インセンティブ設計とスマートロックを活用した自転車シェアの最適化

—「Incentivizing bike sharing」—

1. 背景(Background)

As the population continues to concentrate in metropolitan areas, many households have abandoned car ownership. In Tokyo metropolitan area, only 50% of households own a car. With this background, the importance of bike share is likely to increase.

However, the existing bike share model has two problems. First, the operators have to prepare bikes and ports (i.e., bike stations) and maintain them. This is costly, making it difficult to expand the service. Second, existing bike share operators have to determine the port locations by themselves. Since a thorough location research is prohibitively costly, many needs remain unnoticed and unserved.

2. 目的（Purpose）

Our plan is to solve the above two problems with the combination of technology and incentive scheme. More specifically, we will develop an entirely new model of bike share that enables anybody to rent-out their own bikes to make money, from just one bike, anywhere, regardless of whether you are an individual or a company. During Mitou project, we developed a smartlock and a mobile application to enable this service.

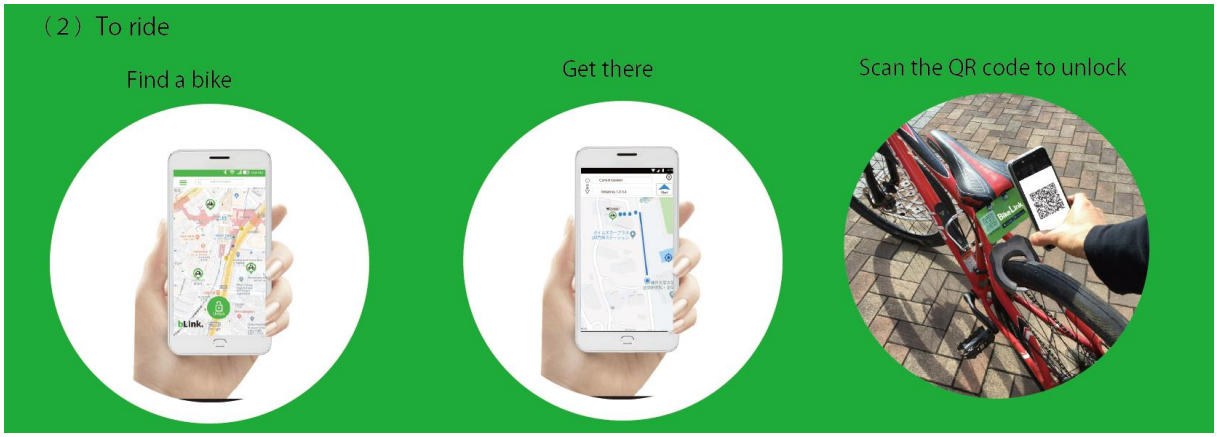
3. 製品・サービスの内容（Description of services）

（1）To rent out

Prepare a bike

Set a port location

Install our smart-lock



(3) The smartlock development (prototype)

The smartlock communicates with Bluetooth, and a GPS is mounted in each lock. The unlocking requires only 3 volt, and thus it is efficiently designed. We designed the lock so that a user can manually unlock the lock with a physical key. This is to make a trouble shooting easier for the bike owner. The prototype lock is currently made with 3D printer. However, we are holding a talk with external companies that provide mass production design services.

(4) Software development (Prototype)

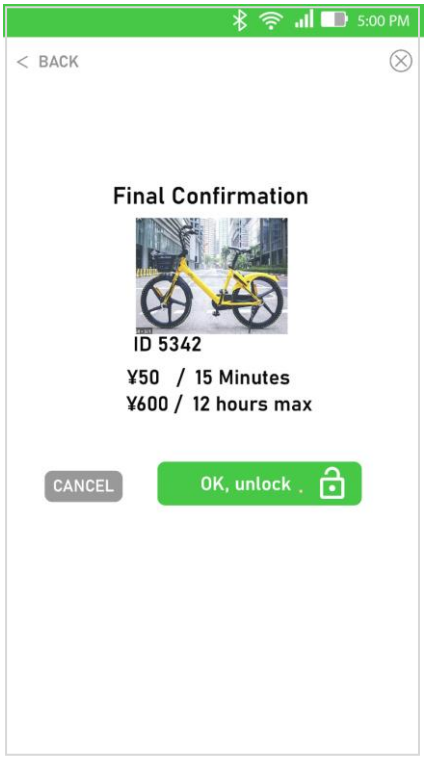
Our software contains three functional layers. The first layer is for database. Our focus was to keep the data secure, while simultaneously allowing us to analyze the bike usage data to assist our business decisions. Thus, we separated the user identity data from the rest of the data. The second layer is for the business logic, such as creating account, renting bike, and so on. This layer also handles authentication. We use the industry standard JWT token for this purpose. The third layer is for the mobile application and the administrative interface. Below,

let us show how the user rent a bike.

①Main screen

②Scan QR code

③Final confirmation



④Screen when you are riding

4. 新規性・優位性（Competitive advantage）

Our bike share model solves the two problems faced by the existing bike share, with the combination of technology and incentive scheme. The incentive is simple: if you rent out a bike, you can make money. Although it is simple, it solves the two problems that have plagued the existing bike share for long time. This is what gives us the competitive advantage.

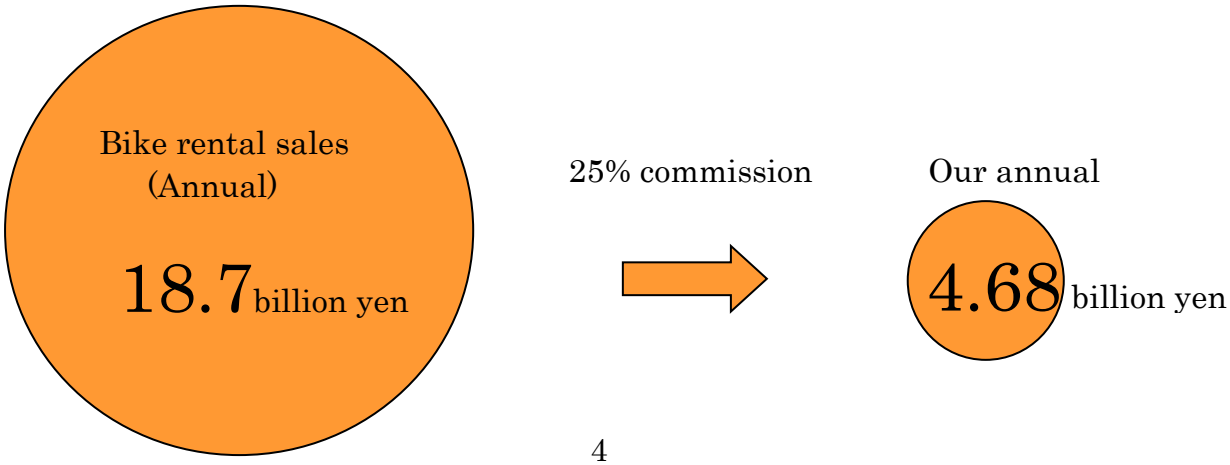
First, the costs of bikes, ports, and labor are on bike owners (i.e., those who rent-out bikes). Thus, we incur no infrastructure cost, making it much easier to expand bike share services. Second, bike owners decide the port locations, and because of this, our service will better reflect users' needs. People naturally have significant knowledge of their local areas, such as local transportation glitches, where to do their grocery shopping, how nearby residents get around in the area, and so on. Thus, they are inherently in a good position to identify the needs for bike rental. Our incentive model of bike share enables ordinary people to exploit such local information to make money. In this way, previously unserved demand will be served.

This point is similar to AirBnB. People who know that there are tourism demands rent-out their property to make money, and therefore, these demands are automatically served even if AirBnB does not conduct location research.

Our ability to solve these problems enables us to enter into the following new markets for bike share:
(1) AirBnB hosts rent-out bikes to their guests.
(2) Hotels or ryokans rent-out bikes to their guests.
(3) In apartments, people who own electric bikes rent them out to neighbors

5. 事業普及（または活用）の見通し

(1) Expected market size



Details of market size computations

(1) AirBnB hosts rent-out bikes to guests

There are 31,776 active listings. Assume 70% of them rent-out bikes, 2 bikes each, at the price per day 600 yen, and a bike is used on average 0.5 times per day. Annual sales from bike rental (before commission) is 4.8 billion yen.

(2) Hotels and Ryokans rent-out bikes to guests

There are 78,000 hotels and ryokans in Japan. Assume 30% of them rent-out bikes, 5 bikes each, at the price per day 600 yen, and a bike is used on average 0.5 times per day. The annual sales from bike rental (before commission) is 12.6 billion yen.

(3) Apartment: people who have electric bikes rent-out to neighbors.

There are 4.4 million households in metropolitan areas who are living in apartments that are at least 3 stories high. Assume that 10 percent of these apartments are suitable for bike rental in that sufficient households are housed in the apartment complex to warrant a bike rental. Further assume that, among these apartments, one bike is rented for each 40 households. Then, there will be 11,000 bikes rented. Further assume that price per day is 400 yen, and one bike is used 0.8 times per day on average. Then annual rental sales (before commission) will be 1.27 billion yen.

(2) Launching

We have conducted a pilot project at an apartment complex with one electric bike for the duration of February 6 to February 19. It was rented 5 times during this period. We will conduct more extensive testing. We hope to test-launch our service this year.

6. 期待される波及効果（Expected effects）

We expect that our service will mobilize a large number of people to rent-out bikes, and will transform the entire urban transportation. It will be much easier to rent a bike when you travel. Apartment residents will be able to rent an electric bike at their apartments, so their daily errands will be much easier and cheaper. In general, it will be much easier to find a bike share where you really need one.

7. イノベータ名（所属）

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