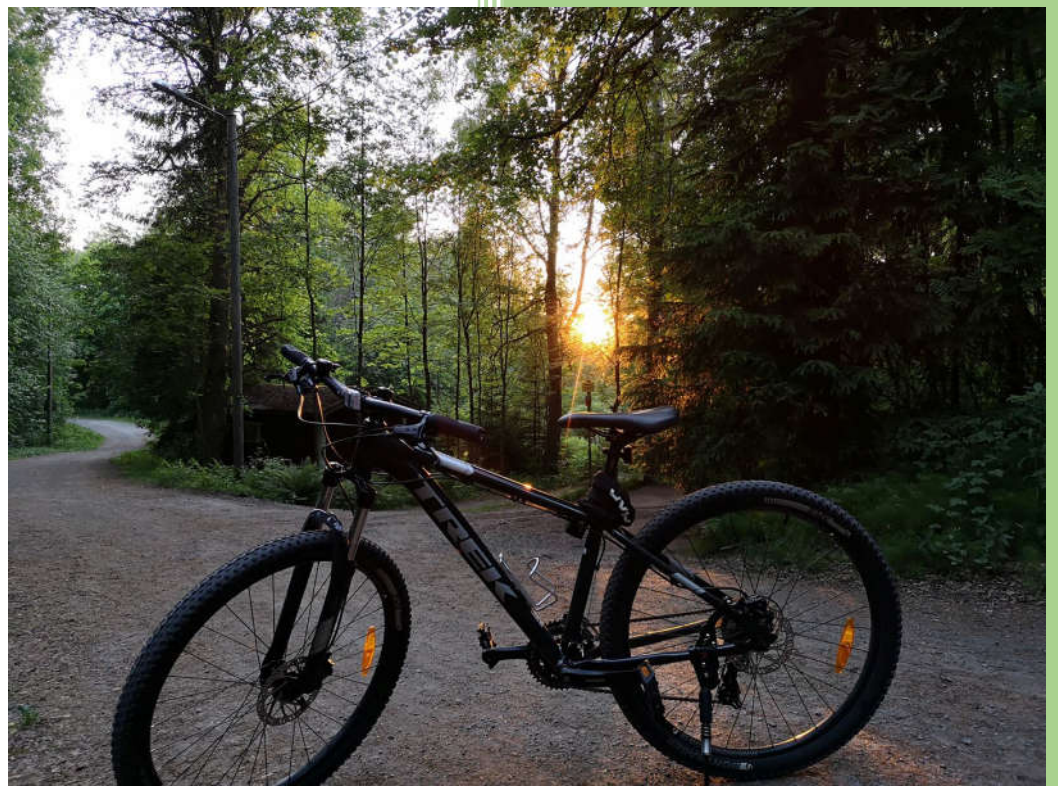# BikeBox – Smartphone App for Secured Storage of Bi-cycles

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"Being an owner of a Trek mountain bike, I always feel the urge to protect it from weather condition, vandalism and theft, wherever & whenever. Same is the feeling of many bi-cycle dwellers of Tampere, where announcements for stolen bikes are frequent in social media platforms. I had the opportunity to work on the UI & UX development for a mobile app, which could be used to store bi-cycles in secured storage. This is the story of BikeBox. Enjoy!"

Like

many Like many other Metropolises across Europe, Tampere, the second largest city in Finland is known for bi-cycles as a medium of daily commute. Not only in summer - the usual season for bi-cycles to fill out the bike-lanes beside the one for pedestrians, but also in winter season we see enthusiastic people simply riding fat-boy cycles or with changed winter wheels on regular bi-cycles. Students as well as service holders often use bi-cycles for traveling because it is cheap, environment friendly and also adds up to the daily exercise routines.

The Design Problem

But all happy things have a twist of Irony! In Finland, if you lose something on your way, there is 95% chances that they would end up in city's Lost and Found office or some kind soul would contact you with your belonging. No such luck with bi-cycles. **Bi-cycle theft** is an alarming issue and people occasionally see missing posts across social media platforms. Some common problems bi-cycle owners face regarding to the safety of their bikes are following:

Lack of security cameras in open parking space to identify stealing incidents

For this reason, **bi-cycles are stolen** in broad daylight **from parking spaces** in **supermarkets**, **university campuses**, **office premises**, etc.

Lack of adequate garages for storing bi-cycles, especially in Student Apartments

Bi-cycle owners are often forced to **put their bikes in open space** because of the **lack of sufficient storage** space either in **common areas** or respective **apartments**. These leaves the bi-cycles **prone to adverse weathers** (specifically during Autumn and Winter Seasons) and with risks of **being picked up**.

Bike locks aren't enough

Thieves ready to pick up bi-cycle often come equipped with **mechanism to break bike locks**. Students, specifically international ones, often **hesitate to buy good locking mechanism**. So, those bikes are in more risks to be **stolen in parts**, with **broken lock** or being **picked up as a whole**.

Not enough bike services provided by the city

Like Helsinki, Tampere is yet to own **bi-cycle services** where bikes can be rented for a few hours or the whole day using the general travel card. A few city bikes are available for tourists to rent and use. So, the residents within Tampere mostly need to rely on having their own bi-cycles.

This is a constant worry for city dwellers for keeping their bi-cycles safe and secured inside and outside their homes, schools or offices. People are willing to pay for a service that would ensure that their bikes are stored in a secured location to their convenience. The bi-cycles need to be out of harm's way and theft. Only owners would be able to have access to their respective bikes.

A Service Idea

*To create a possible solution to prevent bike theft, Sampo Software Oy considered creating a prototype of **bi-cycle storage service**, comprised of separate **containers with electronic lock** that could be controlled by an **app in smartphone**. The app would also include provisions for **locating bi-cycle storage space**, **renting** them on the go and **payment** options. Although commissioned for a private client of the company, Sampo Software decided to expand the service as one of their products and to make sure this could be reached to mass population. Hence, the service needed to be customizable as per the preferences of individuals or organizations using the service.*

Barriers We faced

BikeBox contains features which needed to be implemented both in hardware and software. The storage container needed to contain a lock that could be operated using smartphones. In the beginning phase, the **client was yet to deploy these containers** across Tampere because **locking mechanism** would have determined which type of storage container to choose. So, our implementation team had to start the overall work from scratch, i.e. looking for the perfect locking mechanism in market with reasonable price, creating interface for operating the locks and making the App UI. With the lack of the actual containers, it created **difficulties in testing how the locks are performing**. So, we had to figure out some means to determine if the UI and the lock are performing as they should be in real life scenarios.

Our Process

Our Implementation team had the **Design members** located at **Tampere – Finland** and people responsible for **development** and **coding** resided in **Russia**. The design team consisted of our team-lead and **me** as the **UX designer**. The 1st task for the team was to configure the working mechanism of the electronic lock that could be operated using smart phone. Our team-lead along with the development team took the responsibility of that implementation. That gave me enough time to **talk to some people** who commuted using bi-cycles to places around Tampere.
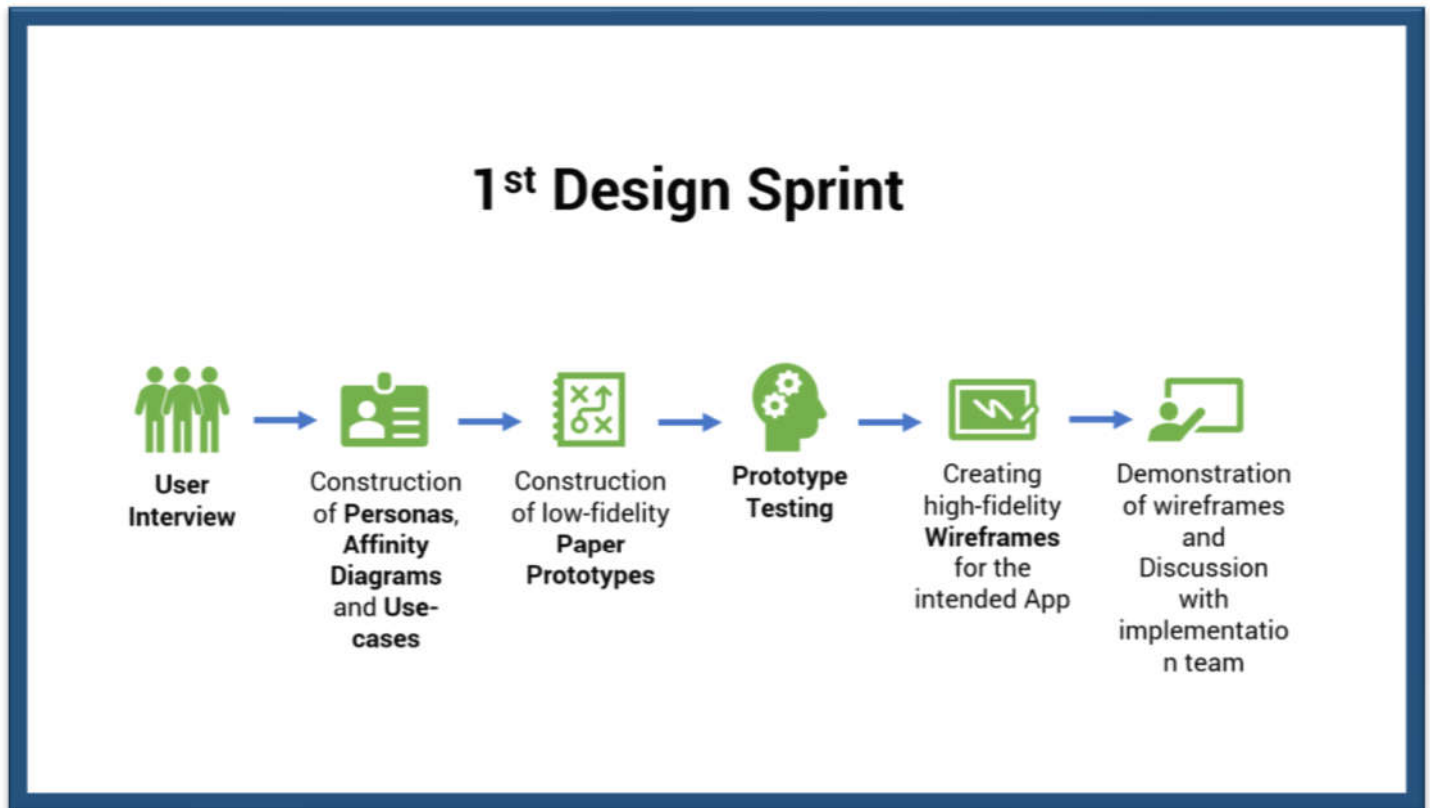

*Figure 1 The very first Design Sprint of **BikeBox**. Primary **User Research**, **Prototype Creation** and **Testing** were done in this period.*

I focused primarily on **university students** and **service-holders** as they constitute the major portion of population using bi-cycles for traveling. I asked them about **how they prevent bike theft** and **protect their bi-cycles from adverse weather**. Their answers, collected and organized as **affinity diagrams** helped me to create **personas**, construct **user case scenarios** and **brainstorm ideas** on the app features with my team lead.
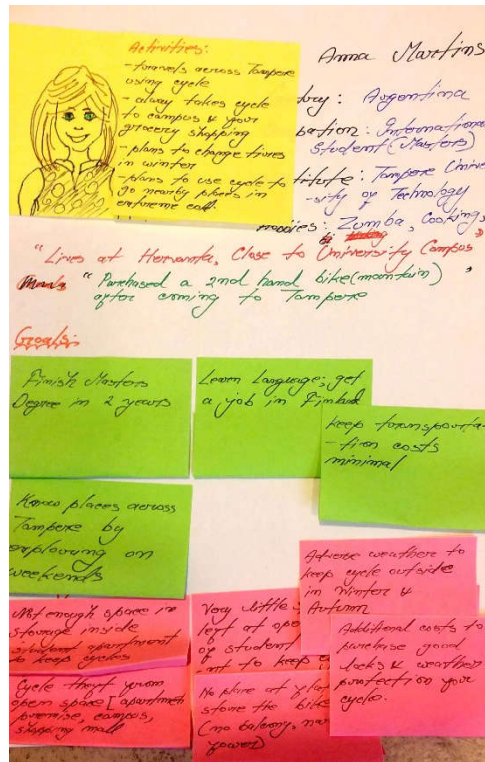
*Figure 2 One of the Personas, **Anna Martins**. Red sticky notes indicate challenges she faces*

*Figure 3 One scenario for the Persona, **Anna Martins**. She gets a **notification** from her **apartment's Facebook group** about an incident of **Cycle Vandalism and Theft**. She rushes downstairs and sees a lot of bi-cycles are damaged and many students are missing their bikes. She discovers that padlock of her bi-cycle is almost broken.*
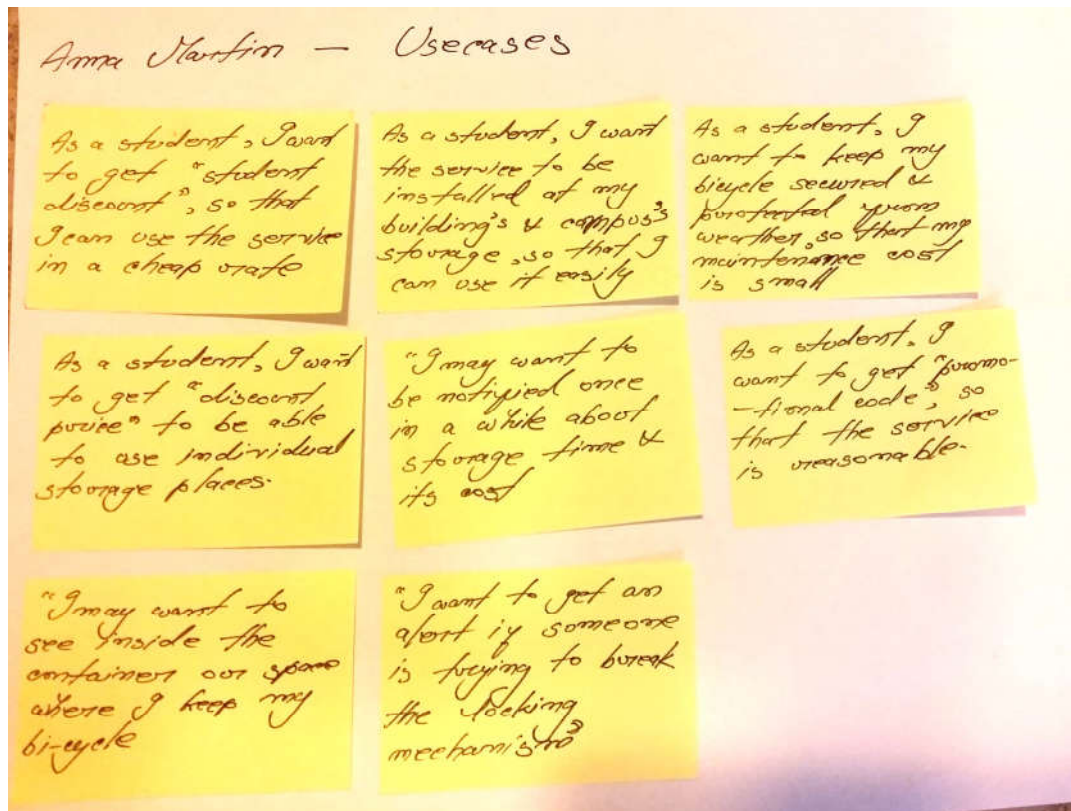
*Figure 4 Use-cases for the **persona Anna Martins** who is a **student**. In interviews, most students **emphasized a cheaper plan** to access and use BikeBox.*

I constructed **low fidelity paper prototype** using **balsamiq** mimicking screens of **different features** of the apps and discussed the logic behind the designs with my team-lead. With some trial and errors, the **revised version of the prototype was tested** with people who were interviewed earlier.
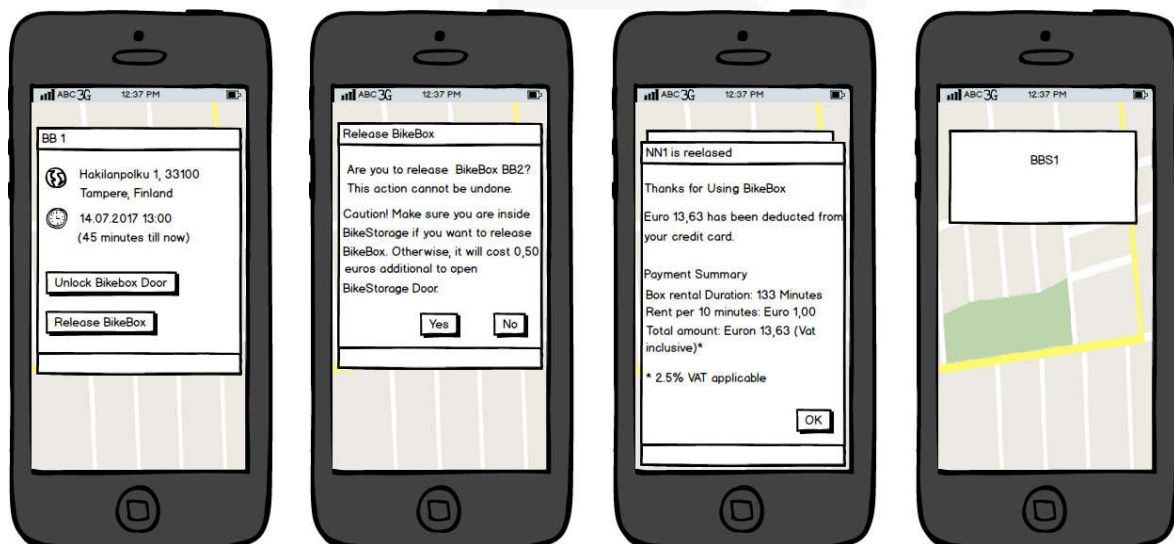

*Figure 5 Screens for the **paper prototype** of **BikeBox**. Here the **use-case** for **releasing a rented container** is demonstrated.*

The work for configuring the electronic lock and primary user research and design work concluded in parallel. I created **wireframes** for different screens of the BikeBox app using **Adobe Photoshop**. The wireframes followed references from **Android Design Principles** and incorporated **different features of the App**. The wireframes represented **primary UI**, its **functionality** and **improvement suggestions** from the **user**

tests. The wireframes were discussed within the whole implementation team and backlogs were created based on features and opinions from the team members.
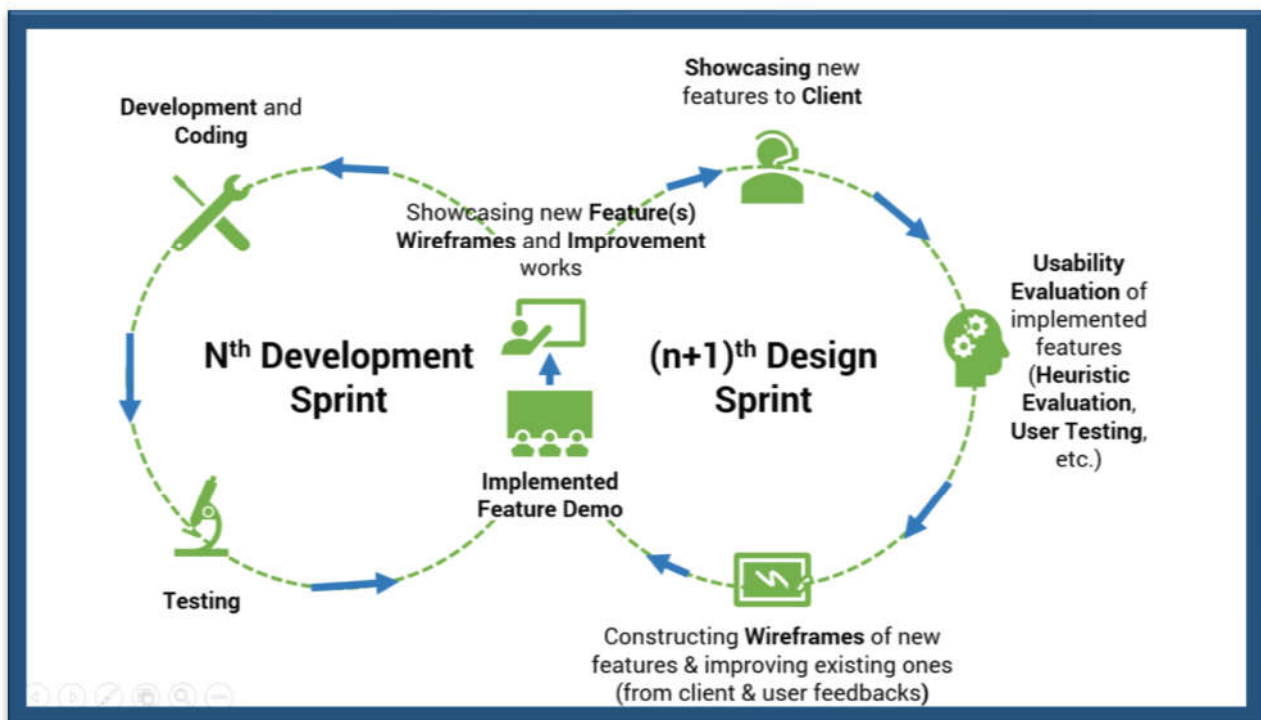

*Figure 6 The **Design** and **Development Sprints** for BikeBox*

Each backlog had a **2-week long Development Sprint** according to its priority. During the development period of one feature, I concentrated on **modifying, refurbishing and finalizing required wireframes** for other features to develop. At any point of the Design sprint, **feedback** from **users** were used to make **necessary modifications to the personas and use-cases**. Additional work also included **conceptualizing and designing new requirements** that came from **the client**. When UI and functionality of a feature in the app was developed, my team lead and I performed quick **heuristic evaluation** of the feature and tried to uncover **potential issues**. The implemented feature(s) in turn were **shown to the client for his feedback and approval**. Although the actual containers were still to setup by the client company, I took the **continuously implemented app for testing** to **cyclists** who might actually use the completed app. I **gathered feedback** from those quick testing which helped **convincing the customer about necessary alteration to the features or introducing new ones**. At the end of both sprints, the development team showcased an implemented feature. As part of the design team, my team-lead presented the next backlog to implement and also modification requests from the client. I **explained the wireframes** of the intended features and **suggested improvement feedbacks** in existing features obtained from **user testings**.

Apart from the **1st Development sprint**, consecutive ones consisted of works **building new features** as well as **modifying the already implemented features.**
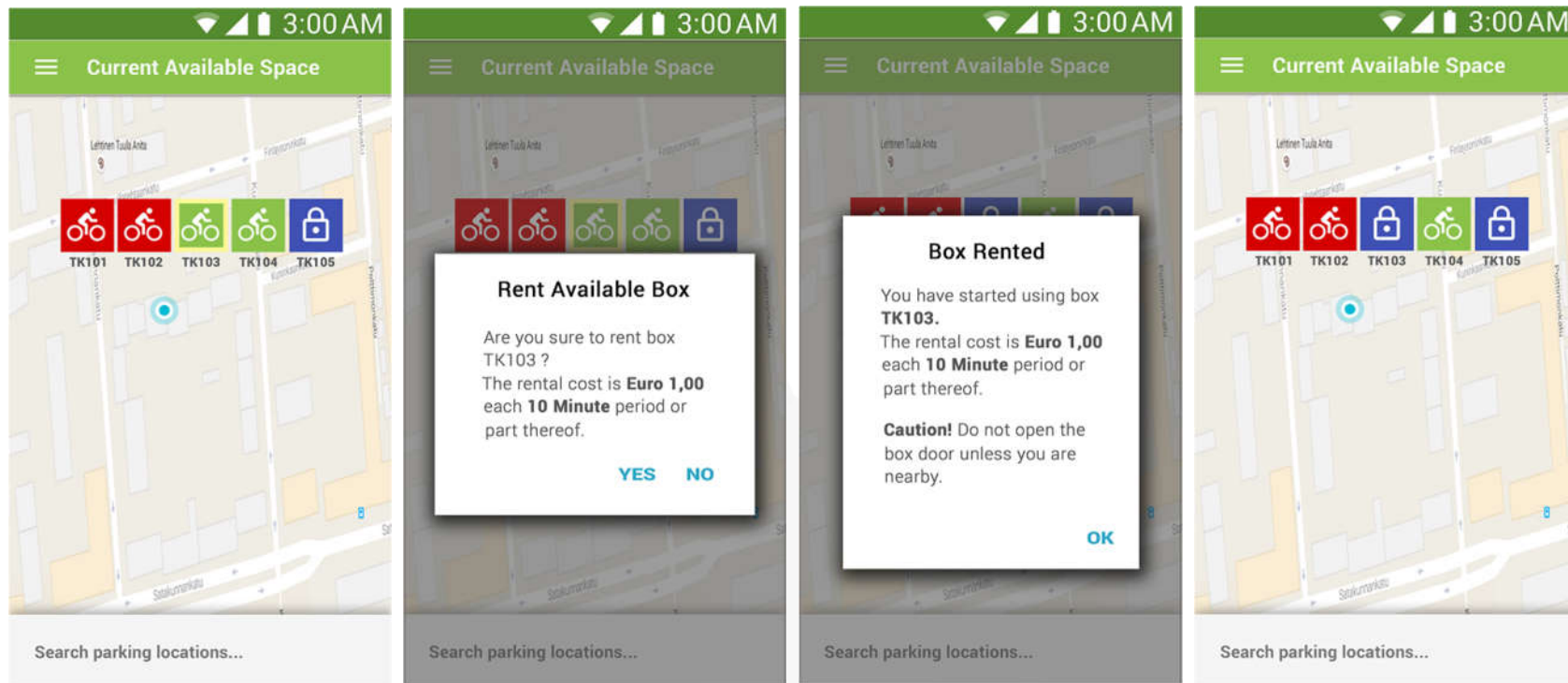
Figure 7 Wireframe showing the action of renting a BikeBox Storage from smartphone. App notifies user about the price before asking confirmation for rental. User can rent more than one storage at a time and they appear as blue square with a padlock icon.

The final product

BikeBox can be used in both **Android** and **iOS** operating system. The 1st version of the App included features for **user registration**, **locating nearby storage spaces** and **renting functionalities**. Users of the app could book in advance storing container for a cycle and can them once they reach to the destination. From the **system admin view**, the service owner can **grant access** to the service to **registered users** and **select monetization scheme** for BikeBox. The interface of the mechanical lock and the app was implemented successfully with some trial and error. With the locks placed on the doors of the actual containers, the team was finally able to test the locking mechanism and how secured they were. If issues with the locking mechanism were uncovered, team fixed them at the earliest convenience. Subsequent versions of BikeBox included **history** option, mark **favourite containers** and **locating storage locations using google map**.

By disabling the payment option, we tested the app with the employees owning bi-cycles from the client company. Results from the user tests came out mostly positive. Suggestions for annual payment options, increasing the number of bike storage containers and storage mechanism inside building were also suggested by the users.

The current version of BikeBox mostly accommodates needs for service-holders. Sampo Software Oy is now working on how to include more than one lock in storage where large number of bi-cycles are stored in larger space and can be accessed using separate entries. Future implementation plan includes designing rental plans suitable for students.