.

4.2 *Scientific Response Model in the Future*

In the face of the unique characteristics of spatial activities, the study on the response model of neighborhood space in Chengdu in the future should also be conducted from the following three aspects, that is the guidance on the use of public space, the spatial matching of traffic behavior chain and the rational division of spatial rights and interests and we are able to better accept the shared cycling mode through planning, design and reconstruction.

As for the guidance on the use of public space, the reconstruction and capacity increase in the key areas should be taken into account, reasonable division of the parking areas in general areas should be

considered and the unified parking spots should be set up in the larger-scale residential areas based on scientific analysis of the status quo, so as to achieve the effective use of public space resources. As for the space capacity, with the mobility of bicycles taken into account, the spatial capacity index of different regions can be set up combined with the large data platform of the bicycles to dynamically monitor the actual situation of bicycle parking in different neighborhoods and to achieve the rational coordination between the active response of space and self-adjustment of the bicycles rather than passive control of the total amount of bicycle delivery through minimally invasive space expansion, optimization of spatial structure and spatial isolation and delivery control.

As for the spatial matching of the traffic behavior chain, cycling-based microcirculation line can be established with the combination of the planning and design of small neighborhoods in Chengdu. It is not a must to add more bike ways to match the existing motorways but instead to adopt the mode of separation combined with mixing. Some small streets and lanes are transformed into cycling-based urban greenways along which the bicycles run through the underground bikeways of the primary and secondary roads connected with another green way to make a constant cycling greenway route and as a whole to form a greenway network. For the roads suitable for mixed cycling and driving, appropriate riding space should be arranged. On the one hand, a smooth and secure cycling network should be created, and on the other hand, more beneficial economic and cultural activities can be promoted through slow cycling and by way of innovating the commercial activities and human landscape in the neighborhood.

In the rational division of the rights and interests of space, a basic principle is justice and equity; a basic approach is innovation and transformation. In the process of planning and design as well as transformation, the interests and requests of all parties should be taken into full account. The conflicts of spatial rights and interests are weakened and the multi-win results are achieved as far as possible through isolation, transition, integration and other means of spatial layout.

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