Analysis of the Characteristics of Bike-Sharing Program in Bangkok.

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ABSTRACT

Non-motorized transport modes are often considered as essential element of sustainable transport system. Bicycle is one element of Non-motorized transport modes that is widely recognized as an environmentally friendly and healthy mode of transportation. In Thailand, a Bike-Sharing Program (BSP) was initiated by Bangkok Metropolitan Administration (BMA) under the name of PUNPUN which to encourage the bicycle usage for short-distance trips in central business district. On the other hand, PUNPUN is not fashionable. This paper aims to provide an overview of the current of BSP in Bangkok and to analyze the factor affecting of the PUNPUN users in each station. The results show that the ridership of PUNPUN tend to increase with attractive points such as shopping center, recreational areas etc., and the system characteristics; the number of public bike and docking stations including operation policy. It also is useful in determining for the Government policy to encourage bicycle use and to select the location of the rental station.

Keywords : Bike-sharing, Bicycle, Sustainable Transportation.

1. Introduction

A Bike-Sharing Program (BSP) is non-motorized transport modes provided for free public rental of bicycles. [1,4] Explains that bikesharing is short-term bicycle access, which provides its users with an environmentally friendly form of public transportation. Individual's cyclist without the cost and responsibilities of bike ownership. This flexible short-term usage scheme targets daily mobility and allows users to access public bicycles at unattended bike stations. Since 1965, bikesharing has grown across the globe on five continents including: North America, South America, Europe, Asia, and Australia. At present, there are approximately 100 bikesharing programs and over 139,300 bicycles operating in an estimated 125 country around the world.

Thailand's first BSP began in 2012 with 100 bikes and 12 rental stations in the city of Bangkok [6]. City governors believe that a BSP provides for short-distance trips made by cars in urban area and they are attempting to use a BSP to increase bicycle share. However, a BSP is not good for every city with depend greatly on the characteristics of a city, legislation related to the bicycle usage, the other available of public transport and their overall social attitude. Therefore, this paper aims to provide an overview of the current of BSP in Bangkok and to analyze the factor affecting of the bike-sharing use in each station. It also is useful in determining for the Government policy to encourage bicycle use and to select the location of the rental station. Fulfill Bangkok Mass Transit System to perfection for quality of living and healthy life for city people.

The structure of the paper is as follows: in Section 2, about briefly discuss history of bicycle policies, bicycle network and BSP in Bangkok. Then, in Section 3, I will present characteristics of bike-sharing users. In Section 4, data issues are discussed and the result from multivariate analyses will be presented. Finally, Section 5 summaries our conclusions

2. Bicycle Network and Bicycle Sharing Program in Bangkok

In Thailand, Bangkok Metropolitan Administration [5] has been constructing bike paths to solve traffic congestion and to encourage for people to use bicycles to travel more. In 2008, 23 sidewalks (total distance 184.56 kilometer) were improved and modified to bikeway for cyclists. Nowadays, a bicycle path was increased by 35 routes and total distance 232.66 kilometer. Types of a bike path have 3 types: 1) Shared used path; width of bicycle lane on sidewalk by 1.0 meters to provide for cyclists (20 paths). 2) Bicycle lanes on the road; provides bike lanes on the left side of the shoulder 1.2 meters wide (5 routes). And 3) Exclusive paths that the paths for cyclist only (10 paths), such as shown in Figure1. Moreover, there are facilities for bicycle users such as a bicycle parking in many locations around the subway station including bicycle sharing program (BSP) which is called PUNPUN Programs.

PUNPUN Programs is a public bicycle systems located in Bangkok, which has been operating since October 28th, 2012. In the first stage of operation, BMA was responsible for operating of PUNPUN programs and totally 100 bikes and 12 rental stations were established. In the second stage, the system was increased by 500 bikes and 50 rental stations. Basically, for bicycle usage in the short-distance trips, recreation, commuting and feeder service to the public transportation such as sky train, subway station, and boat station. PUNPUN's membership must be over 16 years old on the application date which register only 320 baths. Moreover, member's privilege includes PA insurance from using PUNPUN's bike not over 50,000 baths and actual medical treatment not over 5,000 baths at a time.
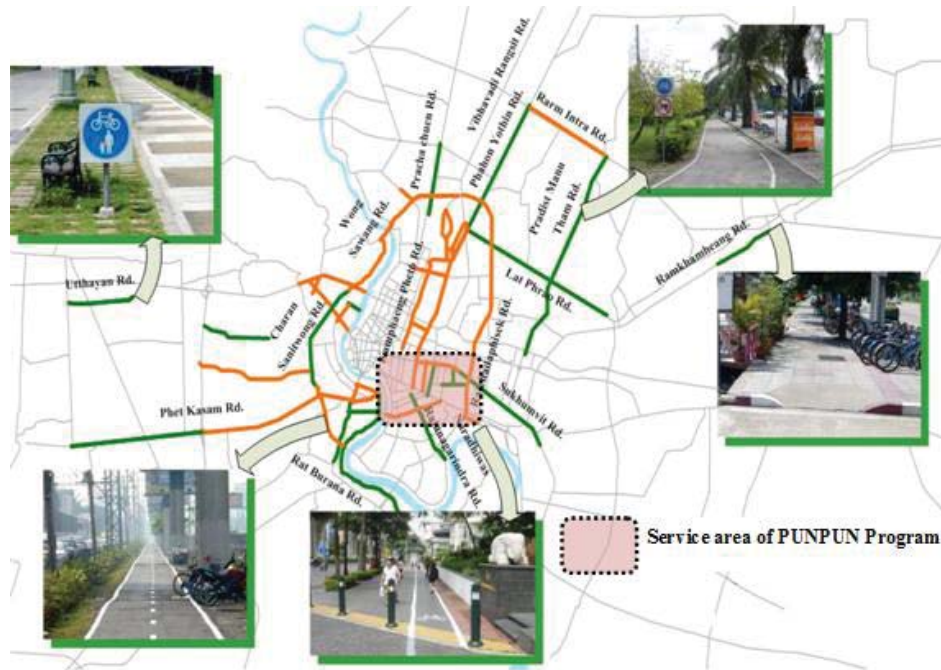
Figure 1. Bicycling Network in Bangkok [2]

As can be found in Figure 2, totally 50 rental stations are nearby sky train, subway station, and boat station with a walking distance within five minutes; the other are located at landmark of attractive or shopping areas. For instance, the rental station No.7 named as Chamchuri Square Station is closed to subway station and Chulalongkorn University.
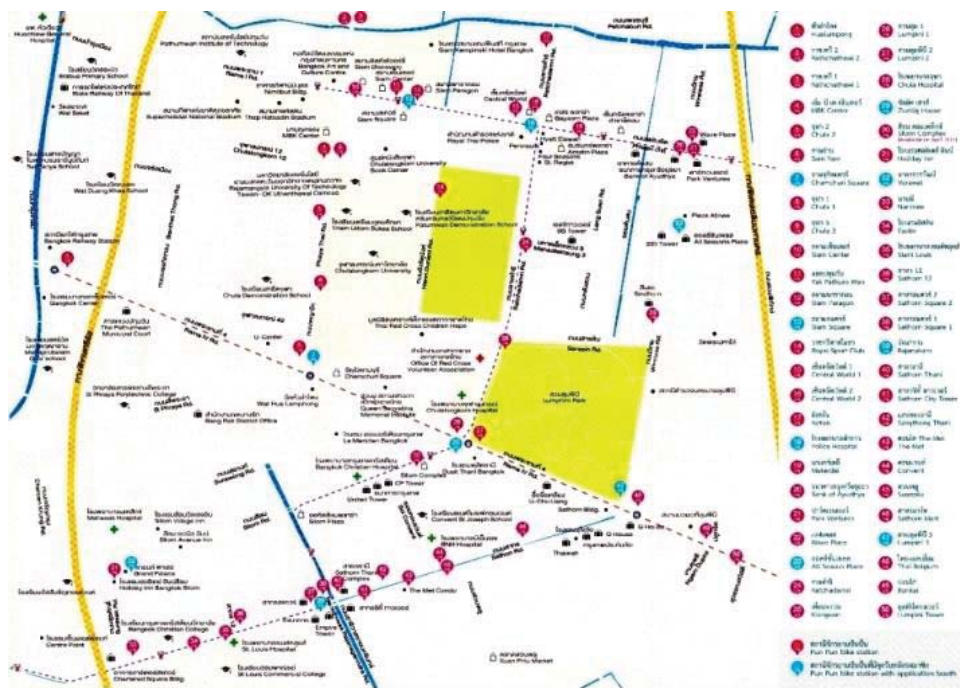

Figure 2. Rental Station of PUNPUN Program [6]

3. Characteristics of PUNPUN Programs

3.1 Characteristics of PUNPUN Users

To analyze the characteristics of PUNPUN (BMA2013), I obtained and used the complete data (from the given period of time) from BMA operating center. In Figure 3 show that the number of PUNPUN member classified by sex. The ratio of memberships by male was higher than by female. In August 2013, I noticed that the number of members increased rapidly because of the discount registration fee. PUNPUN memberships are currently a total of 7,405 members.
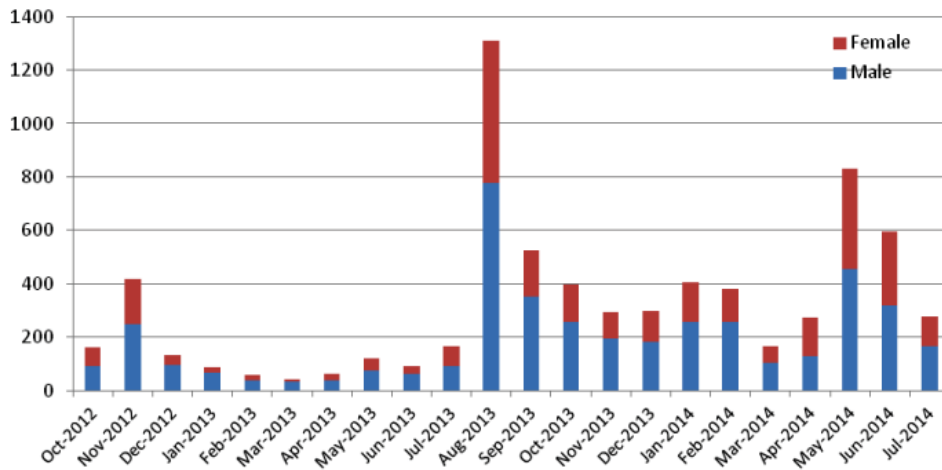

Figure 3 The number of PUNPUN member classified by sex

Figure 4 and Figure 5 show that age and occupancy composition of PUNPUN users. It found that 66% of memberships were private company with age between 26-40 years old. I notice that the most of rental station nearby central business district also during peak hour the traffic jams. Therefore, a PUNPUN programs is an alternative to short-distance trips favorite in private company employee about 66%. On the other hand, 3% of PUNPUN members were statement enterprise employee.
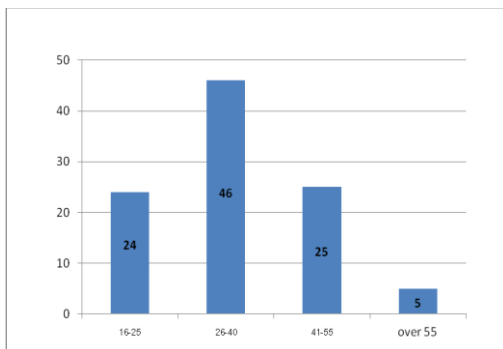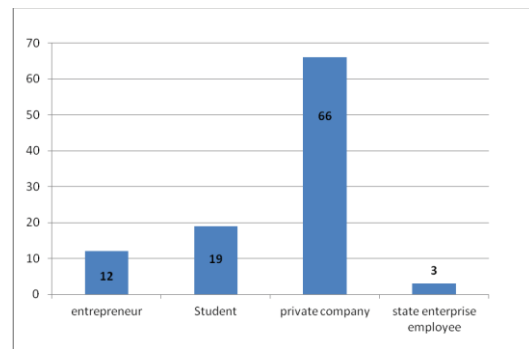

Figure 4 Percentage by age (%) Figure 5 Percentage by occupation (%)

3.2 Characteristics of PUNPUN rental stations

In Figure 6, the average rental tips of PUNPUN programs were estimated based on the person trip survey performed by MBA in each shown month. I found that the average rental tips of PUNPUN programs increasing constantly until March 2014 and decreasing in summer time. Thailand, summer time will be beginning in March to May which the average of temperature is 38 degree Celsius. It is possible that the weather influence of cyclist in Bangkok.

In the first period of operation will be beginning 27th October 2012– 18th March 2013 which 12 rental stations and bikesharing daily use averaged 6.95 times per day. In the second period, on 19th March 2014 the system was increased by 50 rental stations while bikesharing daily use will be declining.
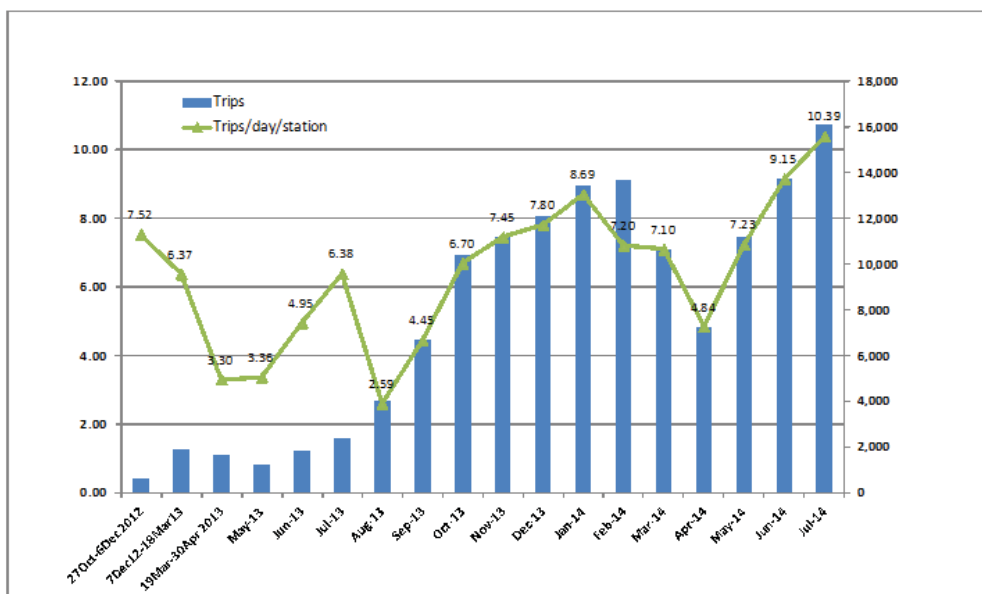

Figure 6 The average rental trips of PUNPUN program

Moreover, I found that the highest of bikesharing daily use 19.64 times at Chamchuri Square Station (No.7) and the lowest of 0 at Lumpini 2 Station (No.27).
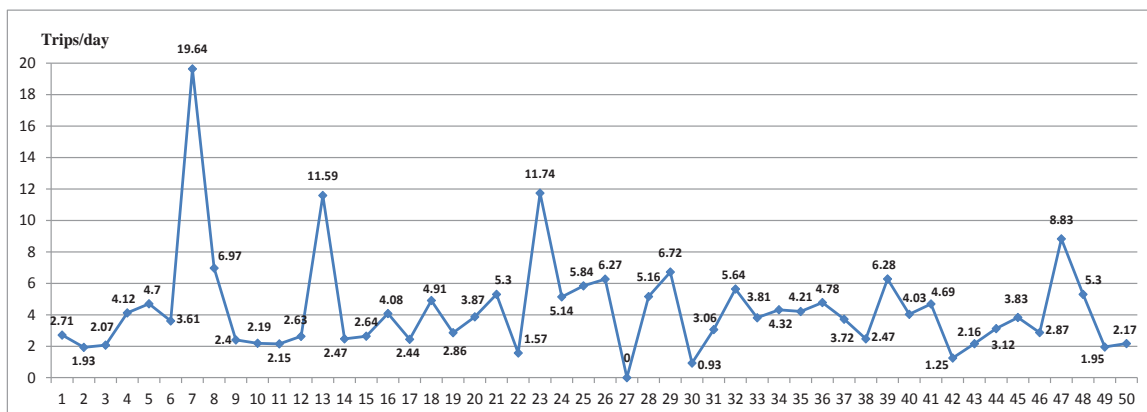

Figure 7 Change of rental trips in each station

4. Empirical Results

With the collected data of 50 rental station, and field surveys were performed to analyze the factors that might affect bikesharing daily use, particularly on the variables transit linkage and system characteristics. Given the interrelationships between the explanatory variables, a multiple regression analysis has to be carried out. Forward Stepwise model selection method, which is added to a variable in the analysis, is the basis of the Score and Significance. The coefficients are statistically significant at 95% level.

To begin with, the physical characteristic of location is different in each rental station. I observed that *the distance from rental station to public transport* is important factors affecting to the bicycle usage [3,7]. The most of users will be consideration the location of rental station that nearby sub train or bus stop. The data concern *the amount of transportation mode* that nearby rental station. If there are a variety of public transportation system surrounding the rental station, bikesharing use will be alternative for short distance trips. On the other hand, in rental stations there are many potential destinations, which might stimulate bicycle. This issue is addressed by an indicator of human activity, which the *number of landmark* around rental stations. Considering, the availability of good quality and readily accessible data. I account for PUNPUN programs characteristics from *public bike* and *the number of docking stations*. It is hypothesized that systems with more public bike and docking stations have higher daily use. For *operation policy* of PUNPUN programs, there are eight stations with application booth which staff to advice on during working time. If public bike is damaged, it will be the maintenance personnel to fix them.

Table 1 OLS regression models of bikesharing daily use.

Dependent variable : bikesharing daily use			
Variable	Parameter estimated	t-Value	
(Constant)	-3.755	-2.621	
Transit linkage			
Number of landmark	0.551	2.229	
system characteristics			
Number of public bikes	0.623	5.665	
Number of docking stations	0.818	2.908	
Rental station with application booths or not (1-0)	3.352	4.164	
Summary statistics			
R-squared	0.734	N	50
Adjust *R*-squared	0.756	*F*-Value	34.888

Table 1 shows the best model form and its terms coefficients and t-statistics. Most of the variables concern the system characteristics. The results show that there are three variables concerning policy efforts appear as significant explanatory variables in the model. If all rental stations have application booth and staff, bikesharing daily use will be increased by 33.5%. When the public bike and docking stations are increased, the bikesharing daily use goes up by 62.3% and 81.8% respectively.

It should be noted that this model does not include any variable on transit linkage. However, concerning the human activity, a one percentage point of increase in the number of landmark would increase the bikesharing by 55.1%.

5. Summary and Conclusion

A BSP has many virtues which make it a possible new alternative for activating bicycle usage. In countries where a relatively low percentage of people ride bicycle, such as Bangkok, a BSP can be an attractive mode of transport for promoting and activating bicycle usage. In this research that aim to analyze the factor affecting of BSP in term of system characteristic and transit linkage.

This result implies that there are essentially two way of encourage bikesharing uses: (1) to increase the public bike and docking stations. During peak hours some stations is not enough the docking stations that the bikesharing user to change the rental station to return the public bike. The rental station should have been application booth at all stations. And (2) Location for rental stations should be varies the attractiveness such as nearby shopping center, university or school, business office etc. which can be activated bike sharing uses. The design of the network for BSP should be link with the network of public transportations so that both systems can support each other.

Furthermore, Thailand does not have legal protection for cyclists. The people do not dare to come out cycling. If there is a law in the bike, the bicycle usage will be increases. As the safety of the bicycle uses, it is essential.

This analysis allows one to take account of this factor that is usually ignored in travel surveys. In the future research, I could analyze the change of O-D pairs and their corresponding volume due to modifying the location of rental stations and users rental station choice behaviors.

6. References

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