

# Designing “Friendly” into Public Bicycle for Taipei City

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**Abstract.** The purpose of this study is to define problems of YouBike’s design, and then, to provide designers with public bicycle design advice. Firstly, an observation was carried out to discover the general process among YouBike users. Secondly, case studies were conducted. Time and period were recorded following each correspondent’s activities, including withdrawing YouBike, returning YouBike, confirming the transaction fee. Research findings include: (1) Attaching magnetic on the bike’s locking plate to reduce the occurrence of error.(2) Changing the color of the lights contrasting colors to enhance the degrees in visual recognition.

**Keywords:** Universal Design, YouBike.

## 1 Introduction

To solve environmental pollution and energy consumption, reducing the number of private vehicles has become an important purposes in recent years. Therefore, Taipei City Government has promoted a policy which concerned of Taipei City public bicycle renting system to encourage people ride bicycles as short distance modes of transport. The policy contains the building process of bike paths and bike rental service. In order to achieving this goal and improving the urban traffic congestion, Taipei City Government cooperated with Giant to research the public bicycle rental system. This service referred to as the "YouBike" and started to operate in 2009. The most impressed part of this system is that we could rent bicycle at A place yet return it at B place. Owing to this advantage, people are willing to use "YouBike." Thus, the number of service sites has grown from 11 to 120. In future, more than 162 service sites will be established in 2014.The purpose of this study is to define problems of people using “YouBike” rental system. The researchers focus on the convenience of rental procedure and record the behaviors. To provide designers a better way and advice on how to adaptive the operate processes of “YouBike.” This study chooses the “YouBike” services as a case study and experiment. Focusing on the usage situation and user experience of the inexperienced users. To clarify as much usage situation as possible, the experiment scope include top three service sites of number of users.

The research will be guided most generally by Universal Design model. The core spirit of Universal Design comes from the caring on disadvantaged minority. It combines the concept of Friendly Design and free access for the disabled, considering every kind of demands in a variety of degrees. The seven principles of Universal Design are as follows: 1.Equitable Use 2.Flexibility in Use 3.Simple and Intuitive Use 4.Perceptible Information 5.Tolerance for Error 6.Low Physical Effort 7.Size and Space for Approach and Use. In this paper, we discuss about the different user experiences and demands on "YouBike" which is in accordance with Universal Design's core spirit. On the basis of this, we can have a foundation to construct experiment design and measurement.

Taipei City Government Department of Transportation to promote the bicycle as a short shuttle ride public transport carriers , for " Taipei build public bicycle renting system operation and management ," hopes to turn the building bike paths and bike rental service, encourage people to make short public bicycle transport, reducing the number of private vehicles held in order to improve the urban traffic congestion, environmental pollution and energy consumption purposes. Taipei City Government to cooperate with Taiwan Giant this service plan , referred to as the " YouBike smile bicycle ." A land lease which , B to the car service has become one of the main promotion services. "Universal design" for disadvantaged groups of people from the care , combined with a friendly design, barrier-free space, and a wide range of design concept, consider the differences between the different ethnic groups and demand of the fair use doctrine . For users who " YouBike Smile Bike " is concerned, the car rental service experience and behavior of these two is the most commonly used and the experience. Universal design is not just for people with disabilities raised . Seven principles of universal design , which contains as : equitable use , flexibility of use, simple and intuitive to use, easy perception of information, allow errors, reduce their burden on the appropriate use of size and space. 2009 began working to build a " YouBike Smile Bike " from the original 11 sites so far in 2013 has grown to 120 renters service points, 162 more are expected to establish a Service Station in 2014 . In recent years, the design principle of " user centric" increasing attention . To human - centered, how to use and experience the mode of " YouBike Smile Bike " more perfect , for research to explore the topic.

## 2 Literature Review

### 2.1 YouBike

Taipei public bike rental system is a public bicycle rental system in Taipei, Taiwan , the Taipei City Government Department of Transportation commissioned the BOT model huge Giant Machinery Co., Ltd. to build and operations and to " YouBike Smile Bike " as the brand name of the external service ( the sign labeled U bike), the second seat for the whole station to enable the public bike rental system , using unmanned self-service . As early as March 11, 2009 demonstration began operations , initially set only 11 stations and 500 bikes in the surrounding Xinyi District . On August 31, 2012 began trial operation , the system on November 30, 2012 officially

opened. After the official opening , YouBike has issued a total of 130,000 membership cards , the cumulative number of leases over 100 million times . As of October 2013 , YouBike a total of 120 districts in Taipei lease site ( Taipei City Government Department of Transportation , 2013 ) . Taipei City Government 's Department of Transportation partners Giant companies, use the following procedure for YouBike (2013 ) [1] :

*YouBike 24- hour unattended self-service , each site has an automatic service machines (kiosk), users can take advantage of the service machine to apply for membership , pay and rental bicycles . Leasing model is divided into two kinds of members and non-members , the membership application can be completed in YouBike website , automated service machine , or two service centers. After the bike racks are leased stations are installed EASYCARD sensing device , members can directly travel card holders registered post to each parking sensors pick up the car cards , non-members shall be paid through automatic service machines after the election the car ( you can use a money payment cards, credit cards or chips Chunghwa Telecom mobile phone numbers ) , and within 90 seconds to remove the bike bicycle column .*

## **2.2 KIOSK**

KIOSK originally referred to the absence of the newsstand, after Japan JR Railway Bureau will set up in each station convenience stores or convenience kiosk on the platform are called KIOSK. Today, digital signage, touch kiosks, navigation system, enabling consumers to obtain useful guidance, effective transmission of advertising or selling information stations are called KIOSK. YouBike automatic service machines without commissioner staffing for automated service systems. Therefore, YouBike automatic service machines called "KIOSK." Users can take advantage of KIOSK application to join, pay and rental bicycles[2].

## **3 Methods**

### **3.1 Subjects**

YouBike user to students the most. Respondents in this study using population-based YouBike students, divided into "first time users" and "proficient user" groups. Each group selected four, a total of eight experiments.

### **3.2 Location**

The experiment was set up in place of the Taipei MRT, MRT Exit 5 of the mansion YouBike experimental locations. The experiment location near the main entrance of National Taiwan University.

### 3.3 The Process of YouBike

By using flow multiplied observation, we can understand the facilities to carry out this activity when passengers will encounter and understand the mode of operation, and to understand the operation of the passenger problem often encountered through these steps.

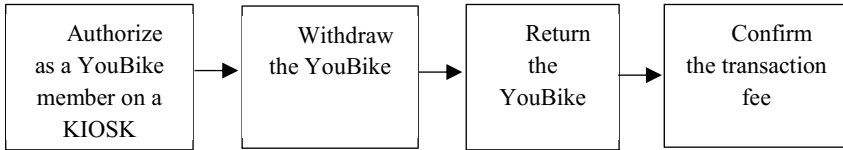


Fig. 1. Remark 1 Novice’s YouBike using procedure

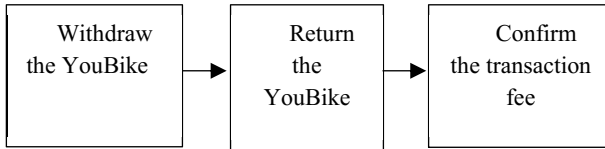


Fig. 2. Remark 2 Expert’s YouBike using procedure

Through the flowchart, you can learn to use two different ethnic groups have different processes used when using YouBike. Differences in first-time users must first Kiosk after registration, in order to use. In addition to using the Kiosk machines, there is no difference between the two subsequent steps. For each of the steps of the flow diagram of the sorting table 1

Table 1. The using process of YouBike

Process	Step	Action
A. Withdraw YouBike	A1	select a bike
	A2	swipe Easy Card to rent a bike
	A3	confirm the indicator green light starts flashing
	A4	pull the bike from the dock
B. Return YouBike	B1	select an unoccupied dock
	B2	confirm dock with a blue indicator light on the dock panel
	B3	insert the bike’s locking plate into the dock’s locking spot
C. Confirm the transaction amount	C1	swipe Easy Card on the dock panel to pay
	C2	wait the panel shows remaining balance for the rental
	C3	confirm the blue indicator turns green, to complete the return process

### 3.4 Case Study

YouBike subjects using step schedule, where S1, S2, S3, S4 for the first time user, S5, S6, S7, S8 is proficient users.

**Table 2.** Time recorder of users

subject \ step	S1	S2	S3	S4	S5	S6	S7	S8
B1	00'23	00'47	01'01	00'37	00'12	00'10	00'10	00'09
B2	00'03	00'03	00'02	00'03	00'02	00'01	00'01	00'01
B3	00'04	00'06	00'04	00'05	00'02	00'02	00'01	00'02
B4	00'06	00'06	00'07	00'08	00'02	00'01	00'02	00'02
C1	00'32	00'20	00'09	00'17	00'05	00'03	00'05	00'04
C2	00'04	00'03	00'03	00'05	00'01	00'01	00'01	00'00
C3	00'07	00'06	00'08	00'07	00'02	00'03	00'02	00'02
D1	00'45	01'23	00'38	00'59	00'23	00'13	00'09	00'09
D2	00'04	00'04	00'05	00'05	00'03	00'04	00'02	00'02
D3	00'04	00'04	00'03	00'04	00'01	00'01	00'01	00'00

Table 2 that by the time required to eight users at YouBike each step, the novice users and expert users record time compared to that between the action first-time users, and proficient users differences are significant, as shown in Table 3.

In each step of the process, in order to "pull back the bicycle", "bike pushed forward into the latch," "confirm Parking column panel display is green," three of the significant t values were less than .001, less than the rest. 05 is greater than .001

## 4 Results and Discussion

### 4.1 YouBike Operating Time Difference

The results showed that the initial use YouBike user in operating time , more than the average are proficient users. T values between the two positive presentation . Which " pull back bicycle ", " bike pushed forward into the latch , " " confirm Parking column

**Table 3.** The difference between expert and novice in using YouBike

process	step	Subject's type	Number of subject	M	SD	t values
A. Withdraw YouBike	A1. select a bike dock	Novice	4	42	16.04	**
		Expert	4	10.2	1.25	3.94
	A2. swipe Easy Card to rent a bike	Novice	4	2.75	0.50	**
		Expert	4	1.75	0.50	4.24
A3. confirm the indicator green light starts flashing	Novice	4	4.75	0.95	**	
	Expert	4	1.75	0.50	5.55	
A4. pull the bike from the	Novice	4	6.75	0.95	***	
	Expert	4	1.75	0.50	9.25	
B. Return YouBike	B1. select an unoccupied dock	Novice	4	19.5	9.53	**
		Expert	4	4.25	0.95	3.18
	B2. confirm dock with a blue indicator light on the dock panel	Novice	4	3.75	0.95	**
Expert		4	0.75	0.50	4.52	
B3. insert the bike's locking plate into the dock's locking spot	Novice	4	7.00	0.81	***	
	Expert	4	2.25	0.50	9.92	
C. Confirm transaction amount	C1. swipe Easy Card on the dock panel to pay	Novice	4	56.25	19.85	**
		Expert	4	13.50	6.60	3.18
	C2. wait the panel shows remaining balance for the rental	Novice	4	4.50	0.57	**
Expert		4	2.75	0.95	3.13	
C3. confirm the blue indicator turns green, to complete the return process	Novice	4	3.75	0.50	***	
	Expert	4	0.75	0.50	8.48	

panel display is green," three of t values have significant differences. Where "bikes pulled back" and "push the bike forward latch" two are fixed YouBike body of related tabs. Latch design is right to left sloping design of the hole, at the time of the body and push forward, to be pushed into the first body to improve. The first time a user during operation of these two movements, pushing the body is horizontal, and therefore likely to fail or produce situations difficult to operate generation. "Confirm Parking column panel display is green" and associated parking pillar panel. Will first display panel design in blue light after stopping, on behalf of the debit line success will make green. Initial user undetermined chargeback is successful, and if there is subsequent steps need to operate, and therefore significantly after the green light so that it stays in the column before stopping. This step can be learned at the proficient user of the record, when after receiving the green light flashes, then left before stopping column. In terms of s8 of the record, "confirmed Parking column panel display is green" operation this action has not been time consuming. According to the size of t values, p values ranged from 0.5 to 0.05 between steps are arranged as follows: pick up the car waiting for the green light flashes and emits short beeps > confirmation parking light blue column > EASYCARD column panel sensors placed in parking area > Bicycle select select parking spaces = EASYCARD column placed in the column panel parking sensor area > wait panel displays debit balances with the times.

Significant differences in the operation of action, "confirmed Parking column panel display is green", "pick up the car waiting for the green light flashes and emits short beeps", "confirmation parking light blue column" with LED display related. "Pull back the bicycle", "bike pushed forward into the latch", "bicycle select", select column parking space" this action with four columns relating to the use of parking.

## 4.2 Design Friendly into YouBike

When expert and novice use YouBike from the comparison between the time required for each action. Through this, if we want to make YouBike become more friendly or convenient for everyone, there are some conclusion as follow:

1. Improve dock's design: According to the study, novices spend more time pulling or pushing bike into dock than experts. Due to novices don't familiar with the special angle of bike's locking plate. The design of dock should be improved. Attaching magnetic on the bike's locking plate to reduce the occurrence of error.
2. Change panel's flashing light's colors: The different flashing lights on the panel represent different meaning. We can set the interpretative signs, so that novice can understand through narrative text. Also in the flash of recognition, it is recommended to change the color of the lights contrasting colors to enhance both degrees in visual recognition.

## 5 Future Works Suggestion

In this study, the degree of YouBike a friendly discussion compile the findings and give recommendations based on the above analysis, the following description may provide direction for future researchers can develop:

(1) YouBike for first-time users are interested in, the reason mostly "fresh", "fashion", "leading", "elegant", "participation." This research is YouBike main user groups - the student group interviews as the main target, but other ethnic groups are also frequently used for YouBike gradually rising trend. Therefore, future studies can then discuss other different age and identity of the Discussion on YouBike friendliness make YouBike design more in line with the needs of all kinds of ethnic groups.

(2) This study provides the first user YouBike less likely to use design, follow-up studies can be compared against unfriendly designs, improved after the experimental tests. Through experimental purposes, in order to learn the most common bike-friendly design patterns.

## References

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