Step Boss
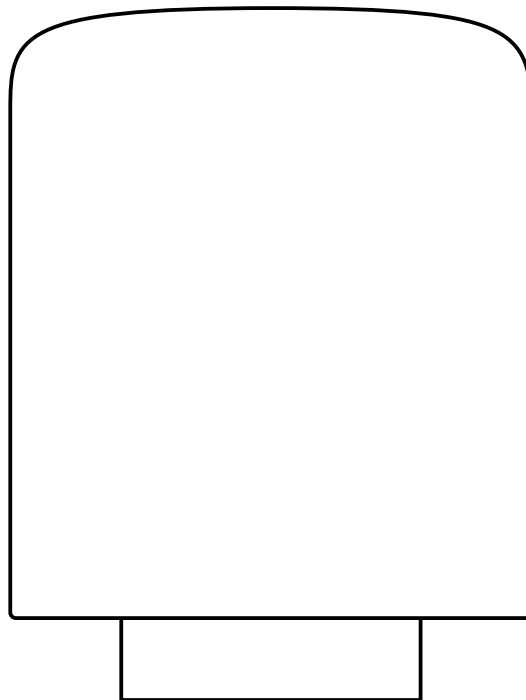
B 1.1 Project Report
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Introduction to Design Brief

Within the project smart moves we got the challenge to design something to make rehabilitation fun. We had to find a way to incorporate a game element in a design that would motivate people to take part in rehabilitation exercises over a longer period of time.

By using gamification in our design this would cause stimulation to prolong a person's interest and drive within rehabilitation exercises.

We chose not to use rehabilitation in our design challenge but focus on prevention. We are incorporating the game element in prevention of RSI. In particular we are focusing on prevention of RSI in the office environment, because office workers regularly get RSI due to bad working conditions and repetitive, strenuous movement. This results in expensive, painful treatment that can result in patients not working for a long period of time, even for moderate RSI problems.

We conducted interviews with physiotherapists to get insight into what causes RSI and what the best way is to prevent it. The solution we come up with to prevent RSI is to incorporate general movement on a daily basis during a work day in the office.

Introduction to Step Boss

The product we designed is called Step Boss, it's a device designed to stimulate office workers to interrupt their work routine with short, regular breaks.
The Step Boss creates a collaborative and social game experience where colleagues work together and motivate each other to complete races and expeditions against other office departments. This happens all within the office.

Our product will start its day on your desk, where it will display a green light for 15 minutes. After this the color changes to orange, indicating a 5 minute time slot to prepare for a short break. Then the light turns red, indicating it is time for a minimum 5 minute break. During this break, you must

take the device for a walk, where it measures your steps taken. At the end of your walk, you must place the device on any colleagues desk, where the 25 min cycle starts again for the other person. This way, the device is transferred between everyone in the office ,throughout the day. These steps taken are transferred into a race to the top of a mountain of an existing location. Each step taken by the individual office workers adds to the journey the department has to accomplish. The department who reaches the final destination as first would receive a reward.

The competitive atmosphere motivates everyone in the office to participate, and makes the device fun to use.
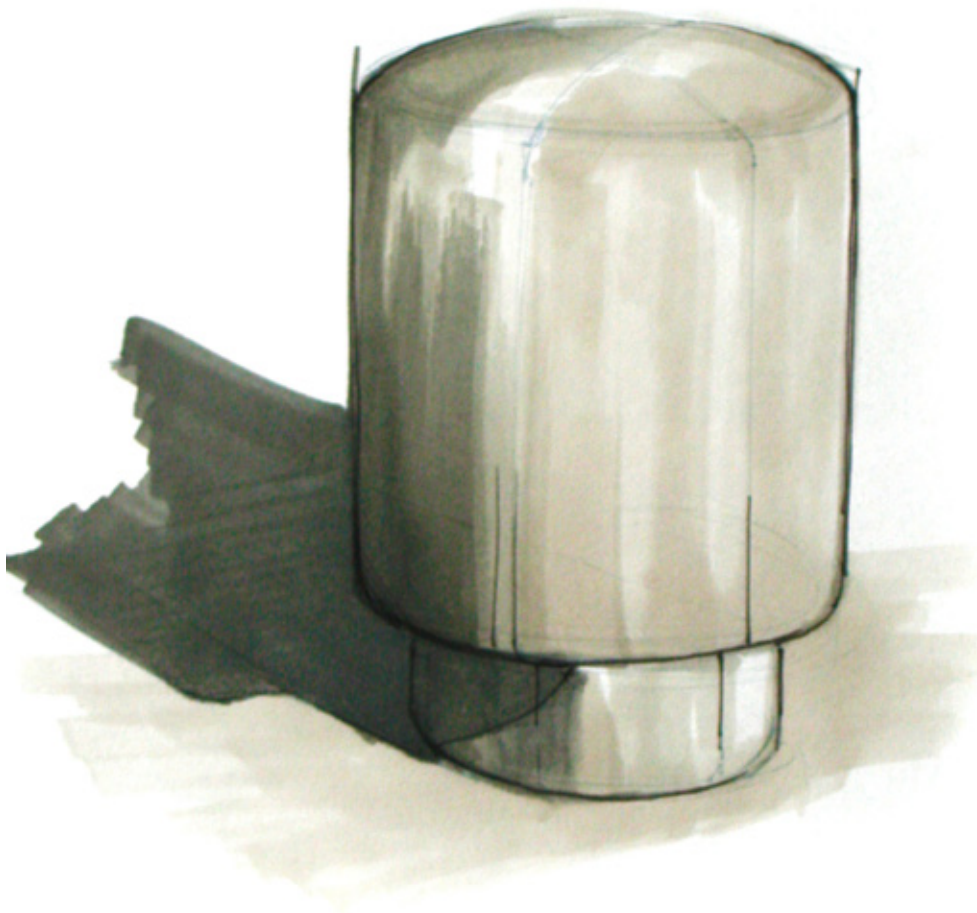
Method

Defining Target Group

The first challenge we faced as a new project group, was that we had to choose a target group we wanted to focus on, and a disease we wanted to address. First we made mind maps of different generational groups: adults, elderly, children and students. Then we looked at the different physical therapies all these groups could face. We focused on the different things we wrote down and talked about design possibilities. We soon came to the conclusion that we were most inspired to design something for adults or students or make something that could be used by both target groups. After this we got feedback to focus more on one specific target group to ease our design challenge. After this we focused more on the different areas where adults could face physical difficulties and came to the conclusion we were most creatively inspired by the office environment.

At that time we all made a separate mind map with our view on the problems an office environment would face. In the end we were inspired by the lecture we got about RSI, from the physiotherapist of the Tue and we realized RSI still is a common problem among office workers. Because of this we decided to focus more on diseases related to RSI and RSI itself. Therefore we made another mind map with all the different forms of RSI. After this we definitely decided to focus on RSI in the office environment.

Research into RSI

To define the target group we needed to know what kind of problems office workers face during their work day. We read a paper that provided information about movements that are a high risk for getting physical problems. We also found a website that introduced us to metabolic syndrome. The website said that you could prevent office workers from this disease, by giving them exercises to do.
Next, we wanted to define these exercises. We found two websites with exercises and tips for a healthier working environment. We made a list of reading questions and focused on a broader scope of injuries. We chose to search for information on mouse-arm, metabolic syndrome and bad posture. The questions contained "What is...", "How do you get...", "How do you prevent...", and statistics. We read a research paper about RSI (repetitive strain injury) and attended a lecture, where we learnt that RSI is an umbrella-term for muscle-related disorders, so this was the best starting point for our project.

To get a better understanding of gamification we read an article stating that teamwork is a good motivator for office workers. We went to a gamification talk where we were introduced to creating a game for the real world and we applied this towards the game experience that we developed You can read more about the gamification further on in this report. The motivation was a big part of our research, especially to have people stay motivated for a longer period of time.

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Expert Meetings

During the project, we did two interviews with the physiotherapist of the TU/e. Our first interview was intended to get more insight RSI.
The interview was mainly focussed on RSI and the consequences of it. We interviewed the physiotherapist and we attended an appointment with an RSI patient . We gained the knowledge that RSI is a disease one gets by doing long,
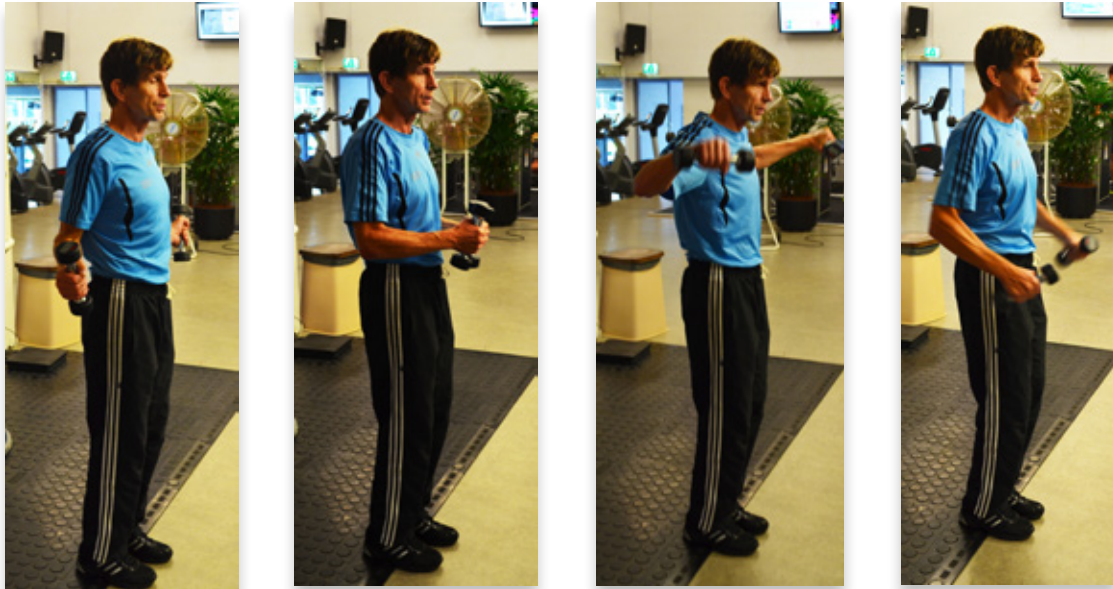
repetitive work in the wrong posture. As a consequence your muscles get 'stuck.' Rehabilitation is very difficult for patients, because they are very limited in their movement and because there are various forms of RSI, like back pain, shoulder pain and the mouse arm. These different types of RSI require different methods of rehabilitation.
We also discussed some existing products for RSI. The physiotherapist was very enthusiastic about the 'ControlWork' program that most office workers and students have on their laptops.

After our interview we concluded that we wanted to focus on prevention of RSI instead of rehabilitation, because prevention is of course always better than curing the disease, and because rehabilitation will cost years of treatment for patients, and prevention is relatively easy to apply.

In the second meeting we were introduced to the different exercises you can do in order to prevent RSI. We concluded that taking regular breaks is a must for prevention. According to the physiotherapist, taking a short 5 minute break every hour is the healthiest break ratio. The expert recommended walking during these breaks as the most effective and easy way to prevent RSI. Although, he introduced us to some other useful exercises and let us experience them ourselves.

Brainstorming and Mindmapping

One of the main methods we used to generate ideas is brainstorming and mindmapping. This method was a very useful one for our project, especially when we started. Firstly, we used the brainstorm and the mindmap to define a target group. When we decided to focus on office workers we brainstormed about the target group (problems they face, their environment, etc). By constantly refining and reorganizing our individual and our group brainstorms, we came to one particular brainstorm which included all relevant thoughts for the project.

This method of idea generation came out to be the best way to start-off our project. It makes it possible to compare, collect and connect all common ideas in a group.
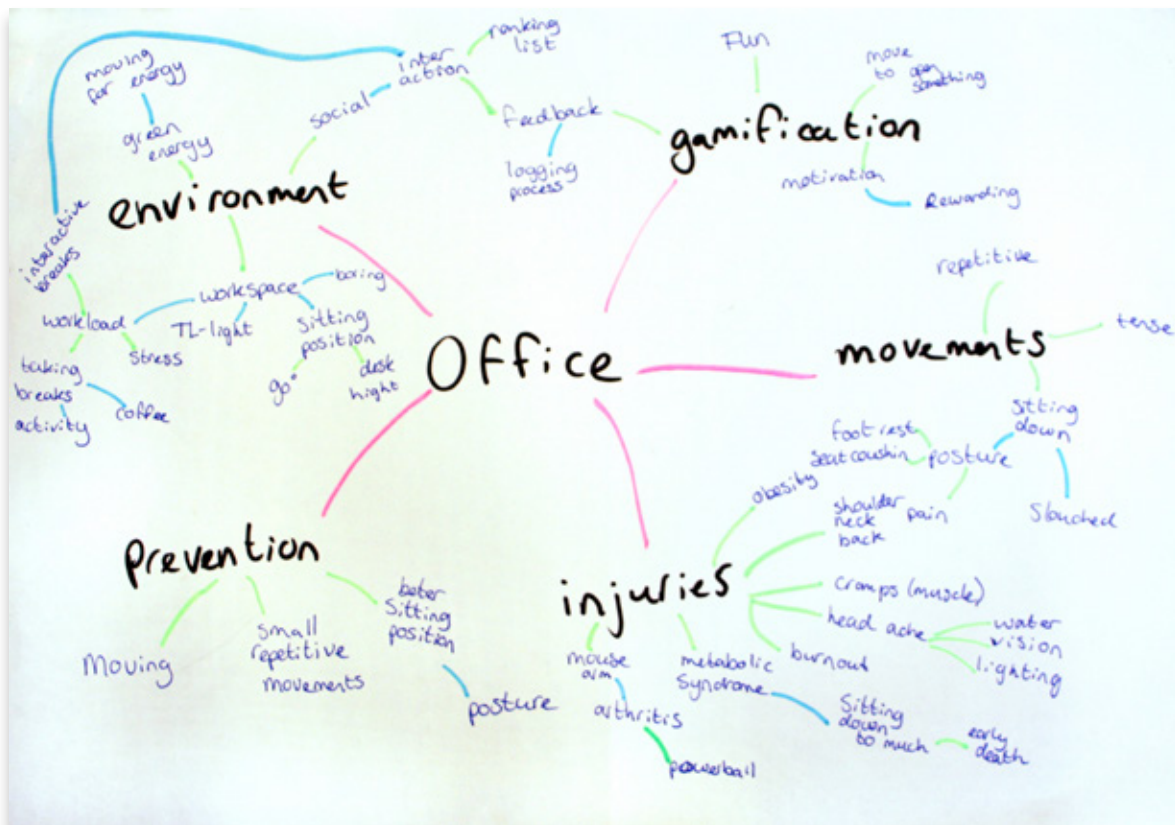
Ideas and Concepts

The research and brainstorming sessions led to the development of ideas and concepts that revolved greatly around the physical rehabilitation of the users. After conducting more user interviews and understanding the user group and their preferences towards exercise, we began developing different concepts that better fulfilled the preferences of the users.

The following are short explanations and reflections of some of our previous concepts.
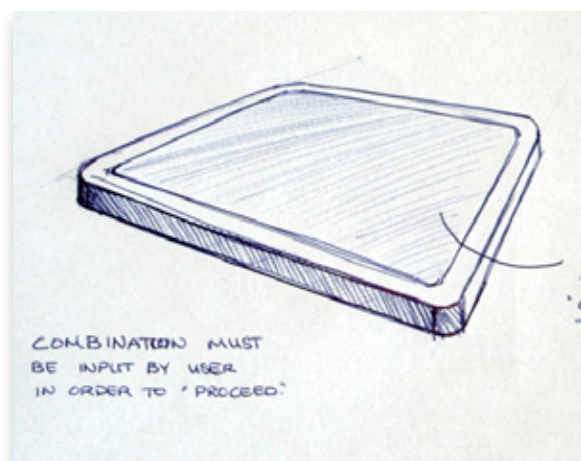
1. 'The Ball'
This concept was more focused on targeted rehabilitation of shoulder and arm RSI. The idea was that the user holds the ball and does rehabilitation exercises prescribed by the physiotherapist that we interviewed. The ball would light up either green or orange, depending on weather the exercise was done correctly. This would give the user some feedback on the quality of the exercise. Group exercises could also be done to, which would make the experience more social and therefore more fun.
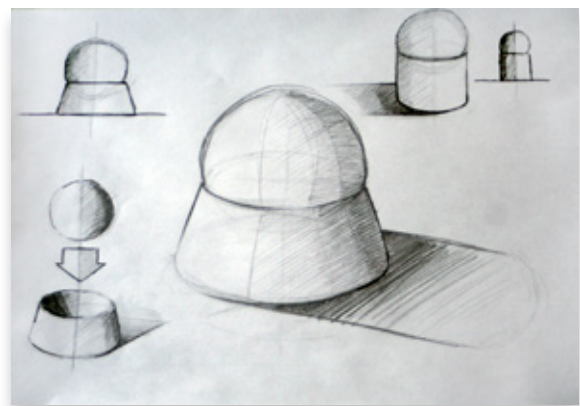
We focused on this concept for quite a long time, because we liked the idea and the direct feedback that the user receives. However, the gamification was very poor, and it was a concept that would quickly become boring and did not fit with the preferences of the user group. We also felt that this concept did not fit well in the office environment. Therefore we decided not to continue further with this concept.

2. 'Tiles'
A very early concept was to create an interactive tile that would be used to encourage the user to do some specific activities that would target specific muscles that are prone to RSI. For example, the face of a door can be covered in these interactive tiles, and the user could need to touch the tiles in a specific pattern to unlock the door. The pattern would be programmed in such a way that the movement the user makes, exercises and stretches the target muscles.

COMBINATION MUST
BE INPUT BY USER
IN ORDER TO 'PROCEED'

Although this idea had a much stronger gamification factor than 'The Ball' concept, it did not effectively tackle the design problem we had.

3. 'Step-Counter'
This concept originated from user interviews, after realising that users' preferred exercise was walking. An expert meeting with a physio-therapist revealed that the easiest way to prevent RSI was for users to take short and regular breaks. This way, the users would frequently stretch their muscles and so would prevent RSI.

The concept was to create a small pocket-able device that each employee would have, and it would track their steps. The steps would be displayed for everyone in the office, and so a competition would be created. This would encourage everyone to be more active during their breaks, and so prevent RSI.
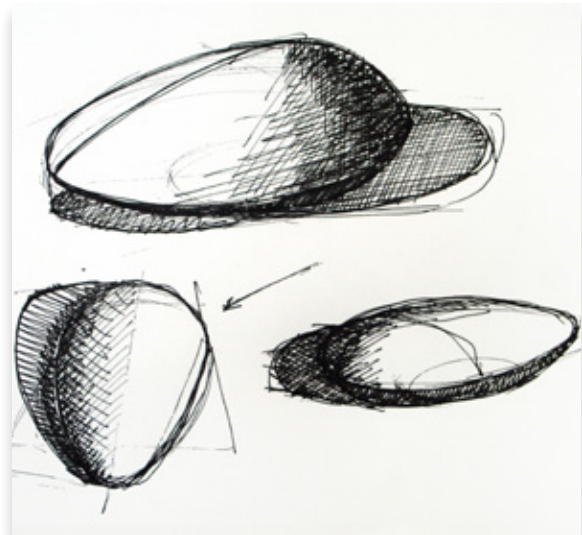
This concept was further developed into the 'Step Boss' through more interviews and user feedback sessions which are described in the next chapter.
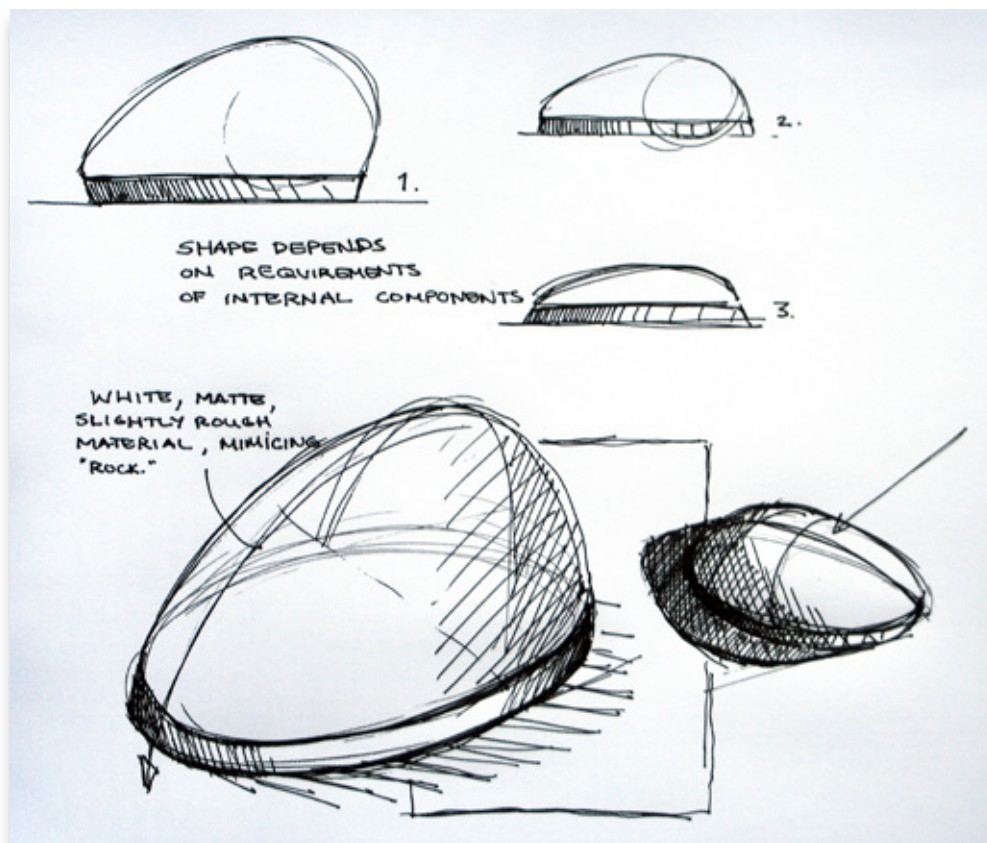
User Involvement

After having the expert meetings and having done a part of the research we found that we needed some input from the user, because without the user we knew only the theoretical part of RSI. We came in contact with an RSI-association in Eindhoven via email. The owner of the webpage of this association gave our email to patients that were willing to speak with us. One women was not living far away so we went to her house for an interview, because she could not do much outside of her home due to her RSI.

We set up a few interview questions to have a guideline for the interview. Being at the house from the patient, the questions appeared to be a good start for the conversation, but the patient had a lot more useful things to tell us.

The patient had told us that very intensive movement would not be suitable in the office environment. She suggested that it would work better to incorporate regular walks in the daily schedule. This was the basis for the idea we presented on the final demo day.

We have also spoken to a man from the city hall. He works in an office environment and could help us with what the current office situation looks like. We went to his office and got a tour around the office. There were two kinds of working. Flex working, where the office workers can work where they want and divide their time how they like, and regular working, where they have a personal desk and work from nine until five.

We were told that flex working was a form of prevention of RSI already, so we could better focus on the old-fashioned way of office working. Architects for example, are still working on their own desk and drawing for hours in the same position. This results in a bad posture and all the problems that come with this. Because we explored a little bit in the field with this interview, we had a new starting point and a better defined target group.

After a few weeks we found that we needed to have a sort of co-design session. This could help us with getting new ideas and new input in the idea generating phase. We made a set-up for the session and we contacted a few people. Only one person from the city hall responded.

We tried to make an appointment, but the appointment was too late to have a real co-design session, so we made it a feedback session.
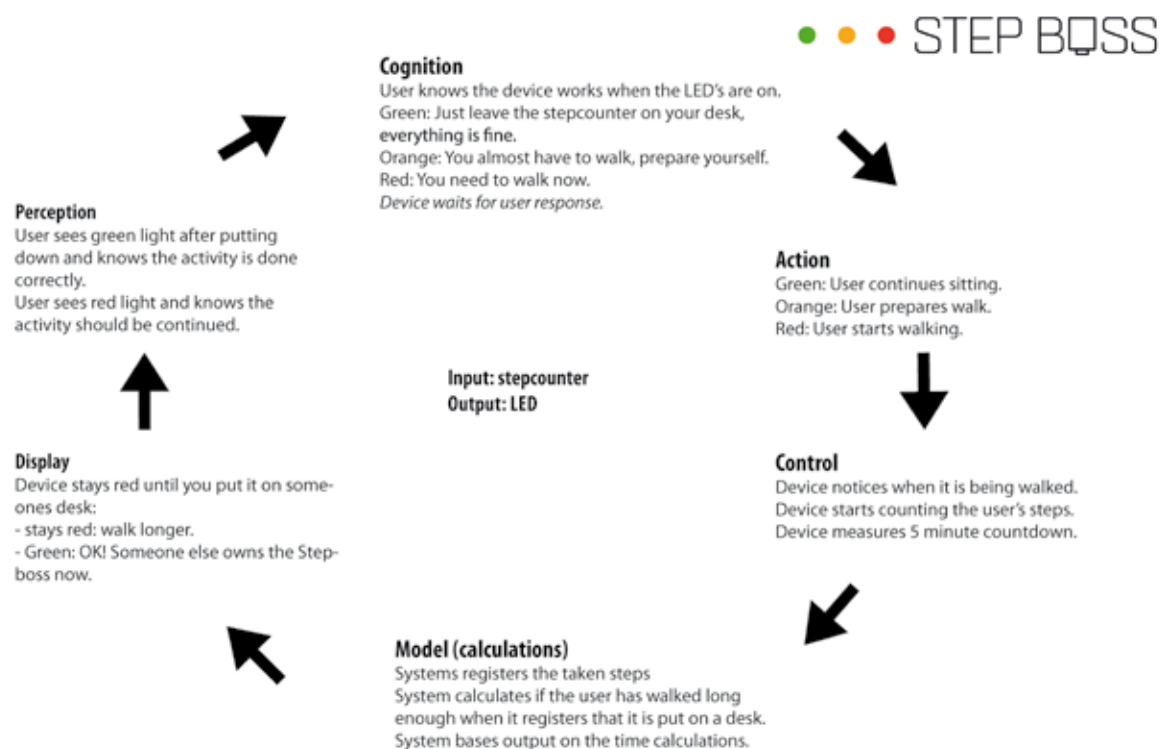
During the feedback session we met with three people from the city hall office. We brought our prototype, explained our idea and vision to them and asked them a few questions. They helped us with ideas for improvement and some ideas for the future. We talked about the shape and size, and used their feedback in the development of the final prototype.

Concept

'Step Boss' is a device designed to stimulate office workers to break-up their work routine with short, regular breaks. It does this by creating a collaborative and social 'game'experience where colleagues work together to complete races and expeditions, all within their offices, against other departments. The group effort required, encourages office workers to take short regular breaks and so prevent RSI.

'Step Boss' starts its day on your desk, where it gives 15 minutes of work time, before changing colour from green to orange, indicating a 5 minute time slot to prepare for a short break. When the light turns red, you must take a 5 min walk with the device, where it measures the steps taken. At the end of your walk, you must place the device on any colleagues' desk, where the 25 min cycle starts again for the other person. This way, the device is transferred between everyone in the office throughout the day.
When shared between a group of 8 workers, each member receives the device at least 3 times per day and in total, using the device only takes up 3% of the work day.

● ● ● STEP BOSS

Cognition
User knows the device works when the LED's are on.
Green: Just leave the stepcounter on your desk, everything is fine.
Orange: You almost have to walk, prepare yourself.
Red: You need to walk now.
Device waits for user response.

Perception
User sees green light after putting down and knows the activity is done correctly.
User sees red light and knows the activity should be continued.

Action
Green: User continues sitting.
Orange: User prepares walk.
Red: User starts walking.

Input: stepcounter
Output: LED

Display
Device stays red until you put it on some-ones desk:
- stays red: walk longer.
- Green: OK! Someone else owns the Step-boss now.

Control
Device notices when it is being walked.
Device starts counting the user's steps.
Device measures 5 minute countdown.

Model (calculations)
Systems registers the taken steps
System calculates if the user has walked long enough when it registers that it is put on a desk.
System bases output on the time calculations.

Gamification

Gamification is important factor in encouraging the users to continue using the product and keep up with the exercises.

When you go for a walk with Stepboss in your hand, the device starts counting your steps. The counted steps are displayed on a screen hanging in a central place in the office, for example in the canteen, or lounge. Together with your team (8 players) you everyone's steps are added together and displayed as a single score for the team in the set challenge.
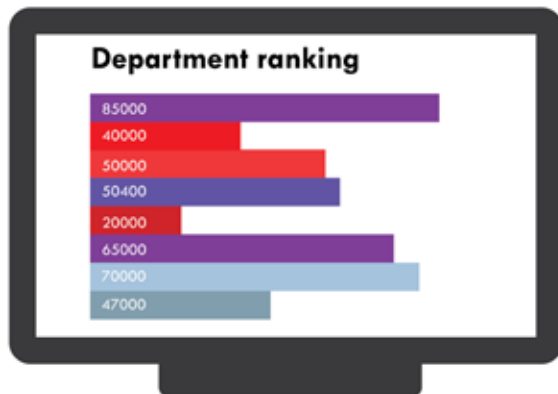
In the department ranking (right), each team has its own bar where the steps taken by the team members are displayed. Although this way of presenting a game was clear and organized, it was a little bit dull and not much of a game.

In these two examples the steps taken by the office workers are transferred into a real challenge. The team must take enough steps to go on 'journeys,' in this case travelling from Eindhoven to Amsterdam or reaching the top of a mountain (top, right).

If someone does not walk, and the device is red for five minutes or more, the system begins deducting points. This will lead to negative progress in the game, which, because of the group-pressure and the competive environment created by Stepboss, office workers will be motivated to go for a walk.

The winning team will receive a small reward, like a free coffee.

In the future, creating a virtual world on the screens instead of presenting 'just the image' will make the game more fun. A complete virtual world including numbers of levels with different degrees of difficulties might achieve more excitement while playing the game. The addition of bonuses and mini rewards could also make the game more exciting and therefore keep user drawn towards it.

In addition to this, the introduction of 'penalties' to the game in more interesting ways would also be beneficial. For example, instead of simply deducting points, users could be forced to take a 'detour' in their journey, which is more difficult, thus encouraging people to actively participate in the game. These penalties can even be translated into the real world, to make the game experience more exciting.

We should also focus on some more details in the future. What happens exactly to the winning and the losing teams? How long does each challenge take? When does a challenge end?

Form Development

The step-counter concept was the basis for the Step-Boss, and therefore the form exploration started there. Initially, the device was going to be an individual product rather than a shared product, and therefore it's from was designed to be slim and pocket-able. Some of our earliest prototypes exploring form reflect this. The device here is thin and well rounded, in order to make it easier to slide into and out of one's pocket.

We also explored the possibility of the device being hand held, which adapted its shape to be more ergonomic.

The form of the final design is not very portable, however, we wanted the device to have presence on the user's desk, and therefore they would not be so tempted to ignore the device and not use it. With a smaller device like in the initial form exploration, it is much easier to misplace or simply ignore and this would then make it useless. By making the device larger, and pointing the LED's downwards to create a halo of light around the object, the device has much more presence, looks much more inviting and this makes it more difficult for the user to ignore it. Although the portability of the device is negatively affected by this decision, we felt that it is more important to make the device prominent, rather than something that is easily forgotten.
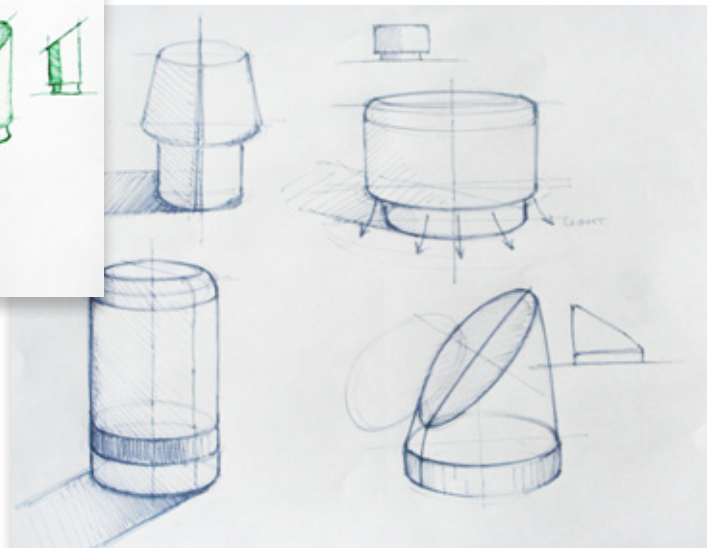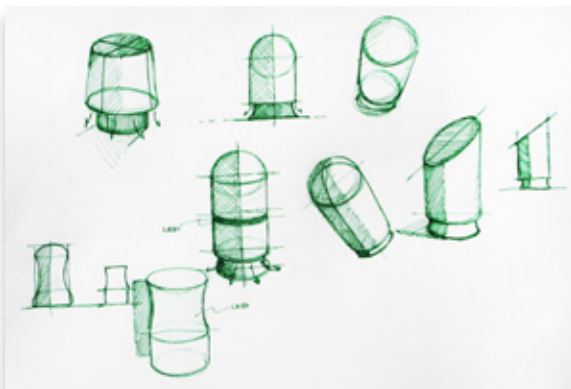
During the demo day, we received feedback that the colour choice of the LED's could be more original, rather than using a conventional green, orange and red display. For example, it could be much better to reflect the attraction of walking that the user's experience, in the choice of colour. A blue hue could be used to display when one should take a walk, emulating the sky outside. This way, the user's interaction and personal connection with the product can be imporved.

Technology

The form of the Step Boss strongly influenced the arrangements of the technology that is integrated in the product. It was a design decision to have downward facing LEDs in order to create a 'halo' around the device and have indirect light be seen by the users, and therefore the integration of technology was centred on creating the right user experience with the technology.

We used SMD RGB LEDs in an early prototype to test the way the light would look and the way users would react to it. In the first prototype, 4 LEDs were soldered to a circuit board, in order to create a simulation of the effect that we wanted to try. In the final prototype, we purchased an 'AdaFruit NeoPixel Ring' with 24 RGB LEDs. Due to the smaller size of this ring, we were able to make the final prototype neater and truer to our vision of the product.
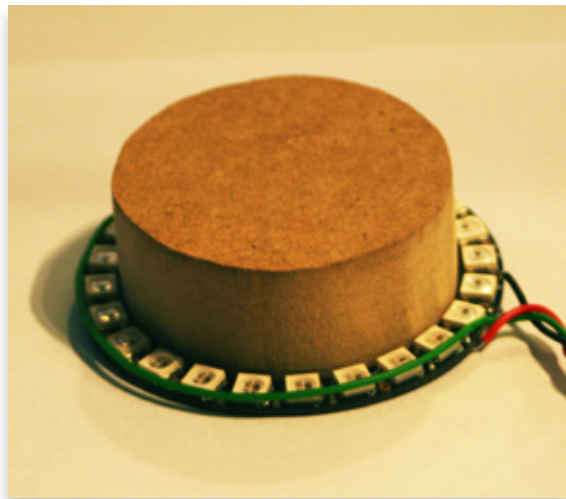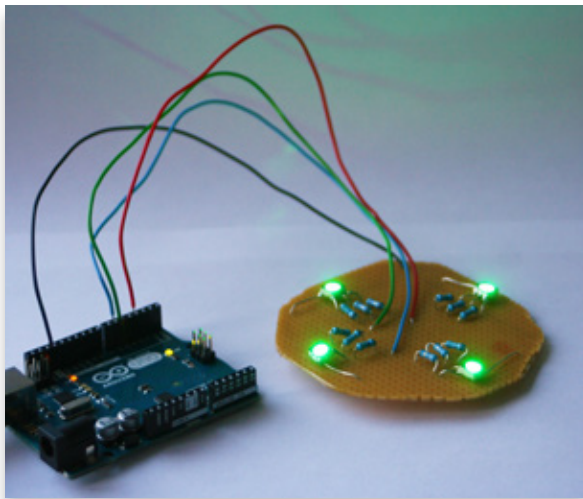
Although we were not able to include this in the final prototype, the device would also have built in 3-axis accelerometer that will be used to measure the steps that the user has taken with the device. As the user moves, the accelerometer measures a change in direction, and the time that this change takes. From these values, the system will work out how many steps have been taken, based on the average length of a step. This would be the next step of our prototype if we had more time to refine the idea. A simple version of a step counter was integrated into an early prototype in the form of a pushbutton.

To power the prototype, and manage the way the device functions, an Arduino program was made. The program controlled the LED's, changing their colour over time. This Arduino program was the basic control of the device and the user interaction with the device and also measures the amount of steps taken by means of the pushbutton mentioned above.

During the demo day, we received feedback that the colour choice of the LED's could be more original, rather than using a conventional green, orange and red display. For example, it could be much better to reflect the attraction of walking that the user's experience, in the choice of colour. A blue hue could be used to display when one should take a walk, emulating the sky outside. This way, the user's interaction and personal connection with the product can be improved.
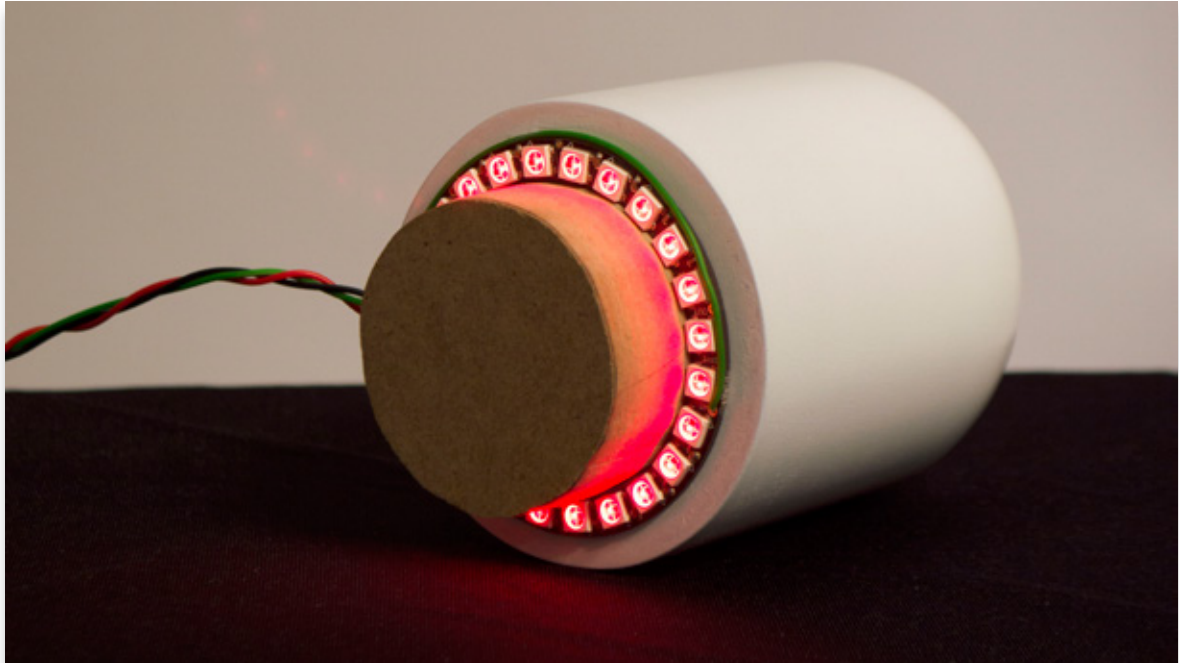
Evaluation & Future

The user feedback session gave us some insight in things we could use for the future of our product. Users were positive about the idea to incorporate sound to motivate the office workers more. There could be a favorite song of the user when you are walking and an annoying song when the user does not exercise. The sound could also be an extra reminder to go for a walk, because when working hard, one could overlook the light from the 'Step-Boss' and therefore not exercise.

Another future addition would be a rewarding system. This does not need to be with expensive rewards, but based on user feedback, it can also be some-thing small, for example, the songs mentioned above. We discussed with the user group how often the rewards could be, and we came to the conclusion that once a week would be suitable for continious motivation. The frequency of the rewards could also be influenced by the game itself. If users perform well in the game, they can receive rewards more frequently.

During the final demo day we received feedback that it could be possible to make a central device in the office and have a phone app to connect to this de-vice, and transfer the steps measured by the users' cell phone. This way, more people can walk together and still have all of their steps counted. Another nice part about having an app is that you do not need to bring the whole device with you during your walk, you just connect your phone when you want to go.

The things we would like to focus on are all related to the gamification of the user experience. The sound would be an extra motivation and also the app would be an extra motivation, because you can walk together and more often and still counting all of the steps.