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INNOVATION AND USER BEHAVIOR FOR ENHANCEMENT IN BIKE SHARING PROGRAMME

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Abstract

Bike sharing is one of the fastest growing transportation mode for its environmental and economical benefits. Originated in Europe, more bike sharing programmes start up annually in major cities in the world. Hong Kong has its first bike sharing system in 2017. This paper first identifies usages and operational problems of bike sharing within the existing systems and examines how innovation in user behavior can enhance and improve the relationship between bike sharing entrepreneurs and citizen's interest in sports facilities. By looking deeply into how innovation in bike sharing can change the mobility in the city, improving traffic network and connectivity in the urban setting, this study will identify key issues related to user behavior and other mis-use which lead to failure of most bike sharing operations. In essence, business operations, traffic departments and citizens can benefit from the insight of this study. By utilizing research methods such as case studies and questionnaire survey, the research compares and

contrasts operational issues between Asian cities such as Hong Kong, Taiwan and Singapore. In addition, questionnaire survey will identify major bike usage pattern in daily commute use and therefore can shed light to the impact of bicycle mis-use and rationale. By identifying transportation pattern in high-density cities with relationship with urban amenities such as parking facilities, the research findings gained from this paper can be beneficial to other small and big business operators as well as city planners on how innovation can help or develop better bike-sharing systems.

Keywords

Innovation, Bike Sharing Hong Kong, Asian Urban Cities, User Behavior

1. Introduction

Bike sharing, one of the fastest growing transportation mode for its environmental and economical benefits. Originated in Europe from 60s, more bike sharing schemes start up annually in major cities in every continents (DeMaio 2009). As one of the most populated cities in the world, Hong Kong has its first bike sharing system in 2017- Gobee Bike, a bicycle in green color and an apps base dockless bike rental system which is very similar with MoBike – a share bike rental programme original in Beijing. At the same year, 4 more bike-sharing programs start up in Hong Kong: Hoba Bike, a share bicycle in white which is mainly located at Tseung Kwan O district; Loco Bike, bike in blue color mainly at New Territories East; Obike, bike in silver and orange mainly in Yuen Long, Shatin and Tseung Kwan O district; and Ketch'up Bike (Nikki 2018), a combination of crown-funding and bike sharing programme, which are using similar bike design and rental system as Gobee Bike and Mobike ("Bike sharing", 2017). As the first bike-sharing business was launched on early 2017 Hong Kong, the following will be a pioneer study on explore the development of bike sharing in order to urban development. Also, figure out about the key factors when bike-sharing applied on high density city and examining how innovation in user behavior can enhance and improve the relationship between bike sharing entrepreneurs and citizen's interest in sports facilities.

1.1 History of Bike Sharing

According to the previous research (DeMaio 2009), there are 4 generations of Bike-sharing programme in the past 50 years. The first generation of Bike-Sharing system was on 1965 in Netherland – Amsterdam, small amount of used bike repainted in white color for public

share use by Luud Schimmelpennink, an anarchist activist. The programme called in "The Witte Fietsen", people ride the white bike to their destination, and drop it for the next biker. The programme just last for few days as those bikes were dropped in the canals and stole for private use by citizens since it doesn't have a normal locking system.

The 2nd generation of bike-sharing programme was born in 90s at Denmark: 1991 at Farso and Grena and 1991 in Nakskov (Nielse 1993), with coins deposit lock at bike station. These two programmes are in small scale that only have 26 bikes in 4 bike stations (DeMaio 2009). In 1995, the first large scale bike-sharing programme was launched in Copenhagen with 1000 bikes under a programme called "Bycykler København" for public use. This bike-sharing system is free to use as long as the coin was refunded when you return the bike to the station. The bike under this system was specially designed: Solid rubber tires for intensive use; Advertising plates on wheels to generation funding to support the sharing programme. A non-profit organization used to operate the system, but stolen cases still happen as the user is anonymous, there is no way to trace back the stolen bike.

As missing bike case keep going on coin deposit bike-sharing system, the 3rd generation bike-sharing – Bikeabout was raise up in 1995 at Portsmouth University, United Kingdom (Remco 2009), 100 bikes operated by a fully automated system: with registered digital smart card, electronic bike lock and parking depot. Apart from those features, there are many advanced technology also applied in Bikeabout bike-sharing system: An online system to control and monitor the programme such as CCTV recording and surveillance; online data access to prevent biker from borrowing more than 1 bike; user can report defective bike to the system and get another bike instantly.

In 2005, the largest 3rd generation bike-sharing programme (up to 2005) "Velo'v" was launched in Lyon, France by JCDecaus (Optimising Bike Sharing in European Cities, 2009). 1500 bikes with 15000 register members were included in this programme, each bike being used in 6.5 times per day averagely. Those bikes were equipped with electronic components that allows the bike to identify by the parking station, the conditions of the bike and travel distance can be tracked. With the succession of Velo'v, the largest city in France, Paris launch a similar programme which called "Velib" in 2007 which have 7000 bikes at the beginning, which has been expanded to 23000 bikes later. This successful case generate a significant change to the bike-sharing history, numerous new programmes launch at Europe (Goodman 2014). America

and even Asia. By the end of 2008, there were 92 bike-sharing programmes around the world (DeNaio 2008).

A bike-sharing system named in BIXI Montreal - Canada, launched at 2009 is the beginning of the 4th generation bike-sharing programme (Susan 2012). BIXI is combination of "Bicycle" and "Taxi" to underline the concept of use a bicycle just like a taxi. The major innovation of this system is the parking stations is movable, which allows the docking to move to different locations easily. This removable docking can relocate to different location according to the user demands and usage patterns. The BIXI bike station is solar-powered for the station operation can reduce emission and secure the energy grids access.

For the dockless bike-sharing system, yellow bike - Ofo from Beijing launch the first dockless bike-sharing programme in 2014. It is a true bike-sharing model that allow biker use and return the bike anywhere (Guo 2014). With the use of Ofo mobile apps, biker will obtain a passcode to unlock the mechanical lock on the bike. 3 years after Ofo launched, a fully digitalized non-docking bike-sharing programme, Mobike from Beijing also started on 2017. With the combination of several latest technologies: Online and GPS grid access to trace the bike's location and prevent vandalism; Mini power generator and solar power panel on the bike for the power supply of operation system; Digital payment by AliPay or Wechat Pay for coins free operation. Bikers just use the Mobike apps to scan the QRcode on the bike will unlock the bike; the rental cost is based on the usage duration. Biker can be pick up and drop off the bike anywhere. Similar dockless system such as Obike in Singapore, LimeBike in United State and Gobee Bike in Hong Kong were also transforming MoBike's concept and launched in 2017.

2. Empirical Research in Hong Kong

The first bike-sharing business was launched on early 2017 Hong Kong. For a comprehensive study and survey was conducted on 3 main districts for applying bike sharing programmes in Hong Kong. The field study was covered in rural areas of New Territories east and north which included Shatin and Taipo, Tseung Kwan O, Tuen Mun, Tung Chung and Yuen Long in Hong Kong (Fig. 1). It constructed a general understanding of sharing bike application of in Hong Kong. On the other hand, the survey was collected by means of a tailor-made questionnaire that consisted of two parts. The first part concerned individual demographical information of bike user. The second part focused on the user cycling behavior of using sharing

bike which included the frequency of bicycle, cycling experience both daily and during vacation, attitudes of cycling and concern on cycling sharing bike.

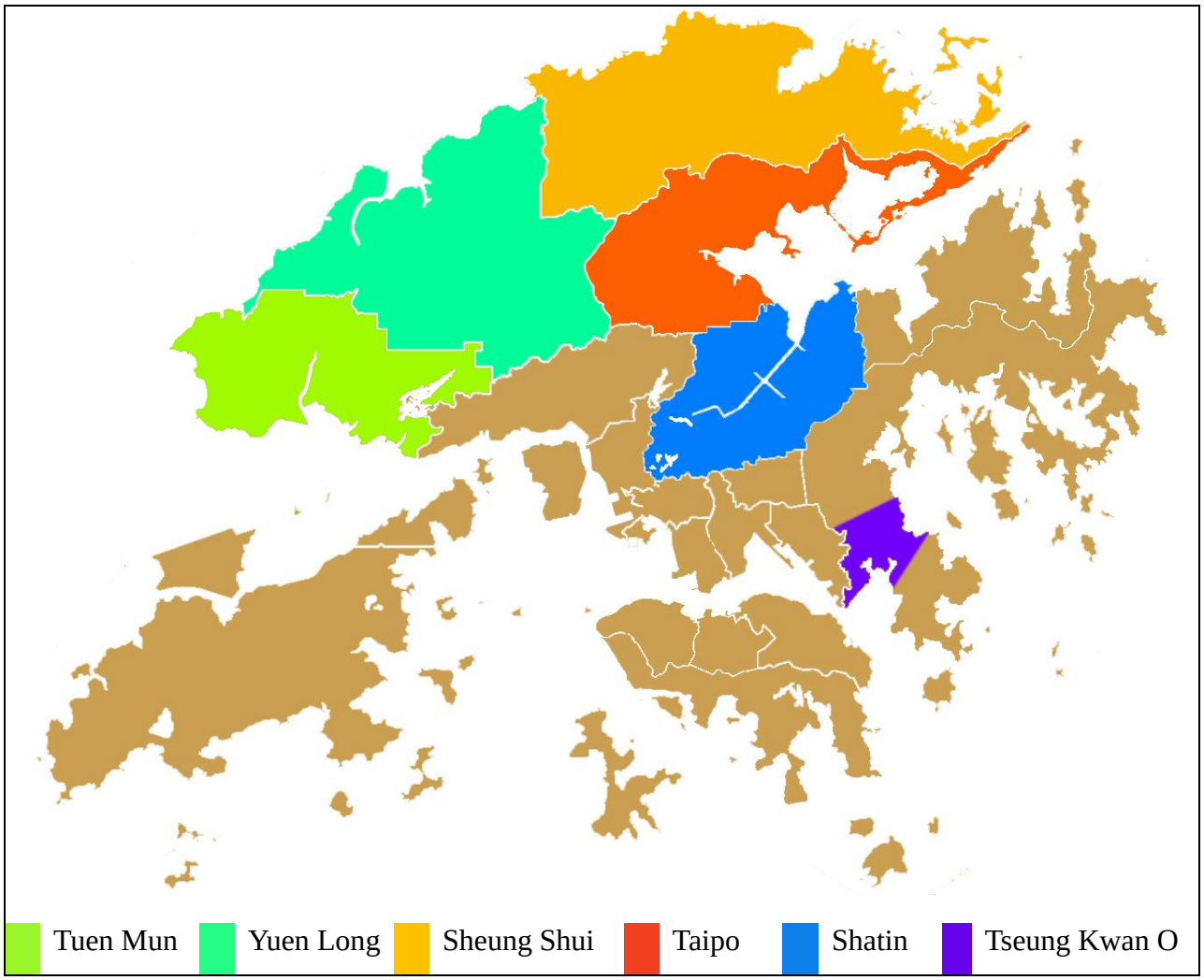

Figure 1: *The available district of sharing bike service in Hong Kong*

2.1 Development of Sharing Bike in Hong Kong

In Hong Kong, there are 4 companies occupied the bike sharing market (Table 1). They are Gobee Bike, Hobabike, Locobike and oBike. Hong Kong's bike sharing programmes mainly provided in low accessibility areas where the areas are not completely supported by public transportation systems. These service points are located between the mass transportation point and rural area. It provides an alternative to citizen for point to point transportation. The first batch of sharing bike service was launched on April 2017 by Gobee.bike. After few months, Hobabike, Locobike and oBike were entering Hong Kong market respectively.

2.2 Situation of Sharing Bike Service

Users are generally required to provide credit card details, which act to both as a deposit from HK$250 to HK$ 350 as payment for registration and usage fees. Using a mobile application to locate the nearest bike by global positioning system and return by locking bike after their journal is finished. The pricing structures generally encourage short-term rental from HK$ 3 to HK$ 10 per half-hour. The bike sharing programme is welcomed by Hong Kong publics. Hong Kong is a high densely populated city, the limited living space, high transportation costs and high demand for mass transportation system. Publics consume over two hours from living place to work place daily. Furthermore, the limited living space cannot allow publics for parking a bike and in dwelling. Bike sharing programme provided an acceptable solution to Hong Kong's publics. It provides a flexible mobility to user by point to point service and the connection between residential areas to public transportation. Also, the cycling lane are well constructed in east and north New Territories in Hong Kong. It allows publics to enjoy the cycling with safe condition and convenience for parking. It is also a reason that the bike sharing programmes are mainly focus on above mentioned areas. Furthermore, lower charging fee on sharing bike services, it provides an economics incentive to publics for using sharing services. Especially, the publics from urban areas when they would like to enjoy cycling on shorter term usage. E.g site seeing and vacation.

Despite the huge market potential, launching bike-sharing services has not been easy in Hong Kong, which has struggled to embrace the shared economy due to regulatory concerns. Indeed, bike sharing programme is a brand new business in Hong Kong, the hardware supporting is not match up with rapid growth. Over haphazard parking of sharing bikes and road blocking by sharing bikes on limited road space. These problems arouse the government and public concern on bike sharing programmes in Hong Kong

Table 1: *Comparison of Hong Kong bike sharing business*

Company	Gobee.bike	Hobabike	Locobike	oBike
Colour	Light green	White with green	Blue	Sliver with orange
Deposit	HK$ 399	HK$ 368	HK$ 99	HK$ 350
Rental fee	HK$ 5/30 mins	HK$ 3/30 mins	$ 3/30 mins	$ 3/15mins
Weight (Kg)	16.50	18.75	19.85	20.00
Transmission	1	3	1	1
Apps support	Yes	Yes	Yes	Yes
Lighting	Front and rear	Front and rear	Front and rear	Front
Number of bike	2,000	2,000	1,000	1,000
Cover area	Ma On Shan Shatin Tai Po Tai Wai Tuen Mun Yuen Long	Tseung kwan O Yuen Long	Yeung Long Shatin	Tseung Kwan O Tuen Mun Tung Chung Yuen Long

3. Methodology

3.1 Field Study

In Hong Kong, the public space limitation and the complex road system design, the public cycling facilities are difficult to build on main urban district and poor connection with working zone. Therefore, the cycling lane and parking only developed on northern rural area (Fig. 2). Cycling is one of popular transportation for rural resident on connection with mass transportation system. Therefore, the field study was applied on the specific area that in northern

rural area in Hong Kong. According the investigation, the main purpose for cycling user are going to transportation interchange point in daily. As cycling can allow user to reach on point to point service where the public transportation cannot cover (E.g public bus). Also, cycling is the reasonable and affordable transportation. The public bike parking were provided in free on every main public transportation points (Fig. 5). User can drop off their bike and park for free on full day. Well-developed cycling lane to reach the main residential area in rural and connected with main public transportation points. It is the main reason that arouse the resident for cycling in high frequently.

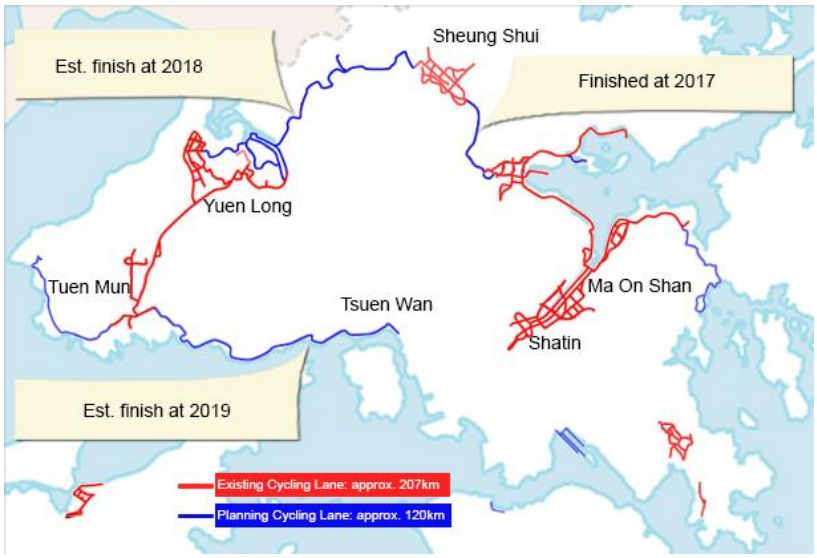

Figure 2: *The location of cycling lane in Hong Kong*

Figure 3: *Safety design on cycling lane design*

Figure 4: *Hong Kong cycling lane*

Figure 5: *Free bike parking installed to mass transportation point*

3.2 Interview of User Attitude and Behavior Understanding

For further understanding of attitudes and behaviors by using sharing bike service in Hong Kong. The survey was conducted for 3 months where the location covered in 3 main cycling hotspot in east and north New Territories districts in Hong Kong. In total, 103 surveys were completed. According the result, interviewees were 46% and 54% male and female respectively. 70% interviewees reported that they tried to use sharing bike in public space. The younger age, 18 - 25 age group were welcomed on sharing service (Fig. 6) compare with the other age group. The majority for choosing sharing bike (34%) were based on the design of bike (Fig. 7) The bike design outlook was affected their priority of choosing sharing bike. Contrasting outlook design was allowed user to searching sharing bike in outdoor location instantly. 15% were concerned for bike rental fee. 15% and 16% respondents showed the bike comfortability and quality were driven their bike's selection. From the observation, some of the sharing bike was designed in heavy weight and user may feel difficult for controlling.

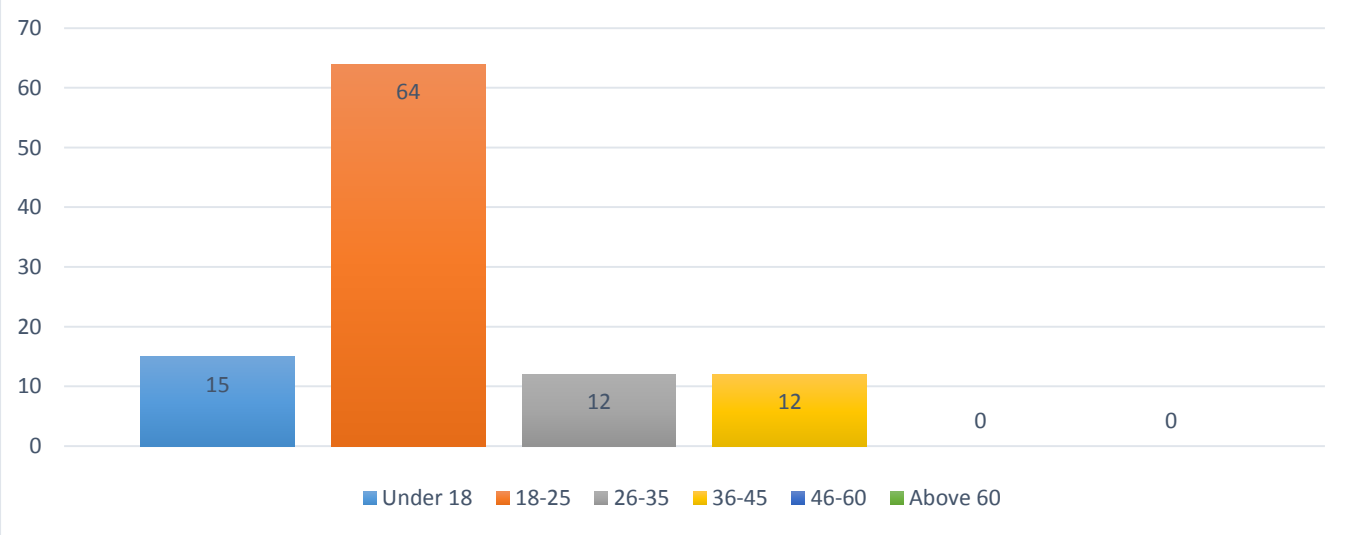

Figure 6: *User age of using sharing bike*

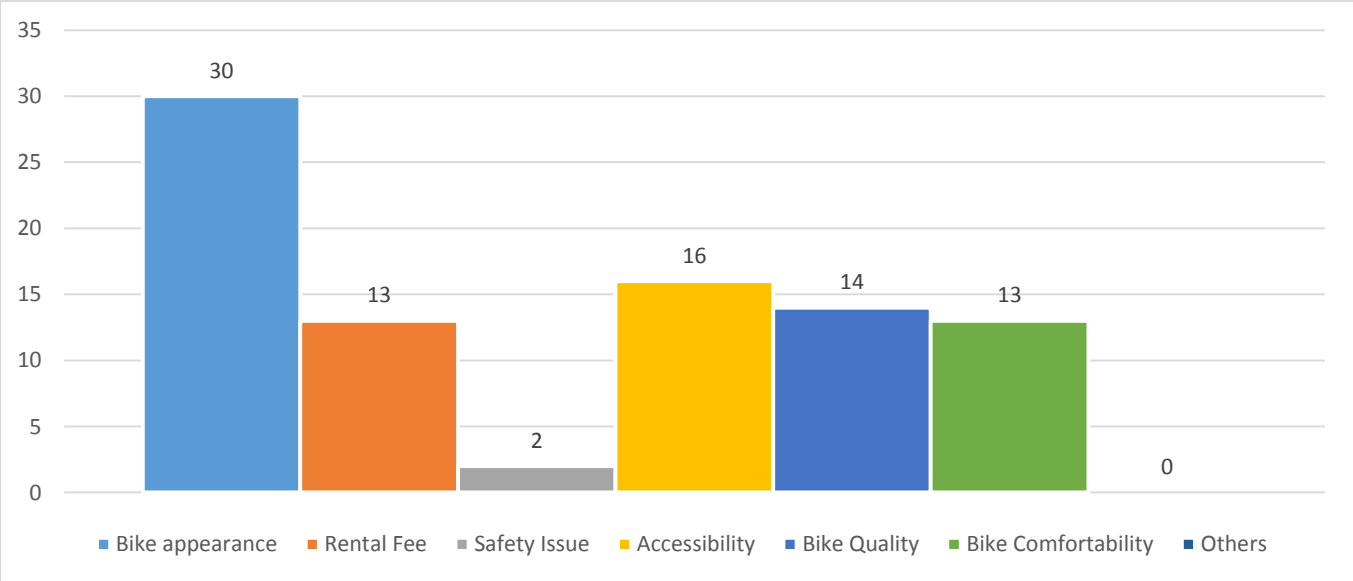

Figure 7: *The factors of choosing sharing bike*

As the Hong Kong cycling lane is in narrow design where limited by the road and infrastructure, part of cycling lane is in complex and sharing the road with vehicle. According the data from Government were 2087 cycling accident in 2016 (TD, 2016). Therefore, user are concerning on bike quality and design which will increasing their selection and provide a confident on cycling in public areas. According the result, 35% interviewees responded that they did not try to use sharing bike before. As the sharing bikes only launched their service on New Territories in Hong Kong. Most of the user from urban areas that they did not used sharing bike. The longest using sharing bike by interviewees were between 30 to 60 minutes. Sharing bike designed with heavy weight and limited the adjustment of bike position. User may not feel comfortable if they are trying to use for long period of cycling time. There were 81% showed the sharing bikes were used for leisure purpose and 19% were used for transportation transition daily. In sharing bike location, 32% users suggested the bike should located on public transportation junction. 27% showed residential areas were important for their daily use where helped to connect their working or studying area. 35% user believed using sharing bike can release the traffic pressure. Sharing bike can provide the energy saving and low carbon footprint reason in 22%.

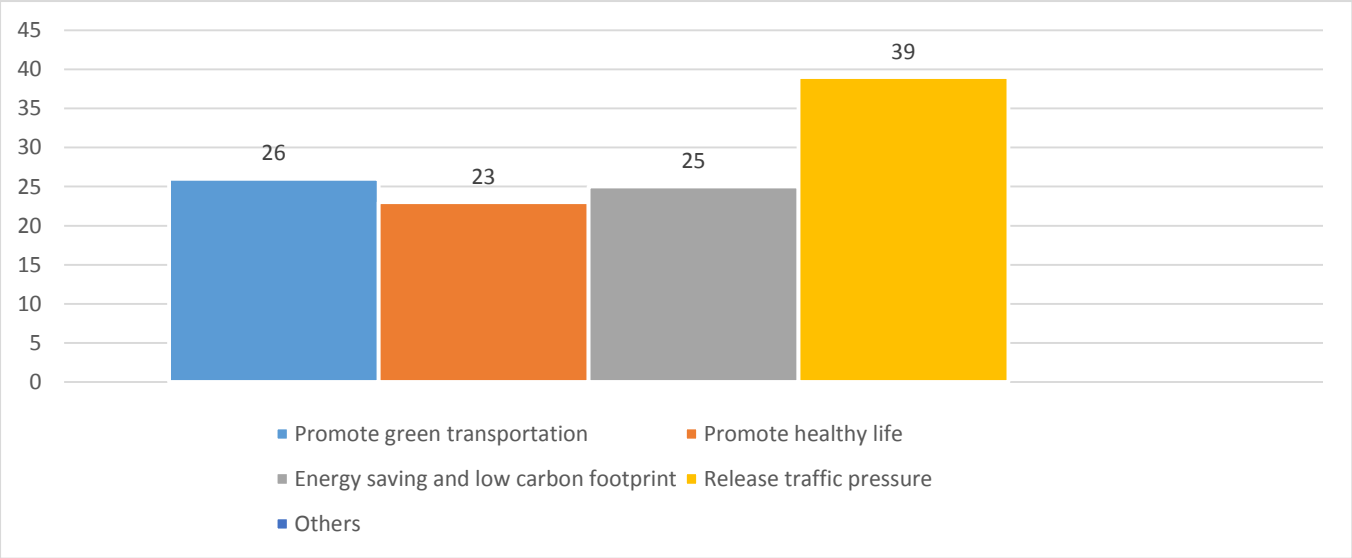

Figure 8: *Reason of using sharing bike service*

Furthermore, 20% users reflected the sharing bike can promoted healthy life and promote green living lifestyle. It allowed they could enjoy their communities and provide harmony atmosphere. In contrast, the interviewees reported that their difficulties on using sharing bike. 34% showed sharing bikes were attached with extra lock by other users. 33% showed sharing bikes were damaged by previous user. In Hong Kong, the sharing bike is dockless design, there is no specific parking space for sharing bike. User need turning the locking system only after finish cycling. New user can hire and use the sharing bike instantly. Some of users may attached with extra lock to blocking the new user for occupying their pervious sharing bike. Also, the sharing bike is a new innovation services, the business and system supporting still in devolvement stage. Interviewees reported that they couldn't find the sharing bike although the mobile application was showed the bike location. The global positing system cannot provide the location accurately as many high raised building and complex road condition. The sharing bike signal is blocked and time consuming for finding sharing bike. In general, the bike sharing programme provide the benefits to community with increasing the flexible mobility and emission reduction (Hamari 2016). Lastly, it arouses the publics on using green multimodal transport connects, by acting as a last mile connection to public transport. Health benefits and individual financial savings are gained while sharing bike programme is launched in community (Heinrichs 2013, Panis 2011).

4. Conclusion

In this study, there are several limitations on investigation and research. Sharing bike was starting on 2017 in Hong Kong. It is a new business model in Hong Kong. Hong Kong citizen are not familiar on sharing concept, especially on elder citizen. Also, the limitation of cycling public facilities (E.g. cycling lane and parking sites) in Hong Kong. It made the filed study only can cover several Hong Kong districts.

For future research is needed to enhance complete understanding regarding on sharing bike business how to affect the mobility on urban transformation. As the Hong Kong is high density and vertical high raised city. Green and door to door transportation mode will be rapidly grow up. Also, the further investigation can be applied to cover more location in Hong Kong, also the Asian cities where the city are in high density living condition. It can help to have an in depth understand on sharing concept on Asian society and the relationship between using public transportation and user behavior.

Although the sharing bike services is a brand-new business in Hong Kong, the urban cycling is increasing and the number of bike sharing programmes have grown rapidly over last years. Hong Kong government only provided practical with policy support. For Hong Kong, the fundamental infrastructure should be improve to match up with the repaid demand of urban development. Cities such as London, Seoul, Tokyo and Taipei have provided a specific cycling lane for who are riding to work. Hong Kong is facing serious of traffic congestion and air pollution by vehicle. Cycling is one of the solution that can be lower carbon footprint and release the traffic pressure. On the other hand, public amenities and space have to be redesigned. Separated bike lanes should be considered further away from the road to improve safety for cyclists, drivers and pedestrians. Indeed, constructing a comprehensive bicycle land network which connecting the districts, such as bike parking area and cycling junction design.

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