



# Alarm Clock Design

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# Chapter I

# Introduction

Context  
Client  
Problem statement  
Design challenge  
Target group

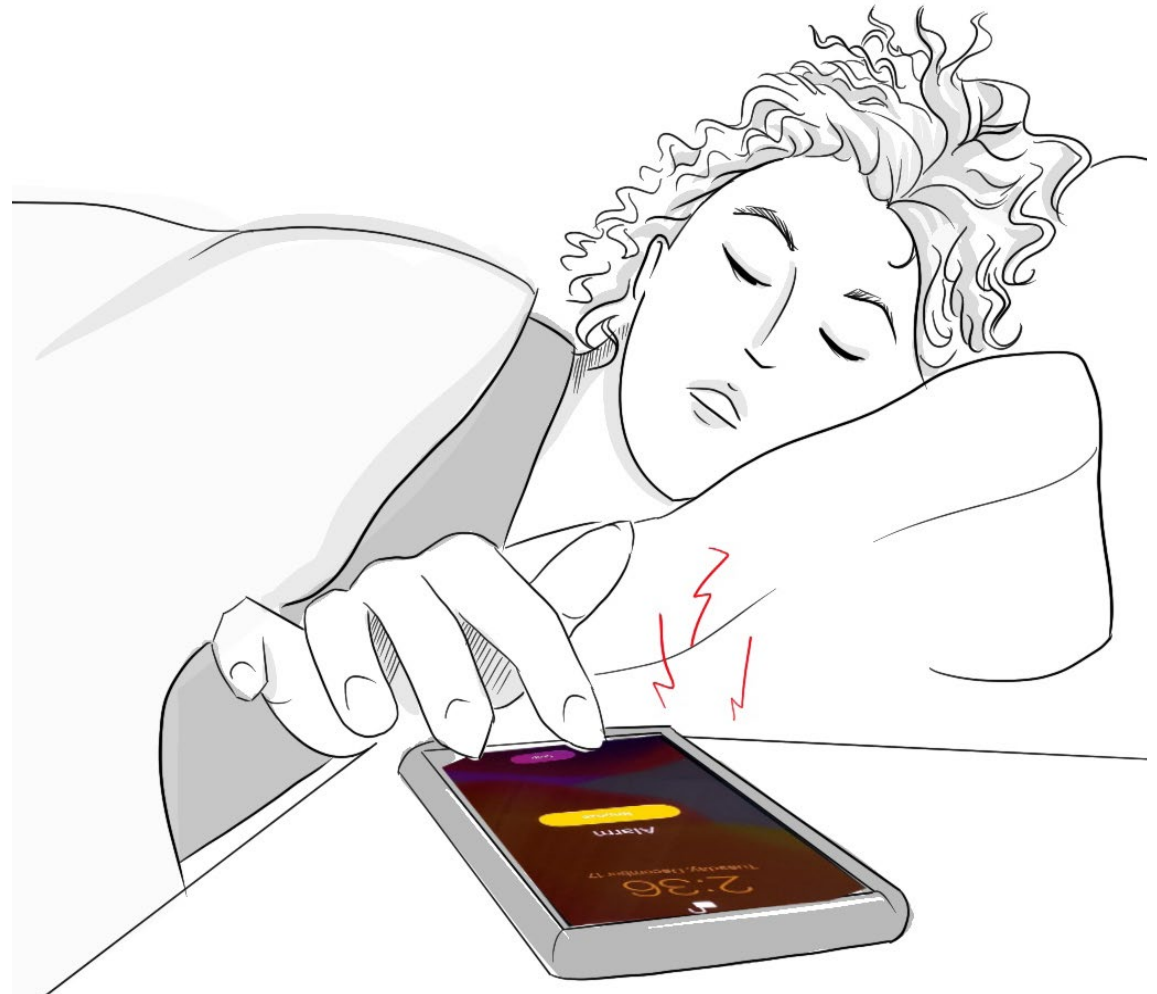
# Context

Today many people use their phones as an alarm clock. This creates a habit of going on your phone upon waking, which can be distracting and stress inducing. There is a need for a desirable, yet affordable alarm clock, which would ensure a pleasant start of the day for people. The alarm clock should be calming and effective, while also fitting into the bedroom environment.

# Client

NeXtime is a Dutch brand specialising in clocks. It's a family-owned company with 50 years of experience in designing and manufacturing clocks. They produce and sell more than 500,000 clocks every year together with their Hong Kong office and partners. Every year around 40 new models are introduced.

For the 2022 collection, the company has an ambition to introduce a new alarm clock, which has to be both innovative and desirable for the customers. Currently the company has to deal with a common expectation from its customers that alarm clocks have to be cheap, which is difficult to achieve as most alarm clocks are complex in terms of manufacturing and require more resources than a normal wall mount clock.



NE X TIME



# Problem statement

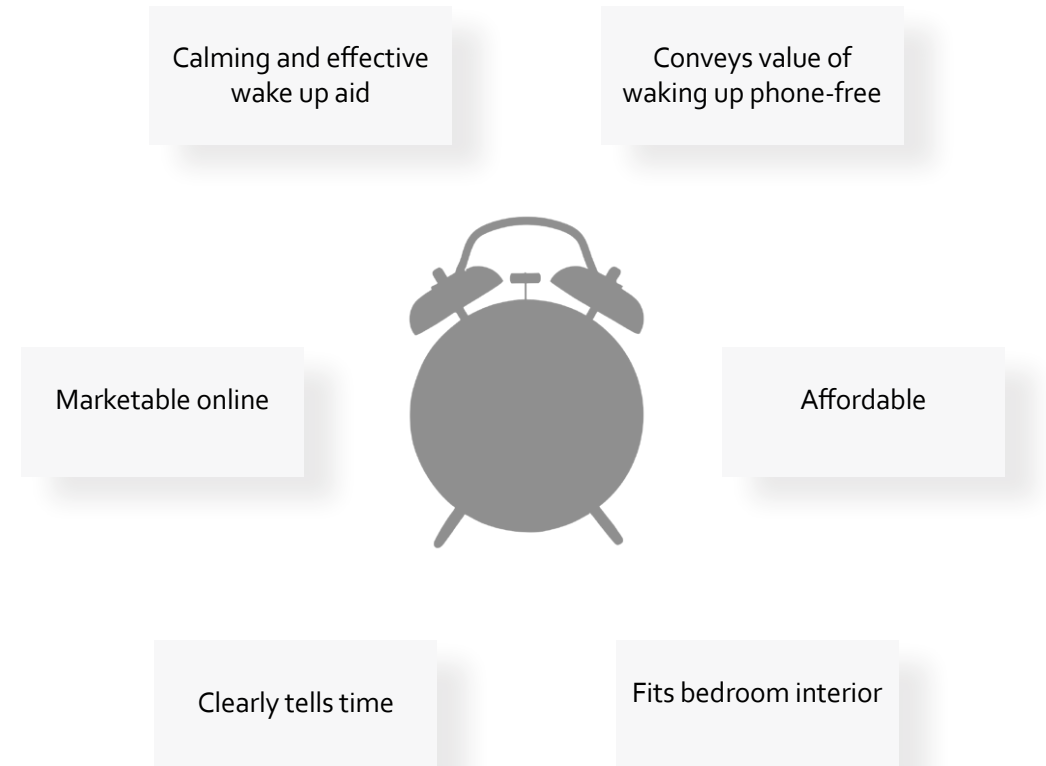
Societal pressures force people to wake up at certain times, therefore self awakening is not an option for the most. Phones are often used as an alarm clock, but their destructing nature can often lead to less effective awakening, since time is wasted away scrolling through social media and checking news. There is a need for a waking aid, which assists calm and effective awakening, while also being a desirable home decor piece.

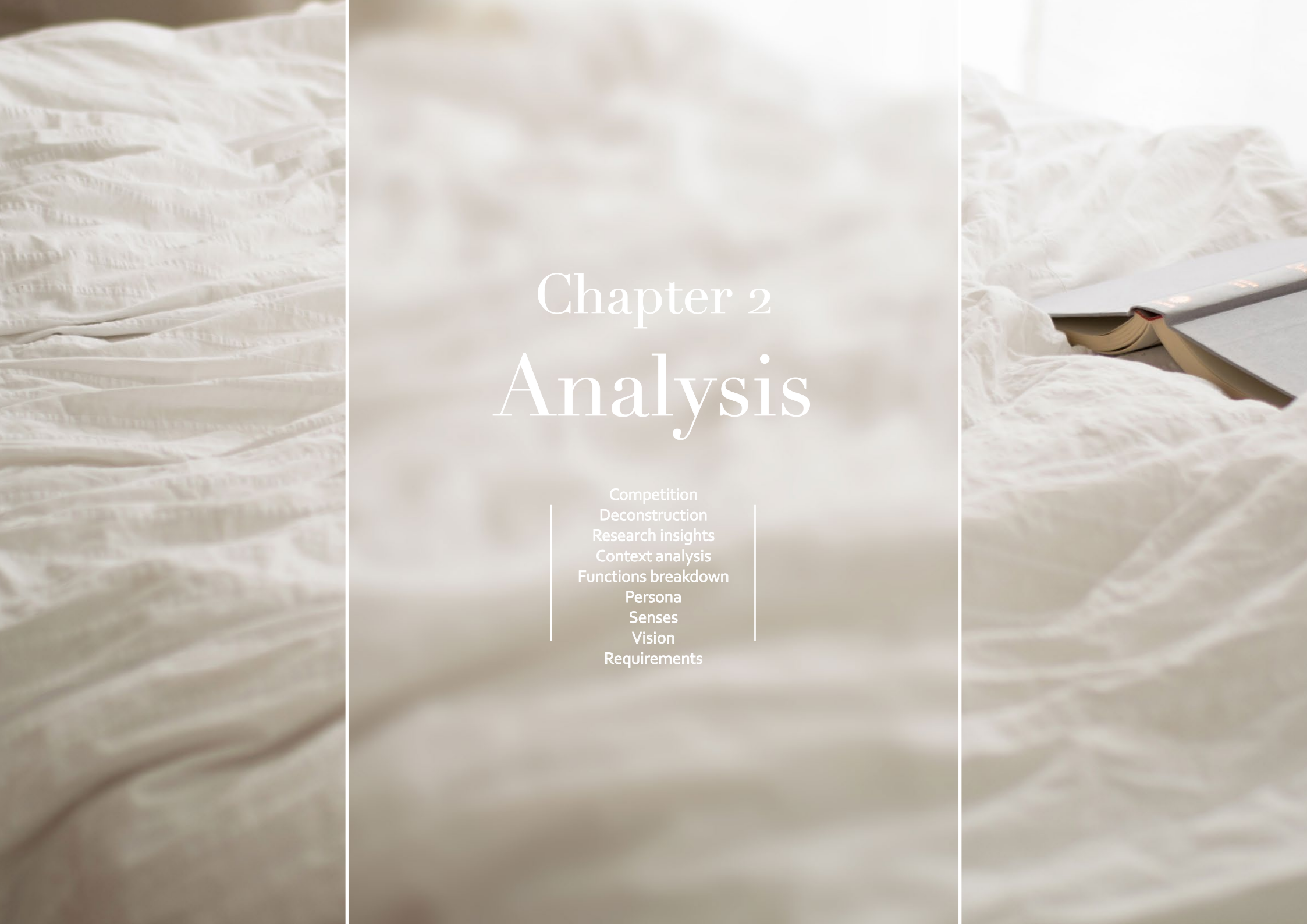
## Design challenge

The challenge of this project is to redefine user perception about alarm clocks. Currently there is a lot of stigma against using separate alarm clocks, since traditionally those were difficult to set up, loud and unpleasant to wake up to.

## Target group

People who experience phone addiction and go on their phones first thing in the morning, night owls and people who struggle to wake up/ fall asleep.





# Chapter 2

# Analysis

- Competition
- Deconstruction
- Research insights
- Context analysis
- Functions breakdown
- Persona
- Senses
- Vision
- Requirements

# Competition analysis

Most people today use their phone as a waking aid. According to the questionnaire done as part of the research, 93% of the respondents use their phone as an alarm clock. 14% of the respondents state that they are not willing to make a switch to a separate alarm clock, since they do not see any value in it.

Nevertheless, the alarm clock market has a variety of products that offer various features to different groups of users. The most popular alarms can be separated into smart voice assistants, light emitting calm alarms, extreme alarms for heavy sleepers, alarms for children and traditional alarm clocks. All of these provide specific value to their users, either aesthetic or functionality.

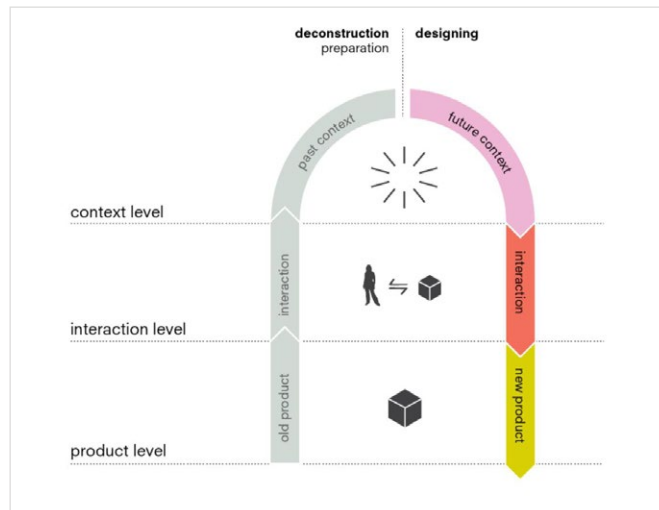
Once plotted on an innovation/price axis it is clear that highly innovative products are always priced highly, while traditional alarms are cheap. It is difficult to find a compromise between those characteristics, where innovation becomes affordable. Product testing showed that most of the alarm clocks currently offered on the market are difficult to set up and not necessarily trustworthy. Most of the time they end up being a mere night stand clock, instead of an alarm.



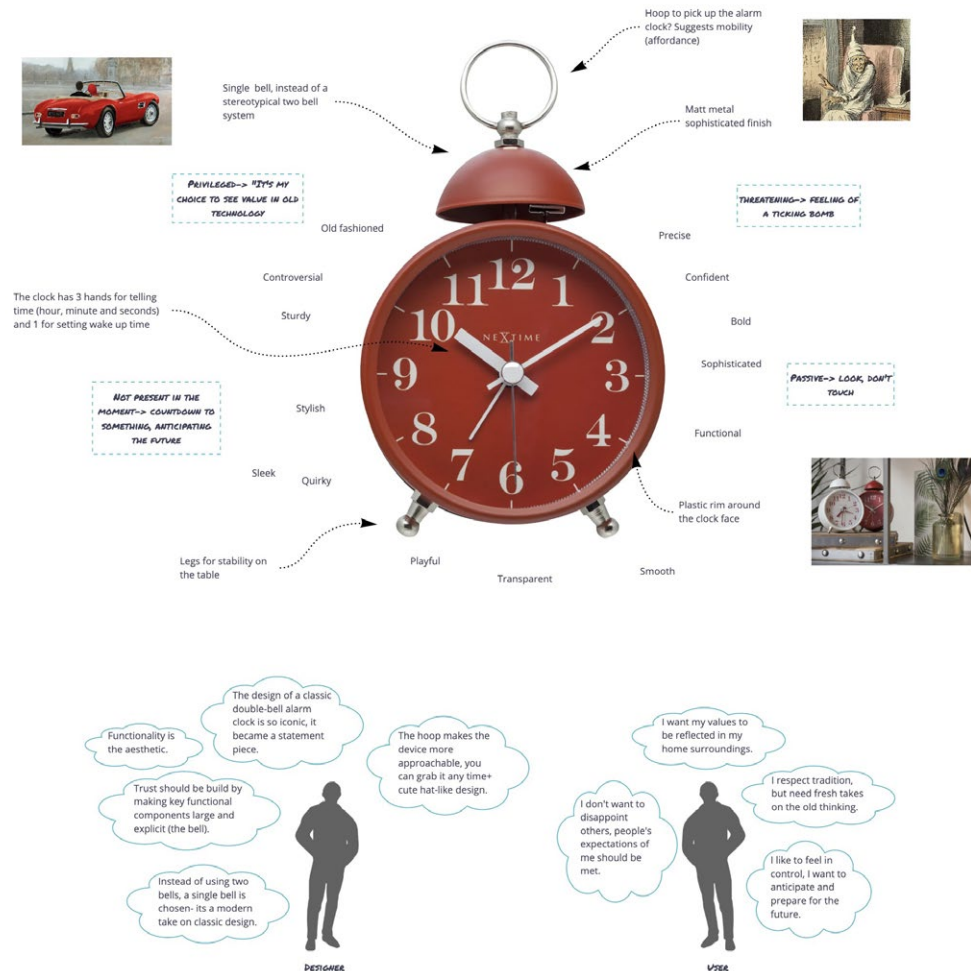
# Deconstruction

Alarm clock is a staple product, which has many common features and basic interactions. Therefore, in order to innovate within that product category, different design directions need to be deconstructed.

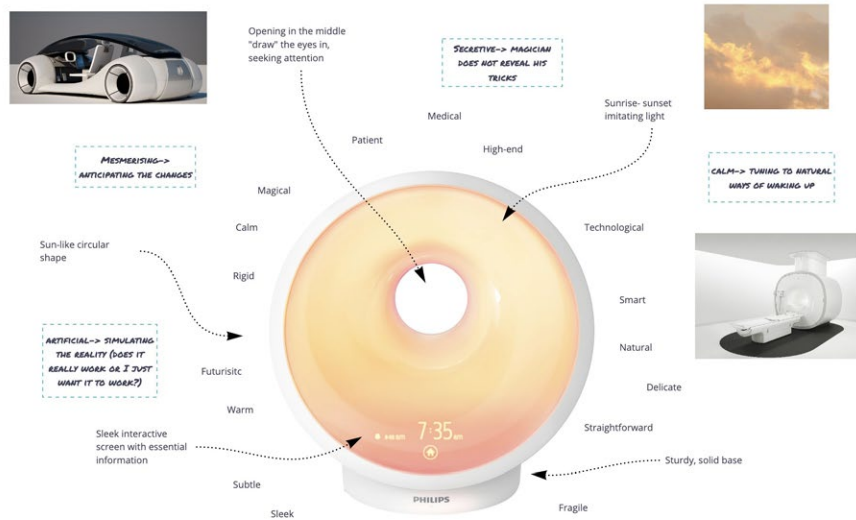
This method is retracted from the Vision in Product Design book by P. Hekkert and M. van Dijk. The goal of this method is to answer the question of why certain design decisions were made. First, the product is described in its basic terms, the kind of interaction it encourages and then finally the kind of thinking the designer instilled in the form and the way the user might perceive it.



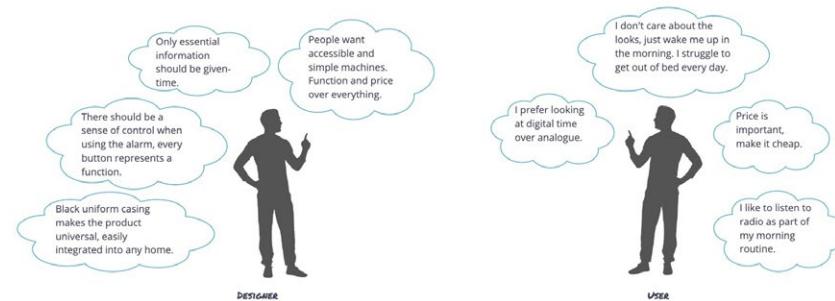
## 1. Single bell loud alarm clock



## 2. Philips Somneo



## 3. iCes radio alarm clock



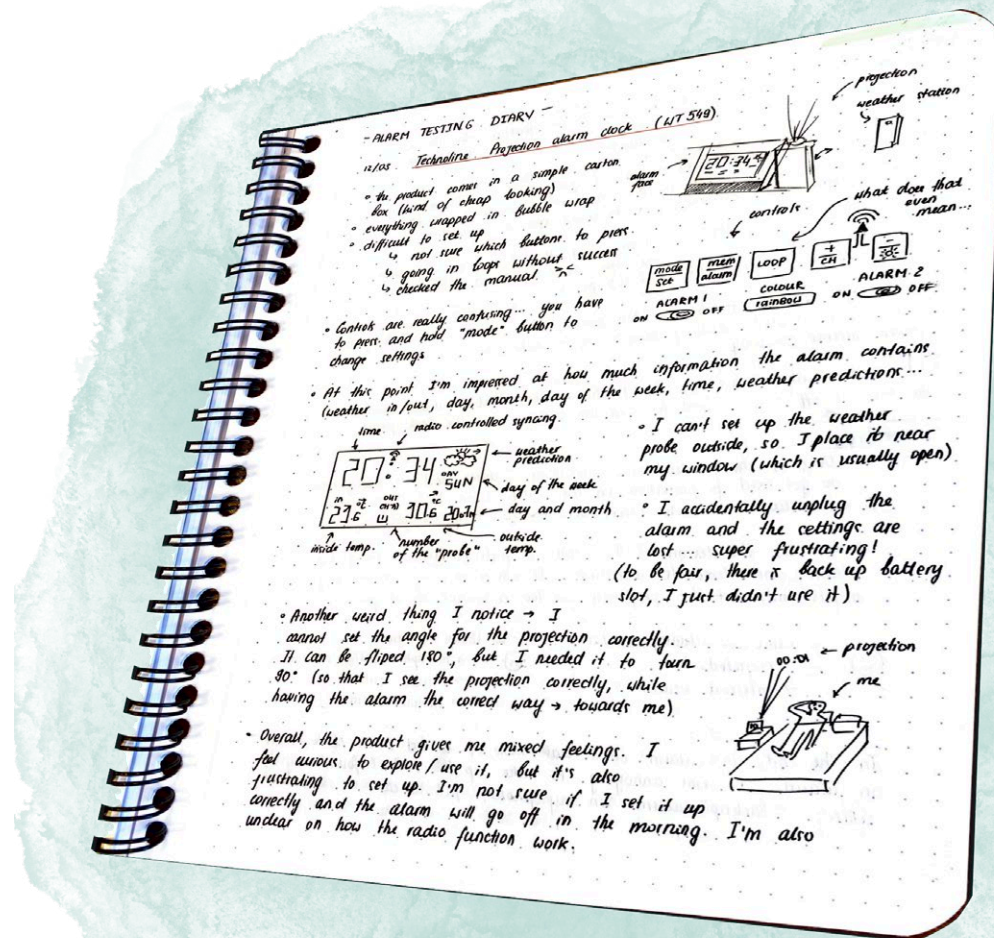


# Research insights

An in-depth research was undertaken to understand the design for pleasant awakening- with a key question being "What factors contribute to a productive and pleasant start of the day?". Literature review as well as a number of human centred primary research methods were used to identify and evaluate those factors.

The purpose of this research was to gain insight into the potential direction of alarm clock design. The key insight learned which differed from the initial assumption is the fact that sleep pattern tendencies are genetic and cannot be changed through discipline.

The alarm clock should offer a calm, and intuitive user experience, which can be personalised. The form of the alarm should be appealing and create a sense of serenity, while being a nice addition to any home interior.

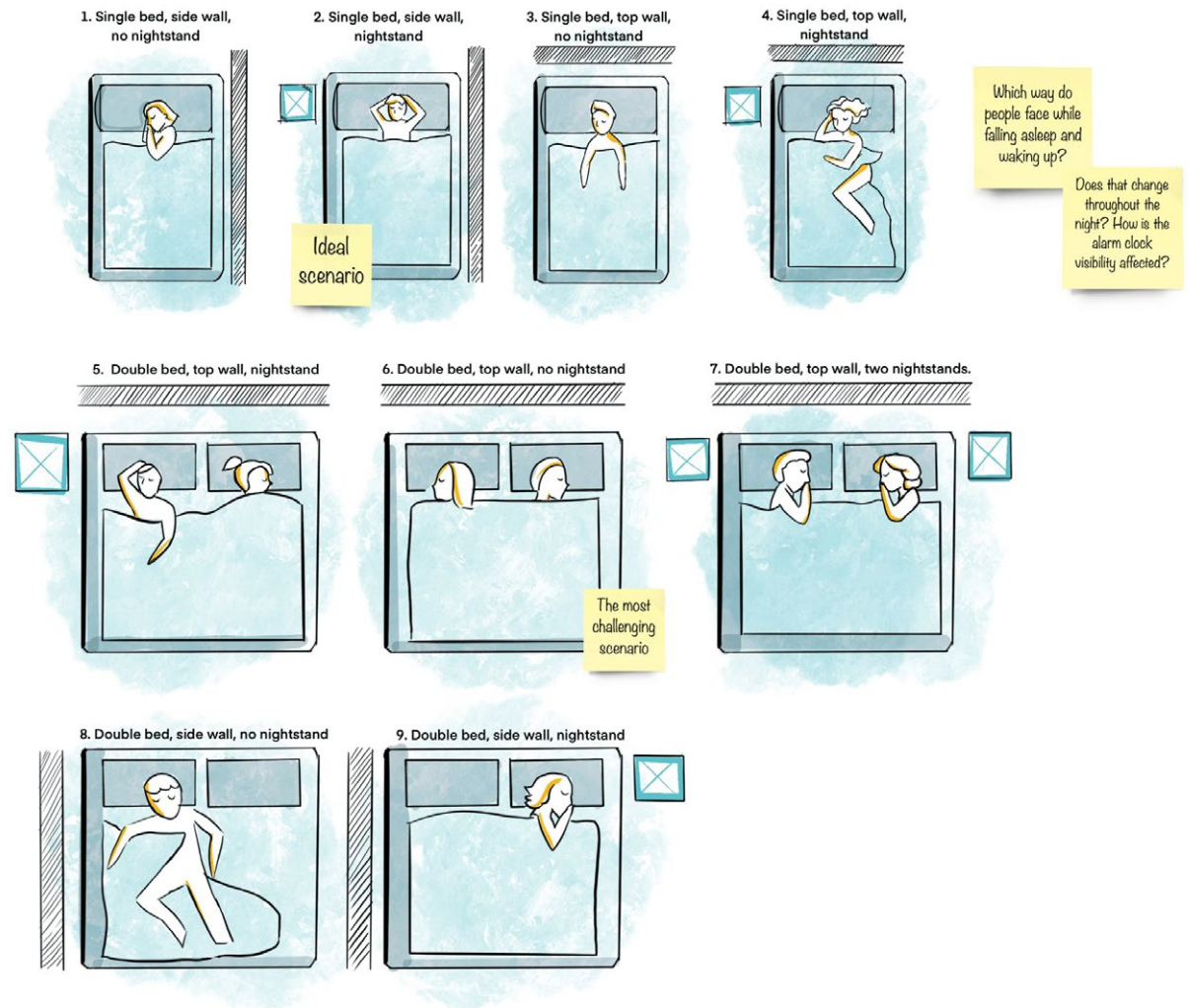


# Context analysis

Primary research showed that people have very different set ups in their bedroom. Normally the alarm clocks are placed on the night stand, however there is also many ways that the night stands can be arranged. This is especially relevant for people who sleep with their partner (according to research, 61% of Americans share their bed with a significant other). Potential set up were sketched out, which led to some additional design considerations:

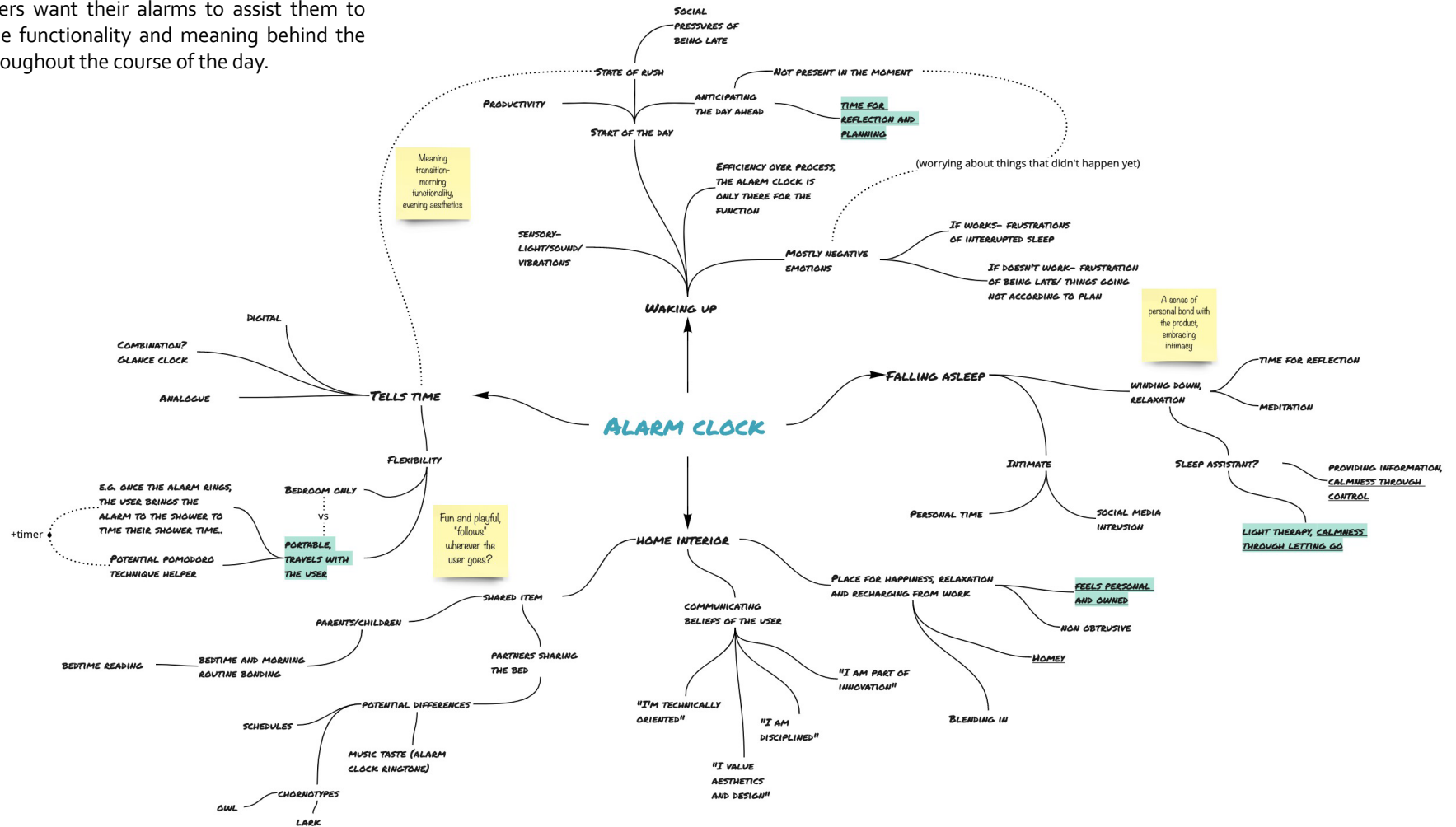
1. Visual stimuli- how close should the user be to the alarm clock for comfortable use?
2. Is effectiveness of the alarm clock compromised when the user changes their position?
3. Can the alarm clock be used by couples with different time schedules?
4. Night stand space efficiency- can the alarm clock perform more than one function?
5. Is the alarm clock stationary? Does it only belong in the bedroom?

Those considerations do not define functionality of the product, but are potential exploration areas for the upcoming ideation stage.



# Functions breakdown

Primary research defined the kind of functionality expectations that the users have for the alarm clocks. Key functions are waking up, telling time and being a home interior piece. Along with that, some users want their alarms to assist them to sleep. Therefore, the functionality and meaning behind the product changes throughout the course of the day.



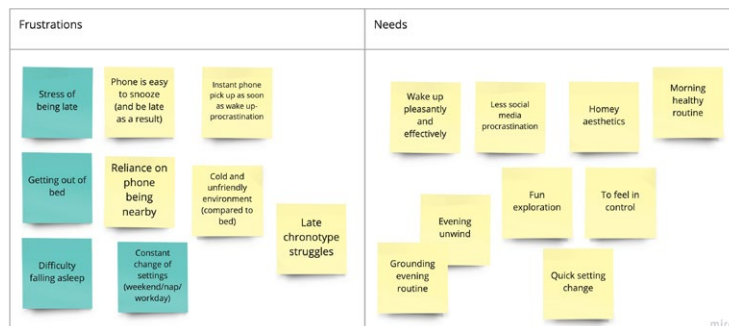


# Persona

In order to define the vision for the product, an ideal persona was developed. Nia Lars is a collective archetype of young professionals in their mid 20s, characteristics of which were partially defined during primary research.

For the product to be successful, it needs to fit the needs and wishes of Nia. To build up her character, different aspects of her life were considered. This included her preferred aesthetic, what her typical day looks like, her favourite and least favourite activities, as well as frustrations. Although she is purely fictional, she represents a large group of people who currently use phones as an alarm and struggle with chronic undersleep due to social pressures and social media addiction.

During the ideation stage, the ideas were filtered out partially based on their fit with Nia's persona.



## NIA LARS

Age 26  
Origin German, but moved to Amsterdam, Netherlands 10 years ago  
Occupation Social media marketing specialist  
Relationship status Single

Nia is a young professional working at a trendy marketing agency in Amsterdam. She lives with her roommate in a small apartment near the city center. Her office has flexible work hours, but since her colleagues come in at 9am, she tries to wake up earlier too. No matter how hard she tries to go to sleep earlier, she still goes to sleep past midnight and wakes up tired and disoriented. Before she feels awake she needs to drink a lot of coffee.

Hobbies: Art, Literature, Running  
Favourite activities: Cooking with friends, Reading in bed, Biking around

Frustrations: Hates to wake up early, she does most of the work after 12pm. She is addicted to social media and hates that she wastes so much time on her phone. Her jobs gives her many projects and she often feels stressed and overwhelmed.

Lifestyle: Values her personal space and surroundings, A bit disorganised, Follows many lifestyle bloggers, Reflective and self critical, Private

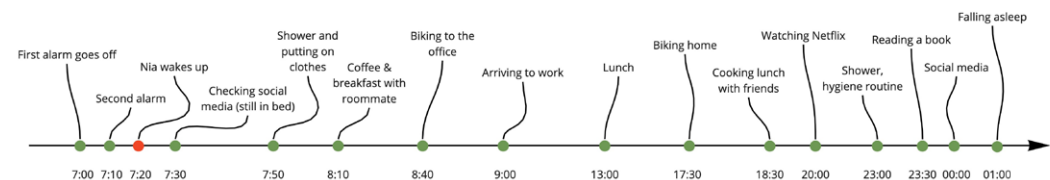


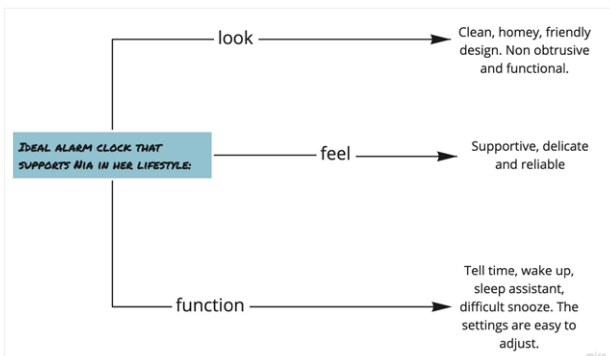
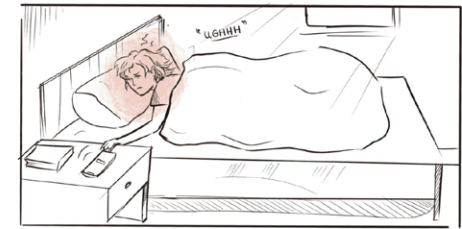
Responsible  
Creative  
Friendly

Wants to improve her routine

Bad habits- excessive coffee, social media

Owl, with a constant social jetlag





For Nia an alarm clock should assist her in waking up and falling asleep while also being a nice home decor piece. It should be friendly, explorative and fun to use.



# Senses

After defining how the product should “feel”, different senses were explored on how they can be engaged during product interaction. Basic five senses (smell, touch, taste, hearing and vision) were broken down into more subtle sensations.

Key relevant senses in product interaction are touch and vision. In terms of touch two key aspects need to be considered-temperature and texture. Texture can be welcoming or hostile for the touch and there is an association of “softness” for indoors and “harshness” for outdoors. Temperature is also important, since coolness of materials (metal, glass) can be considered less welcoming than warmer materials such as textiles. At the same time, “cooler” materials feel more premium.

In terms of vision, lightness and darkness are key. Slight difference in shades of light can make the product feel friendly or unfriendly. It is also a classic “Zeitgeber”- a way of telling time for our biological clock, since we can detect the difference in light during sunrise and sunset.

The most powerful sense of all is that of neural pathways-memories. A combination of multiple sensations can lead to associations, which can initiate powerful feelings such as nostalgia, deja vu or dreams. All of these can make product memorable and special.

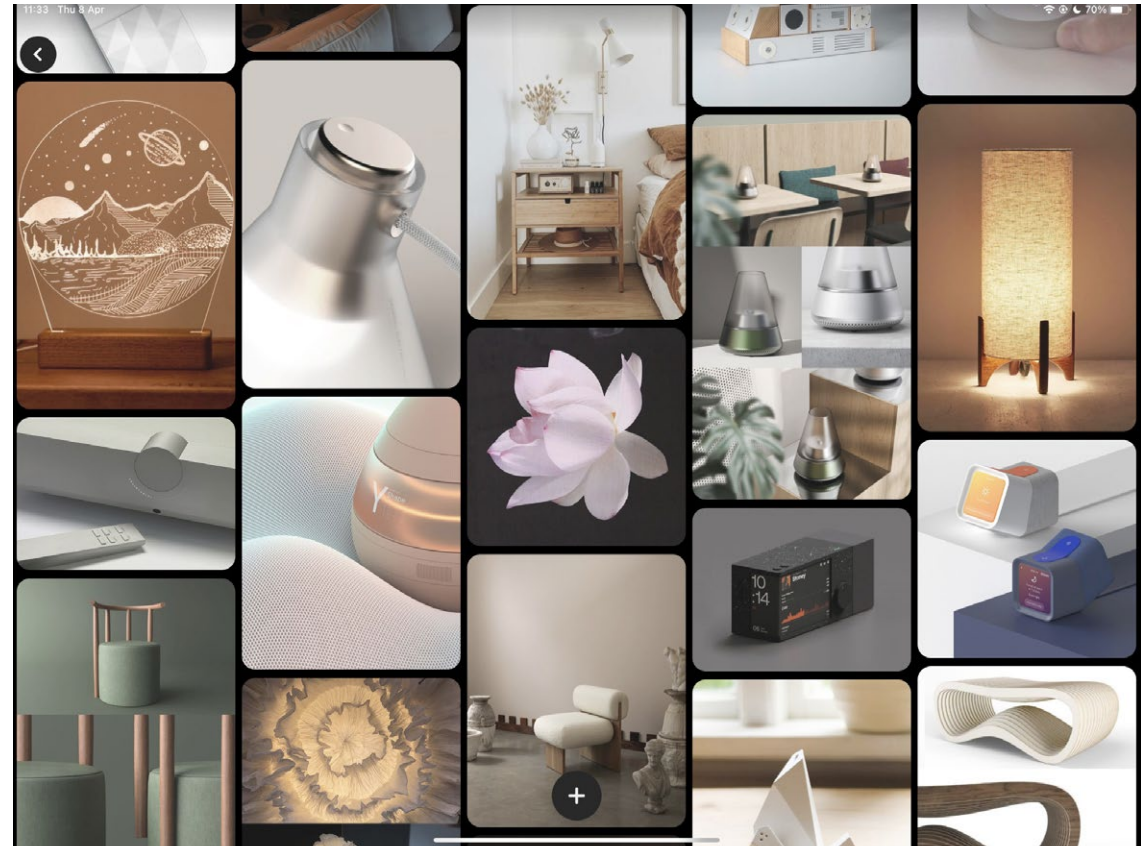


# Vision

To define the vision for the product the aesthetics research was summed up into key characteristics that are desirable for the product. Those five characteristics are “Hygge”, delicate support, playful, timeless and nostalgic. The collage also indicates the kind of feel the product should have.

Functionality-wise, the product should take out the “alarm” part out of the alarm clock and instead become a sleep assistant. It should facilitate the process of falling asleep and waking up, in a peaceful manner. It should seamlessly integrate into the home setting and become a desirable part of the bedroom, creating a sense of home and intimacy.

*Vision: To design an alarm clock, which would stimulate a sense of peace in users by assisting them in both night-time and morning routine. It has a timeless feel, with soft curves and tactile materials, making the users feel at home and safe.*



## Hygge

(mood of coziness and comfortable conviviality with feelings of wellness and contentment.)

## Delicate support

Creates a sense of trust, friend telling you "let me deal with that"

## Playful, adaptive

Feels fun and personal, fluctuating its purpose throughout the day

## Timeless







Stays relevant, cannot be traced down to one single movement of trend

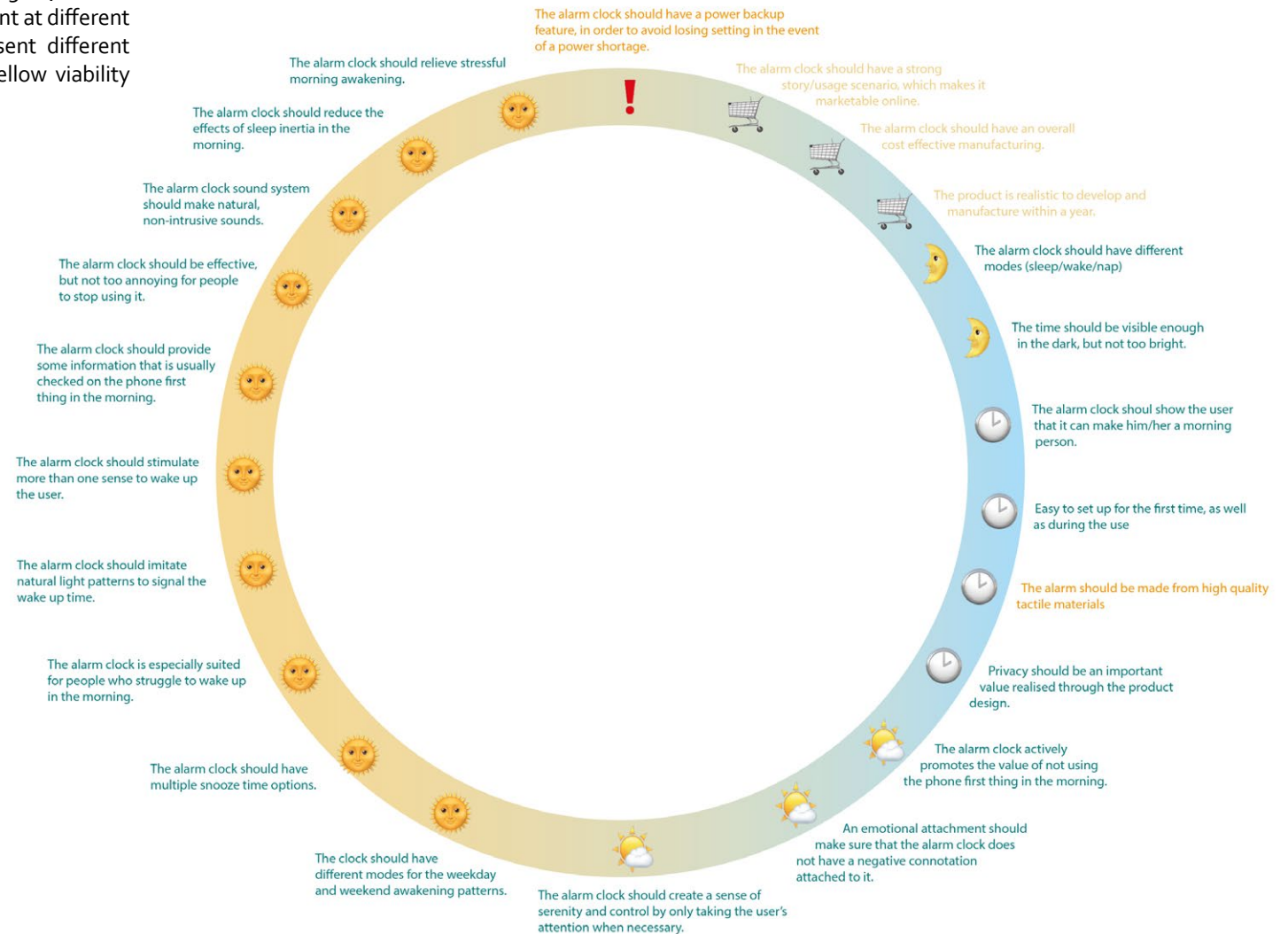
## Nostalgic

Reminder of something that cannot be described, "on the tongue"

# Requirements

The requirements were built upon research insights, as well as vision. Different requirements become relevant at different times of customer journey. The colour represent different values that are relevant- blue is desirability, yellow viability and orange feasibility.

-  Awakening
-  Falling asleep
-  During the day
-  All the time
-  In case of power shortage
-  Buying





# Chapter 3

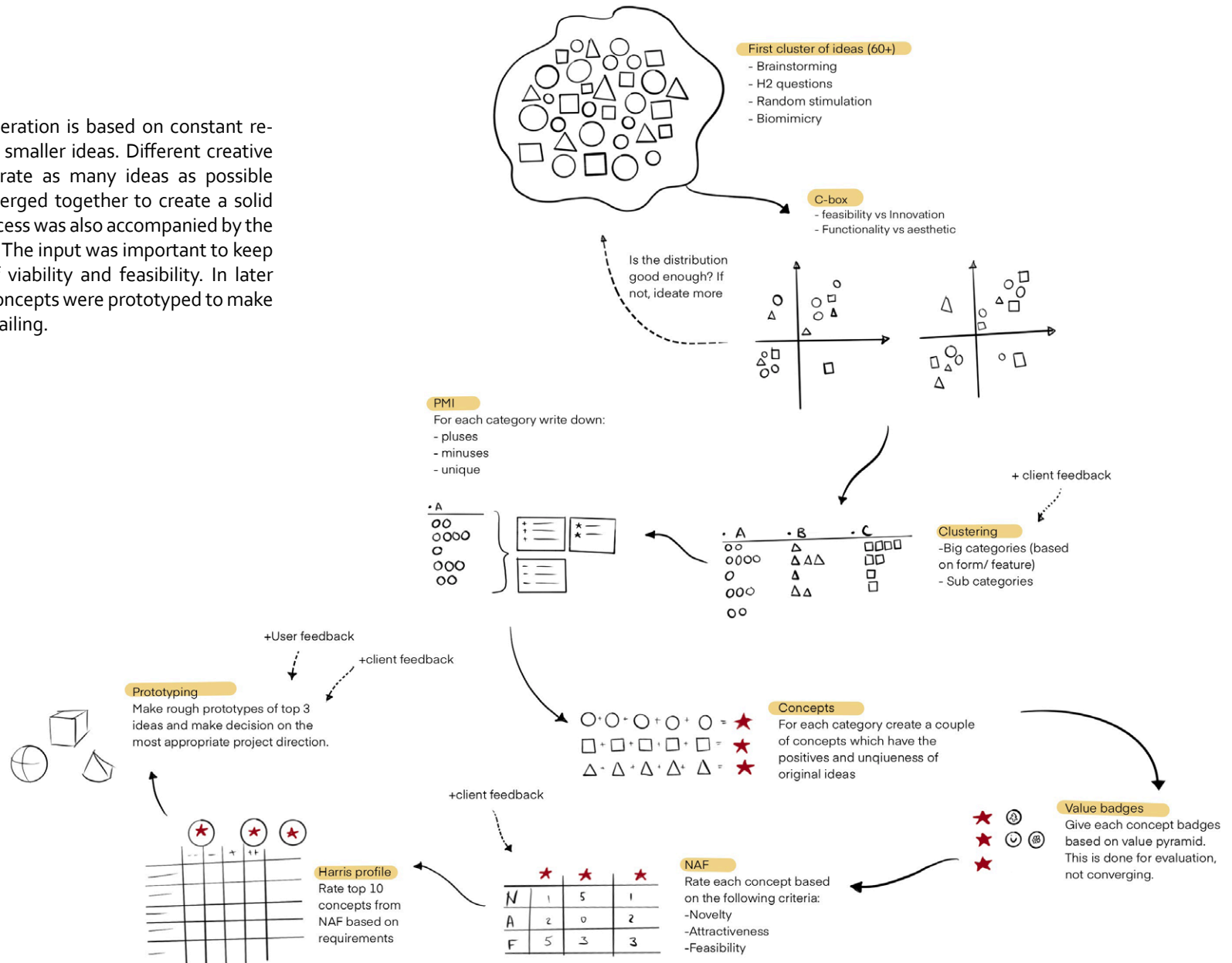
# Ideation

Process  
Ideation  
C-boxes  
Clustering  
PMI  
Concepts development  
Value analysis  
Converging  
Simulation  
Final direction



# Process

The process of concept generation is based on constant re-evaluation and morphing of smaller ideas. Different creative methods are used to generate as many ideas as possible and then those ideas are merged together to create a solid concept. Every selection process was also accompanied by the client and their expert input. The input was important to keep ideas grounded in terms of viability and feasibility. In later stages of the process top 3 concepts were prototyped to make the final choice and start detailing.





# Ideation



# C-boxes

Two C-boxes were made to see if the ideas generated are well distributed on basic criteria of feasibility, innovation, aesthetic and functionality. The following questions were kept in mind:

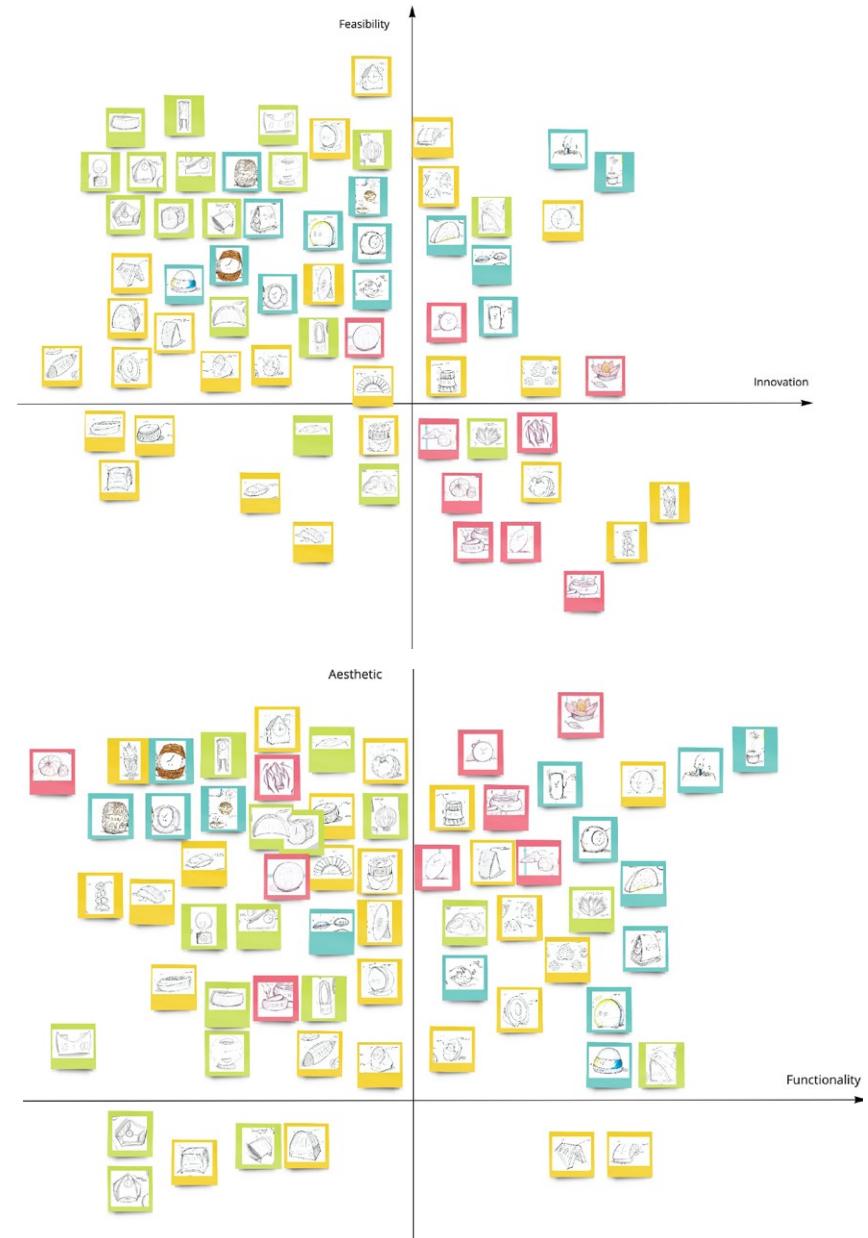
*Feasibility*- how manufacturable is the product? Does it satisfy core needs? Is it reliable?

*Innovation*- is there a lot of competition in that product domain? Is it creative? Fun?

*Functionality*- does the product introduce useful features to the user? Are they innovative?

*Aesthetic*- how well does the alarm clock fit into home environment? Is it attractive?

Different colours of sticky notes represent different methods used for ideation. Yellow notes are for ideas generated during random stimulation, green are brainstorming, pink are biomimicry and blue are from H2 questions. Most of the ideas generated by one method are close together, which means that the level of creativity or functionality is determined by the method used to come up with a particular idea. Therefore, a couple additional rounds of ideation were necessary to fill up the gaps.

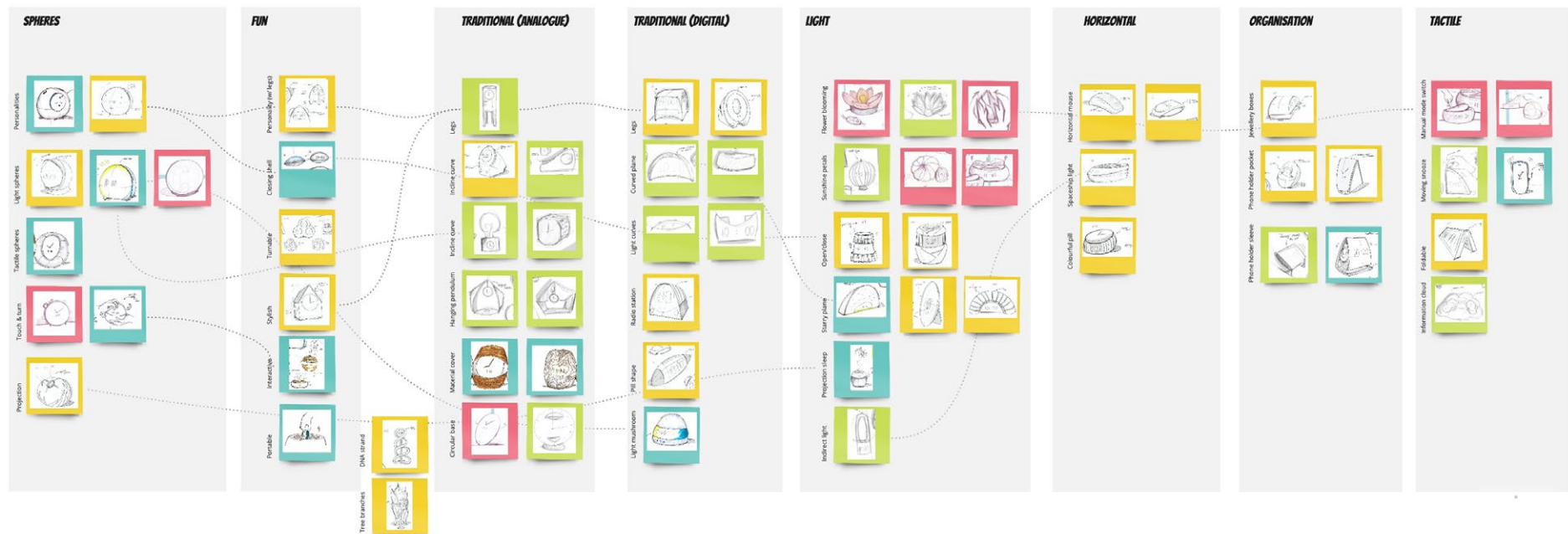


# Clustering

Clustering was used to organise 80+ ideas which were generated during ideation. Some ideas were more developed than others, or some were duplicates. 7 key groups were identified- spheres, fun, traditional, light, horizontal, organisation and tactile. Those groups also had some sub groups within them and connections across the ideas. Along with that, the client identified 5 groups which could be potentially interesting. "Personality" and "projection" ideas became separate categories.

Potentially interesting clusters (feedback from the client):

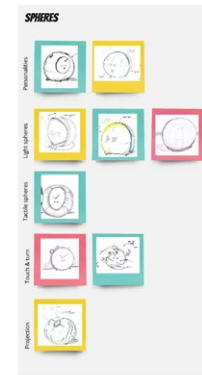
- Light
- Projection
- Phone holder/ night stand organisation
- Personality clocks
- Analogue/ digital combination



# PMI

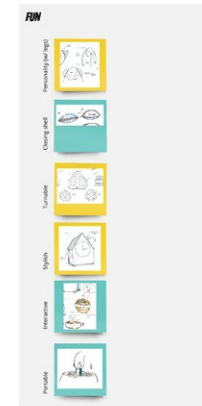
After clustering the ideas, some clear favourites emerged. In order to avoid being biased each sub category was evaluated in terms of Pluses (P), Minuses (M) and Interesting (I). Those evaluations showed positive aspects of every idea, while also showing clear downsides of the initial "favourites". Each category also underwent an overall summary evaluation.

Based on the overall category descriptions, "goodie" concepts were sketched. Every concept which was sketched aimed to avoid the minuses of its group, while empathising the positives. Some ideas were merged together, while others were abounded due to the fact that the minuses outweighed the pluses. As a result, 20 concepts which had equal potential were developed.



Plus (Advantage)	Minus (Limitation)	Interesting (Unique)
<ul style="list-style-type: none"> <li>Friendly, approachable shape</li> <li>Can work well on multiple user groups (adults+ children)</li> <li>Adjustable feature set</li> </ul>	<ul style="list-style-type: none"> <li>Difficult to manufacture</li> <li>More expensive</li> <li>Reliance on phone app</li> <li>Similar competition</li> </ul>	<ul style="list-style-type: none"> <li>Great for marketing</li> <li>Faces can be personalised</li> </ul>
<ul style="list-style-type: none"> <li>Light to wake up (Zeigebier)</li> <li>Easy addition to the nightstand</li> </ul>	<ul style="list-style-type: none"> <li>Difficult to manufacture</li> <li>Similar competition</li> </ul>	<ul style="list-style-type: none"> <li>Allegory to Sun/Moon</li> </ul>
<ul style="list-style-type: none"> <li>Aesthetic experience</li> </ul>	<ul style="list-style-type: none"> <li>Not innovative</li> <li>More like a nightstand clock, not an alarm</li> </ul>	<ul style="list-style-type: none"> <li>Soft rim material (pillow-like)</li> </ul>
<ul style="list-style-type: none"> <li>Tactile experience</li> <li>Visible mode adjustment</li> </ul>	<ul style="list-style-type: none"> <li>Higher chance of breakage</li> <li>Non adjustable functionality</li> </ul>	<ul style="list-style-type: none"> <li>Visible mode setting (not digital)</li> </ul>
<ul style="list-style-type: none"> <li>Can check time without turning over in bed</li> <li>Fun and adjustable</li> </ul>	<ul style="list-style-type: none"> <li>Can get loud</li> <li>Limited brightness (not visible in the morning)</li> </ul>	<ul style="list-style-type: none"> <li>User doesn't need to change their position to check time</li> <li>Compact</li> </ul>

+Friendly & approachable  
+Customisable  
+Tactile  
+Visible modes



Plus (Advantage)	Minus (Limitation)	Interesting (Unique)
<ul style="list-style-type: none"> <li>Reminiscent of original double bell alarm (clear function)</li> <li>Has personality, fun</li> </ul>	<ul style="list-style-type: none"> <li>Limited features</li> <li>Might not fit all of the interiors</li> </ul>	<ul style="list-style-type: none"> <li>Legs and bells are very prominent</li> </ul>
<ul style="list-style-type: none"> <li>Clear display on when to go to sleep</li> <li>Shell/eye allegory</li> <li>Cute shape, fits different interiors</li> </ul>	<ul style="list-style-type: none"> <li>Cannot show time once the shell is closed</li> <li>Opening mechanism can be easily broken</li> </ul>	<ul style="list-style-type: none"> <li>Visual representation of when to go to sleep</li> </ul>
<ul style="list-style-type: none"> <li>Interactive way of changing modes (night/day/nap)</li> </ul>	<ul style="list-style-type: none"> <li>Having 3 separate screens increases the cost drastically</li> <li>Needs to rely on batteries</li> </ul>	<ul style="list-style-type: none"> <li>Non stationary and fun to use</li> </ul>
<ul style="list-style-type: none"> <li>Cute shape, which can be appealing on the nightstand</li> </ul>	<ul style="list-style-type: none"> <li>Limited in functionality</li> <li>Old fashioned</li> <li>Many people prefer digital clocks over analogue</li> </ul>	<ul style="list-style-type: none"> <li>The flag on top of the house shows if the alarm is set</li> </ul>
<ul style="list-style-type: none"> <li>Interactive</li> <li>Effective for heavy sleepers</li> </ul>	<ul style="list-style-type: none"> <li>Doesn't fit persona well</li> <li>Functionality is limited to the awakening process</li> </ul>	<ul style="list-style-type: none"> <li>Vents out negative emotions at the point of awakening</li> </ul>
<ul style="list-style-type: none"> <li>Not only limited to the bedroom</li> <li>Can be used for studying (e.g. pomodoro timer)</li> </ul>	<ul style="list-style-type: none"> <li>Needs to rely on batteries</li> <li>Might not fit everyone's lifestyle</li> </ul>	<ul style="list-style-type: none"> <li>Portable</li> <li>Versatile, can have many functions if paired with phone</li> </ul>

+Non stationary  
+Versatile  
+Visual & tactile mode changes



Plus (Advantage)	Minus (Limitation)	Interesting (Unique)
<ul style="list-style-type: none"> <li>Tall (good for people with lower nightstands)</li> <li>Bold statement piece</li> </ul>	<ul style="list-style-type: none"> <li>Takes up a lot of space on the nightstand</li> <li>Can be accidentally knocked down</li> </ul>	<ul style="list-style-type: none"> <li>Tower clock design</li> </ul>
<ul style="list-style-type: none"> <li>Smooth, leaning towards the user</li> <li>Controls are easy to reach</li> </ul>	<ul style="list-style-type: none"> <li>Bulky shape, takes up space</li> <li>Small screen, big body (unbalanced)</li> </ul>	<ul style="list-style-type: none"> <li>Curves make the design more contemporary and approachable</li> </ul>
<ul style="list-style-type: none"> <li>Very simple shapes</li> <li>Recognisable as an alarm clock</li> </ul>	<ul style="list-style-type: none"> <li>Similar competition</li> <li>Lack of speciality</li> </ul>	<ul style="list-style-type: none"> <li>Clear representation of function (alarm clock/telling time)</li> </ul>
<ul style="list-style-type: none"> <li>Non traditional design</li> <li>"Singularity" feel, not mass produced</li> </ul>	<ul style="list-style-type: none"> <li>Main function- telling time</li> <li>More fitting to older generations</li> </ul>	<ul style="list-style-type: none"> <li>Hanging clock piece</li> </ul>
<ul style="list-style-type: none"> <li>Material cover which blends the product with the rest of the interior</li> </ul>	<ul style="list-style-type: none"> <li>Limited in functionality</li> <li>Materials can be worn down/ damaged over time</li> </ul>	<ul style="list-style-type: none"> <li>Tactile materials are friendlier than exposed plastic</li> </ul>
<ul style="list-style-type: none"> <li>Traditionalism mixed with new features (spinning)</li> <li>"Wow factor"- non static</li> </ul>	<ul style="list-style-type: none"> <li>Spinning can limit clock visibility</li> <li>Can be easily broken if not handled gently</li> </ul>	<ul style="list-style-type: none"> <li>Non static, constantly in flux</li> </ul>

+Curves  
+Clear that it's an alarm clock  
+Non static, constantly in flux



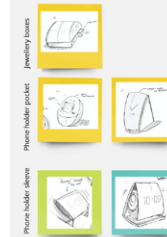
## TRADITIONAL (DIGITAL)



Plus (Advantage)	Minus (Limitation)	Interesting (Unique)
<ul style="list-style-type: none"> <li>Legs make the design appear lighter than it really is</li> </ul>	<ul style="list-style-type: none"> <li>Can get dusty</li> <li>Less stable</li> </ul>	<ul style="list-style-type: none"> <li>Legs give the form more personality</li> </ul>
<ul style="list-style-type: none"> <li>Digital time becomes the key information</li> </ul>	<ul style="list-style-type: none"> <li>A lot of competition</li> <li>Outdated form</li> </ul>	<ul style="list-style-type: none"> <li>Controls are easily accessible and do not compromise stability of the clock</li> </ul>
<ul style="list-style-type: none"> <li>Key controls (e.g. snooze) is easily accessible</li> <li>Elegant forms (the left one)</li> </ul>	<ul style="list-style-type: none"> <li>Pointy parts can be dangerous</li> <li>Easy snooze</li> </ul>	<ul style="list-style-type: none"> <li>Curves make the shape appear lighter</li> <li>Eye catching form</li> </ul>
<ul style="list-style-type: none"> <li>Dials are satisfying to operate (if calibrated well)</li> <li>Traditional radio design</li> </ul>	<ul style="list-style-type: none"> <li>Takes up a lot of space</li> <li>Combines many functions at once, can be confusing</li> </ul>	<ul style="list-style-type: none"> <li>Material combination</li> <li>Dials</li> </ul>
<ul style="list-style-type: none"> <li>Looks like a bluetooth speaker, can be loud</li> <li>Controls are visible and easy to reach</li> </ul>	<ul style="list-style-type: none"> <li>Non-alarm clock</li> <li>Derivatory form, not original</li> </ul>	<ul style="list-style-type: none"> <li>Large speakers on the side can create better sound</li> </ul>
<ul style="list-style-type: none"> <li>Light is directed</li> <li>More hidden, less invasive</li> </ul>	<ul style="list-style-type: none"> <li>Awkward shape</li> <li>Controls are more difficult to press</li> </ul>	<ul style="list-style-type: none"> <li>Light strip to identify daytime change</li> </ul>

+Legs  
+Easily accessible controls  
+Curvy, eye catching design

## ORGANISATION



Plus (Advantage)	Minus (Limitation)	Interesting (Unique)
<ul style="list-style-type: none"> <li>Organises loose items on the nightstand (in particular jewellery)</li> </ul>	<ul style="list-style-type: none"> <li>Putting small items into small drawers can make them feel even more "lost", since they are not in the direct eyesight</li> </ul>	<ul style="list-style-type: none"> <li>Nightstand organisation technique</li> </ul>
<ul style="list-style-type: none"> <li>Phone is safely stored in the pocket</li> <li>Charging station</li> </ul>	<ul style="list-style-type: none"> <li>Promotes phone use</li> <li>Old fashioned design</li> </ul>	<ul style="list-style-type: none"> <li>Everyone still wants to have their phones nearby, so this product allows this</li> </ul>
<ul style="list-style-type: none"> <li>Phone is more hidden than a pocket</li> <li>Easier to slide out without damaging the screen</li> </ul>	<ul style="list-style-type: none"> <li>Very standard design (somewhat similar competition)</li> <li>Wire connection</li> </ul>	<ul style="list-style-type: none"> <li>Declutters the nightstand</li> <li>Phone charging</li> <li>Easy slide in/ slide out</li> </ul>

+Nightstand organisation  
+Phone storage  
+Charging station

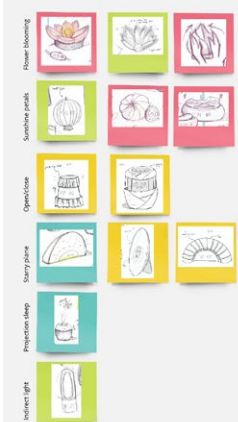
## HORIZONTAL



Plus (Advantage)	Minus (Limitation)	Interesting (Unique)
<ul style="list-style-type: none"> <li>Can be hung anywhere near the bed (no nightstand necessary)</li> <li>Flattering shape</li> </ul>	<ul style="list-style-type: none"> <li>Difficult to tell time from horizontal position</li> </ul>	<ul style="list-style-type: none"> <li>Portable and flexible, can fit into any bedroom set up</li> </ul>
<ul style="list-style-type: none"> <li>Unique shape</li> <li>Light rim can produce a lot of light</li> </ul>	<ul style="list-style-type: none"> <li>A lot of empty space</li> <li>Can take up a lot of space on the nightstand</li> </ul>	<ul style="list-style-type: none"> <li>Light rim shines upwards, not at the user directly</li> </ul>
<ul style="list-style-type: none"> <li>Small and portable</li> <li>Analogue traditional shape</li> </ul>	<ul style="list-style-type: none"> <li>Difficult to access controls</li> <li>Time is more difficult to read since the clock face is not directed at the user</li> </ul>	<ul style="list-style-type: none"> <li>Traditional time telling mixed in with original form</li> </ul>

+Portable  
+Doesn't require a nightstand  
+Tactile  
+ Non direct information display

## LIGHT



Plus (Advantage)	Minus (Limitation)	Interesting (Unique)
<ul style="list-style-type: none"> <li>Elegant design</li> <li>Clear associations (flowers blooming and closing over the day)</li> <li>Light ambience</li> </ul>	<ul style="list-style-type: none"> <li>Difficult to manufacture</li> <li>Fragile</li> <li>May not fit every interior</li> </ul>	<ul style="list-style-type: none"> <li>Clear metaphor found in nature</li> <li>Light and shape changes over the course of the day</li> </ul>
<ul style="list-style-type: none"> <li>Light peaks opening and closing</li> <li>Focus on time, not light</li> </ul>	<ul style="list-style-type: none"> <li>Difficult to manufacture</li> <li>The mechanism can be easily broken once pressure is applied</li> </ul>	<ul style="list-style-type: none"> <li>Unique shape not found on the market</li> </ul>
<ul style="list-style-type: none"> <li>Closing and opening time display for people who find it difficult to sleep with light</li> </ul>	<ul style="list-style-type: none"> <li>Two modes- light or no light can be limiting</li> </ul>	<ul style="list-style-type: none"> <li>Adjustable modes for light</li> <li>Modifiable by the user</li> </ul>
<ul style="list-style-type: none"> <li>Sunset metaphor</li> <li>Focus on light, not time</li> <li>More relaxing overall experience</li> </ul>	<ul style="list-style-type: none"> <li>Some people are not receptive to light stimulus</li> <li>Controls have to be placed at the back- less accessible</li> </ul>	<ul style="list-style-type: none"> <li>More targeted light direction (more efficient)</li> <li>Appealing experience</li> </ul>
<ul style="list-style-type: none"> <li>Compact, versatile</li> <li>Phone app connection can make it a special experience</li> </ul>	<ul style="list-style-type: none"> <li>Projection not visible in the morning</li> <li>Might get loud if too bright</li> </ul>	<ul style="list-style-type: none"> <li>Unique sleep assistant experience</li> </ul>
<ul style="list-style-type: none"> <li>Light is not shining directly in the user, can be more appealing</li> <li>Light shining on the wall can be brighter/ more prominent</li> </ul>	<ul style="list-style-type: none"> <li>Takes up a lot of space</li> <li>The style is more difficult to integrate into the bedroom environment</li> </ul>	<ul style="list-style-type: none"> <li>Indirect light shining onto the nearby wall</li> </ul>

+Nature metaphor  
+Light changes over the day  
+Sleep/Wake assistant

## TACTILE

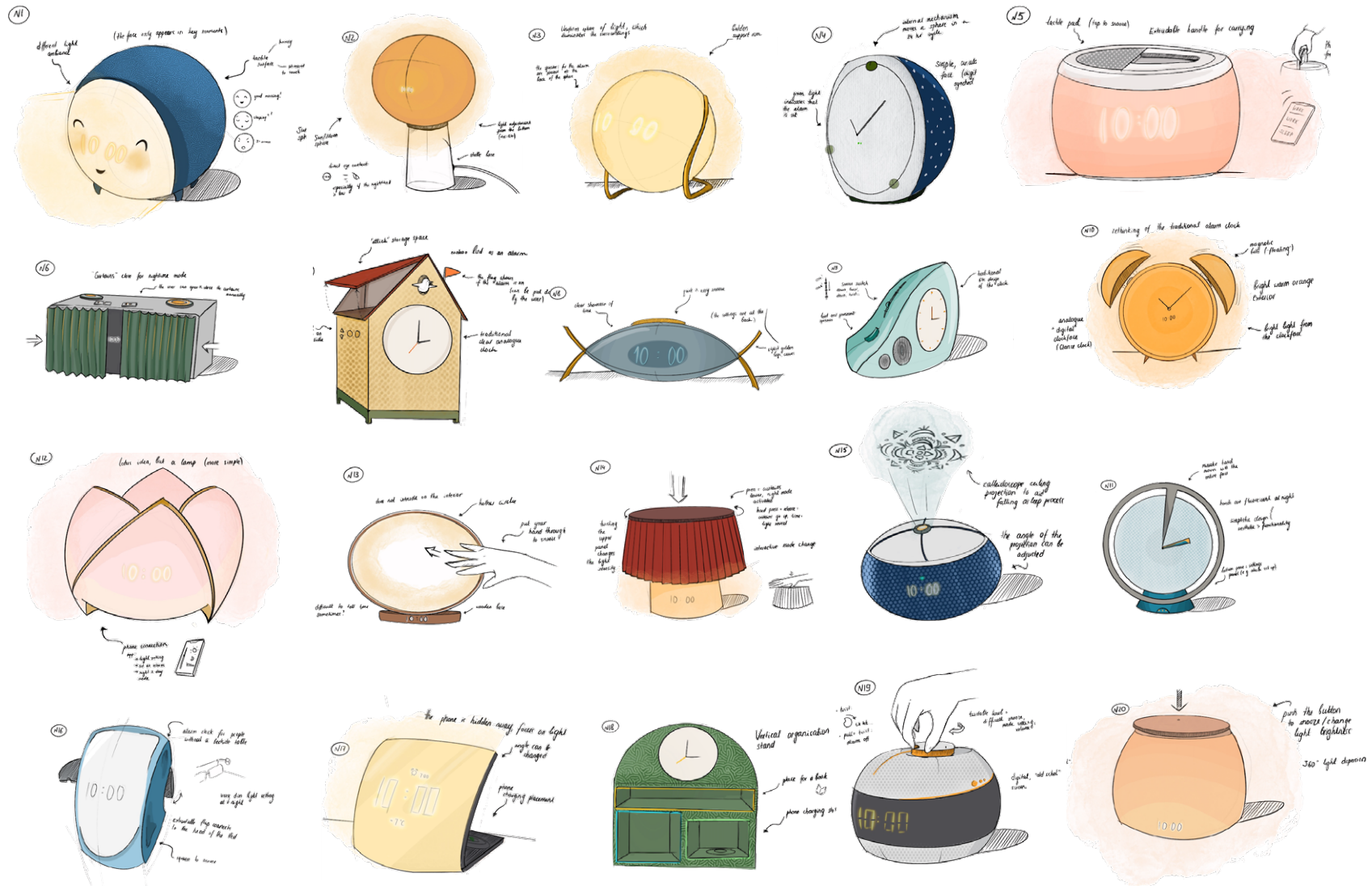


Plus (Advantage)	Minus (Limitation)	Interesting (Unique)
<ul style="list-style-type: none"> <li>The user is in control on when to go to sleep and when to wake up (manual mode change)</li> </ul>	<ul style="list-style-type: none"> <li>Can be more fragile</li> <li>Requires user involvement</li> </ul>	<ul style="list-style-type: none"> <li>The product adjusts to changing routines</li> </ul>
<ul style="list-style-type: none"> <li>Difficult to snooze- more precise motion is necessary</li> <li>Visible mode change</li> </ul>	<ul style="list-style-type: none"> <li>Can be more fragile, so if the user is frustrated at the awakening, the alarm can be broken</li> </ul>	<ul style="list-style-type: none"> <li>Difficult snooze is not fully explored in the market</li> </ul>
<ul style="list-style-type: none"> <li>Angle of time display is adjustable</li> <li>Control knob is placed at the hinge (space efficient)</li> </ul>	<ul style="list-style-type: none"> <li>Classic square-is shape can look cheap</li> <li>Wire placement needs to be considered</li> </ul>	<ul style="list-style-type: none"> <li>Flexible display angle</li> </ul>
<ul style="list-style-type: none"> <li>Soft material</li> <li>Tactile experience</li> <li>Friendly shape, fits different home styles</li> </ul>	<ul style="list-style-type: none"> <li>Many separate displays can be expensive</li> <li>Soft material health concerns</li> </ul>	<ul style="list-style-type: none"> <li>The cloud gives the user key information they would search for in a phone</li> </ul>

+Manual mode  
+Difficult snooze  
+Flexible display angle



# Concepts development



# Value analysis

Before converging, a value analysis of the concepts was necessary. This was done in order to prioritise human values over product feasibility. The goal was not to converge, but instead to see the concepts from a desirability perspective.

According to Harvard Business Review, when customers evaluate a product or service, they weigh its perceived value against the asking price. However, what consumers truly value, has more to do with psychology and emotional needs than the exact price. The elements of value approach extend Maslow's "hierarchy of needs". It consists of 30 fundamental attributes, which were derived from scores of quantitative and qualitative customer studies. Those attributes are organised according to the following tiers- functional, emotional, life changing and social impact.

The hierarchy does not state that the functional values are less important than the social impact value. Numerous patterns of fulfilment can exist, however the higher order values leave deeper impact on the user, which makes them more willing to spend more money on the product or service.

## SOCIAL IMPACT



Self-transcendence

## LIFE CHANGING



Provides hope



Self-actualization



Motivation



Heirloom



Affiliation/belonging

## EMOTIONAL



Reduces anxiety



Rewards me



Nostalgia



Design/aesthetics



Badge value



Wellness



Therapeutic value



Fun/entertainment



Attractiveness



Provides access

## FUNCTIONAL



Saves time



Simplifies



Makes money



Reduces risk



Organizes



Integrates



Connects



Reduces effort



Avoids hassles



Reduces cost



Quality



Variety



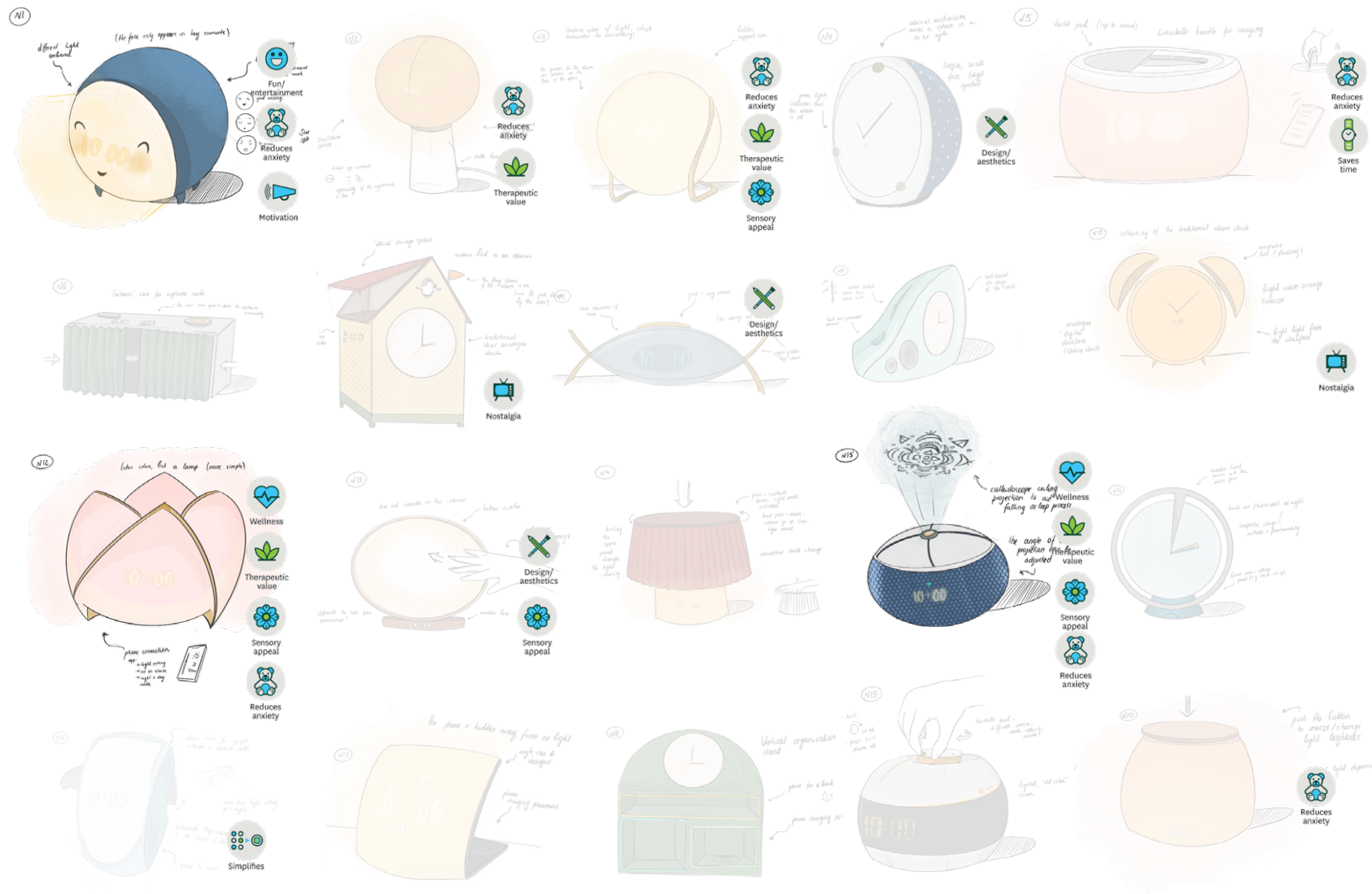
Sensory appeal



Informs

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# Converging





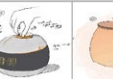
After evaluating the value of each concept, the concepts were rated according to the NAF criteria- Novelty, Attractiveness and Feasibility. Each idea was given a score from 1-15 according to those characteristics. After the rating, 10 ideas were eliminated. At this point the client agreed with the top three concepts, however, the objectivity of this method was questioned.

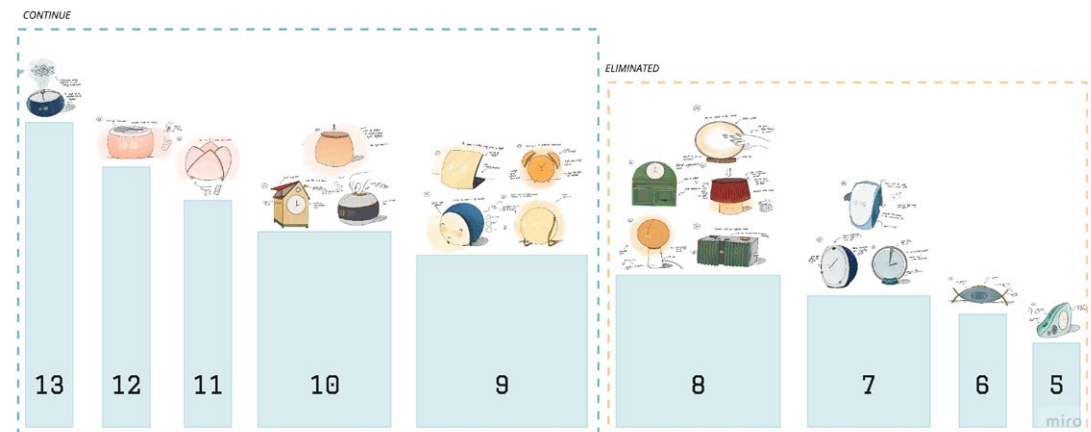
In order to eliminate the bias, a quick questionnaire was conducted which was sent out to 10 people (who would fit the target group description, similar to Nia Lars persona) and the ratings were compared. The rating for projection alarm clock which scored the highest was overestimated, with people not seeing it as particularly novel. The portable alarm was rated approximately the same. However, the lotus alarm clock was underestimated and it's novelty was higher in the eyes of the potential user.

The client also liked a more traditional house clock and although its a very feasible idea, it does not fit the vision as well as the ideas that scored highest. To further confirm the top three concepts, Harris Profile method was used, which ensured that the requirements developed during the research phase were properly implemented. Once again the following concepts came to the top:

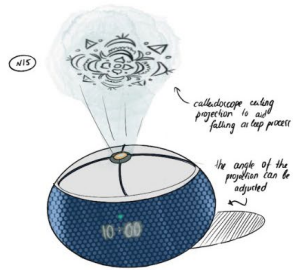
1. Kaleidoscope projection
2. Lotus light
3. Portable timekeeper

										
Novelty	2	3	4	3	5	5	1	2	1	2
Attractiveness	4	3	4	2	4	1	4	2	1	4
Feasibility	3	2	1	2	3	2	5	2	3	3
Total	9	8	9	7	12	8	10	6	5	9

										
Novelty	2	3	4	3	5	4	2	1	4	4
Attractiveness	3	5	3	4	4	2	3	2	3	4
Feasibility	2	3	2	2	4	1	4	5	3	2
Total	7	11	9	8	13	7	9	8	10	10

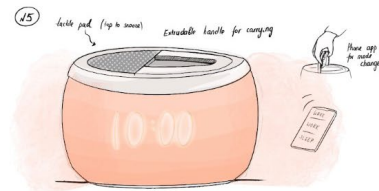






N.15 KALEIDOSCOPE

Client: Good idea with a strong story, but not so sure about feasibility. Making a clear and interactive projection might make it a very digital product, which will take a lot of development to realise.



N.5 PORTABLE TIMEKEEPER

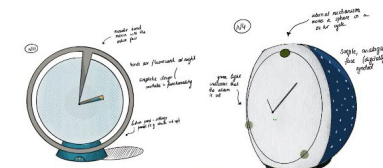
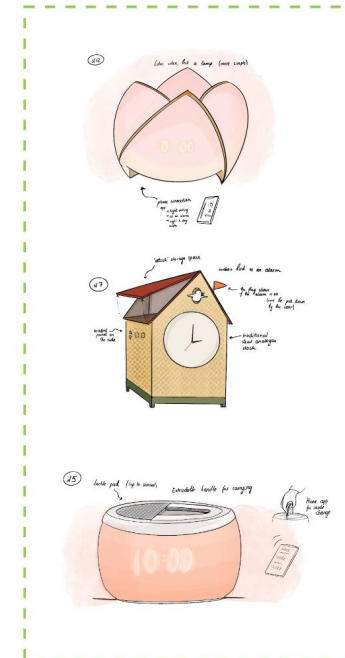
Client: The idea is clear, but not so sure how it can be conveyed in online marketing. This one is not something we are looking for.








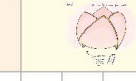

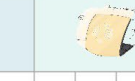

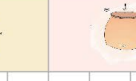
N.12 LOTUS LIGHT

Client: Favourite idea for the client, it's simple and elegant. Need to work out exact materials, but out of the top 3 it's the most appealing. Simple products, which remind people of something, but that is difficult to put in words are usually the bestsellers.

## CLIENT FAVOURITES



Notable mentions- these are the ideas which are most feasible for NoTime. They are outside of the project scope, but still interesting for the client.

																																								
	--	-	+	++	--	-	+	++	--	-	+	++	--	-	+	++	--	-	+	++	--	-	+	++	--	-	+	++	--	-	+	++	--	-	+	++	--	-	+	++
	N.1 FRIENDLY SPHERE				N.3 ELEGANT SPHERE				N.5 PORTABLE TIMEKEEPER				N.7 LITTLE HOUSE				N.10 DOUBLE BELL				N.9 LOTUS LIGHT				N.12 KALEIDOSCOPE				N.14 PHONE HOLD (BACK)				N.14 KNOB TWIST				N.15 BIG BUTTON			
Relieves stressful morning awakening																																								
Reduces the effects of sleep inertia																																								
Not too annoying for people to use																																								
Provides some information that is usually checked on the phone first thing in the morning																																								
Stimulates more than one sense to wake up the user																																								
Imitates natural light patterns to signal wake up time																																								
Suitable for people who struggle to wake up in the morning																																								
Multiple snooze time options																																								
Different modes for the weekday and weekend awakening patterns																																								
Creates a sense of serenity and control																																								
Creates emotional attachment																																								
Actively promotes the value of not using the phone first thing in the morning																																								
Visible time																																								
Different modes (sleep/wake/nap)																																								
Made from high quality tactile materials																																								
Easy to set up																																								
Has a strong story/usage scenario, which makes it marketable online																																								
Cost effective manufacturing																																								
Realistic to develop within a year																																								
Total	10-15				17-10				8-17				11-18				18-7				8-20				6-20				18-7				15-9				18-8			
	+5				-7				+9				+7				-11				+12				+14				-11				-6				-10			

miro

# Simulation

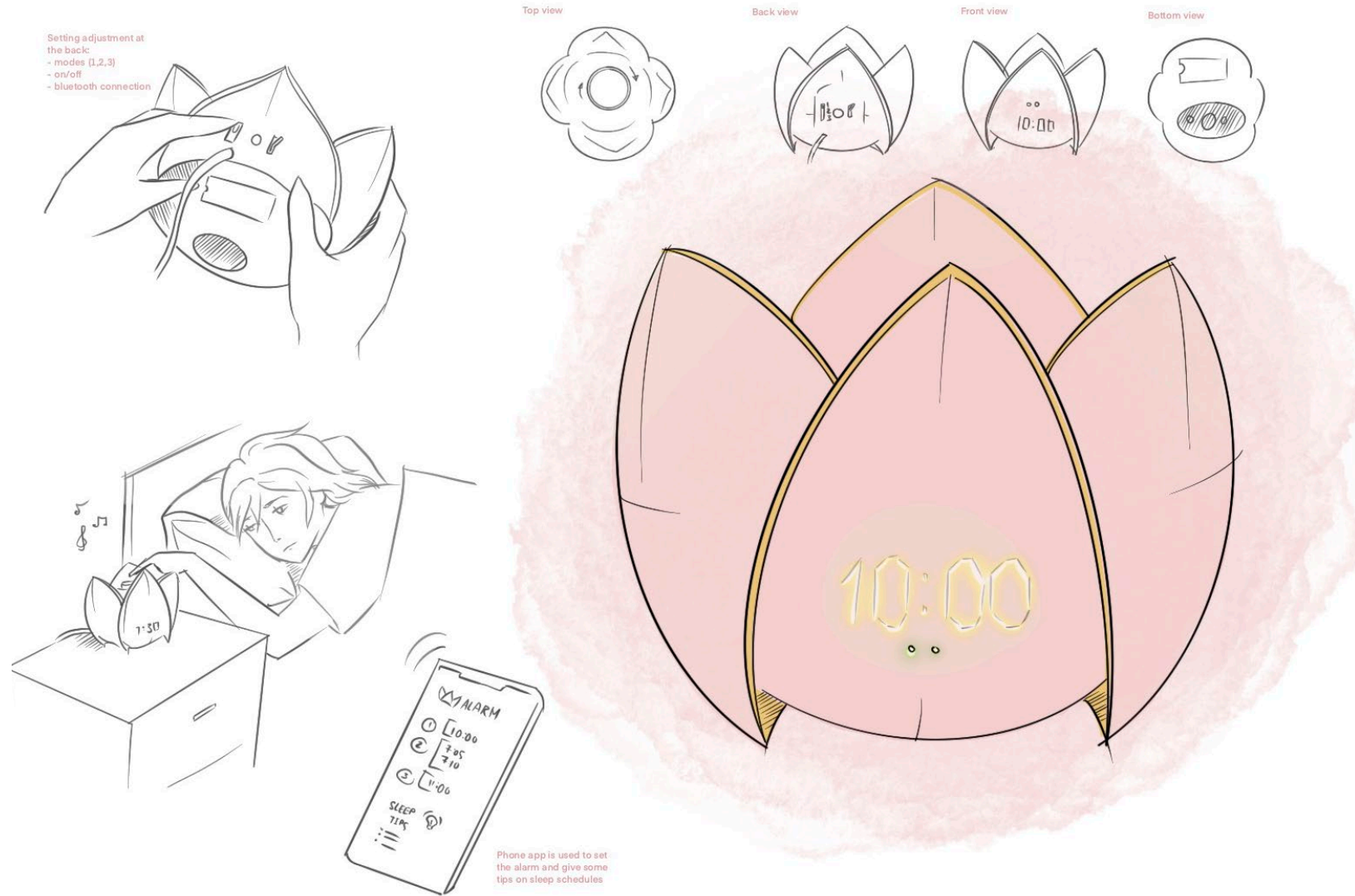
Once the top three concepts were chosen, they were prototyped using low density foam. The purpose of those lo-fi prototypes was to evaluate the form of the concepts and communicate the ideas to the client.

The visualisation of the prototypes shows key material ideas which could not be conveyed through foam: textile cover of the projection clock, handle indent of the portable alarm and the glowing surface of the lotus idea. Although the lotus prototype was least accurate due to the difficulty of prototyping double curvature in foam, it was still the most appealing of the three. The past converging methods, user testing and client feedback all conclude that this is the direction that has the most potential for the purpose of this project.

The prototype also revealed the areas which still need to be developed. This includes the size of the product, the control panel and the material itself. These are the future steps in the detailing chapter.



# Final direction





# Inspiration in nature

Both primary and secondary research showed that people are mostly out of tune with their internal clocks, which leads to sleep disorders, tough mornings and coffee addiction. Other living organisms, on the other hand never experience this struggle, since their instincts always force them to follow circadian rhythms.

An example of such organism is *Nelumbo nucifera*, also known as Indian or sacred lotus. The lotus closes in the afternoon and throughout the night only to open again in the early morning. This slow, rhythmic and predictable cycle is also healthy for people, however, we are far less likely to listen to our internal signals when it comes to sleep.

Therefore, during ideation biomicry method was explored. Different flower forms and interactions were ideated, with some initial ideas having actual movable petals. However, as the concepts were developed further the shape was simplified to a four petal pattern with golden highlights. Instead of opening and closing the flower lights up, making it feel more "alive". This connection to nature and its values is one of the reasons why this concept direction was decided upon.





# Chapter 4

# Detailing

Functionality breakdown

Controls ideation

App development

3D modelling

Manufacturing

Customer journey

Habit installation

# Functionality breakdown

Once the final concept direction was determined, it was time to begin the detailing process and figure out exactly how to achieve the ideal user experience. The product is a smart sleep aid that can both put people to sleep and awaken them. To make this experience as pleasurable as possible, the product should be able to adapt to the needs of each individual. This is done by giving the user as much control over the device as possible. However, this is difficult to achieve with the hardware controls, due to limited space on the device. Confusion over device controls and difficulty reading the labels was one of the key frustration points during competition research, so the goal was to avoid this pitfall at all costs. Moreover, many questionnaire respondents expressed their lack of motivation to buy separate alarm clock due to the difficult and confusing set-up.

Therefore, it was decided that some device control would be done via a phone app. Hardware and software functionalities were then separated, with software providing control and hardware realising user wishes. Afterwards, the functions were labelled under what needs controls, what needs indicators and what goes into hardware and cannot be interacted with directly.

In short, apps functionality is about setting time and alarm, while also informing the user about sleep. The last function was derived from research since it was concluded that effective and pleasant awakening is dictated by many factors, not just the type of wake up aid. It was also important to communicate to the user the importance of a consistent sleep schedule and healthy sleep duration.

Hardware	Software
<ul style="list-style-type: none"><li>• Light emitting awakening</li><li>• Telling time</li><li>• Telling if the alarm is set</li><li>• Sound emitting speaker</li><li>• Adjusting brightness</li><li>• Telling the phone is connected</li><li>• Wifi connectivity</li><li>• Power on/off</li><li>• Alarm on/off</li><li>• Snoozing</li></ul>	<ul style="list-style-type: none"><li>• Setting up the alarm</li><li>• Setting time</li><li>• Mode changes (light)</li><li>• Information about sleep</li><li>• Choosing alarm sound</li></ul>

## Need controls:

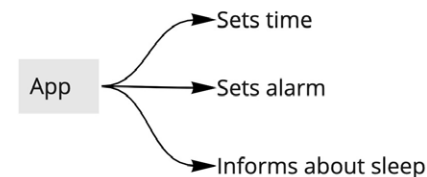
- Adjusting brightness
- Connection
- Power on/off
- Alarm on/off
- Snoozing

## Need indicators:

- If alarm is set
- If phone is connected

## Hardware:

- Light-emitting surface
- Digital time
- Sound emitting speaker
- Wifi connectivity



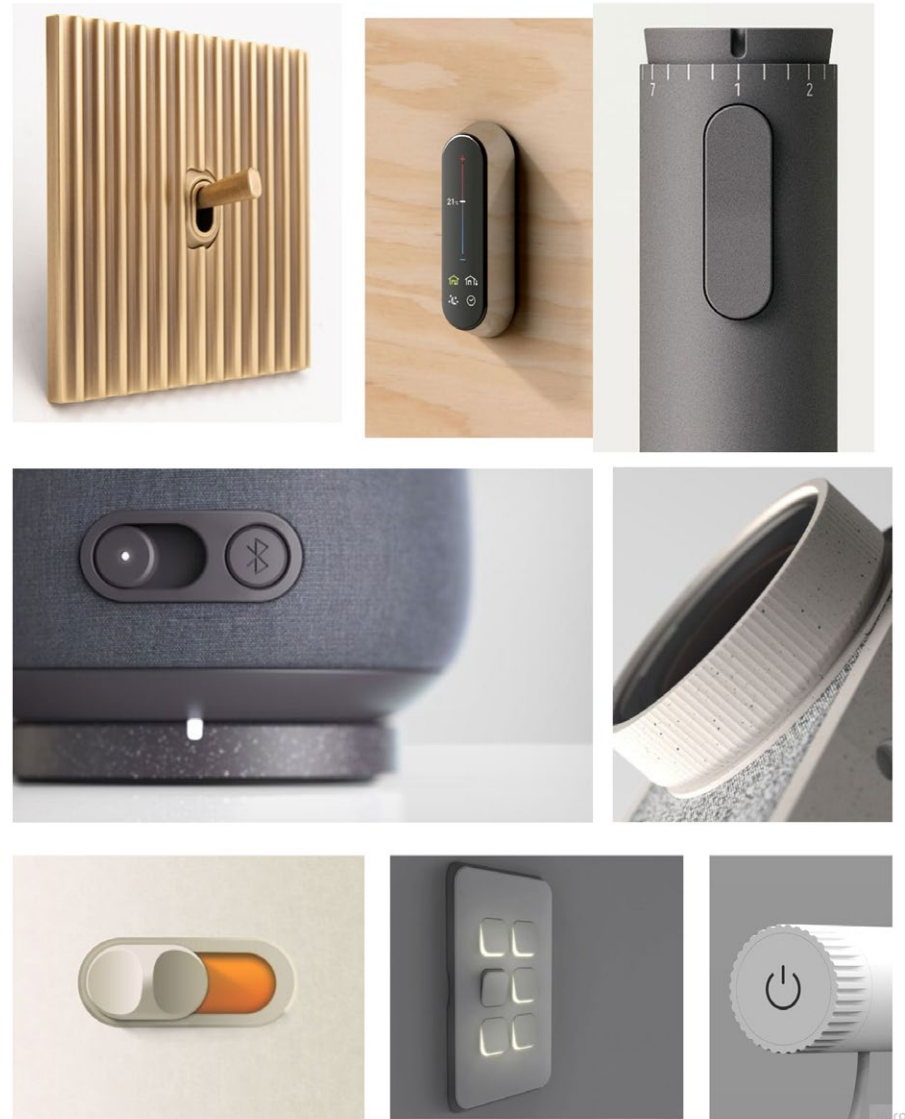
# Controls research

Device controls are a crucial way for the user to interact with the device, which means that special care is necessary with its design. Bad controls can lead to a frustrating user experience, while good ones can empower the user and make them feel more in control of the situation. According to D. Norman in his book "The Design of Everyday Things", key characteristics of a good design is discoverability and understanding. There are five ways how discoverability is achieved through controls design:

1. Affordances= determine what actions are possible
2. Signifiers= communicate where the action should take place
3. Constraints= limitation in application or use that can help with the formation of conceptual models
4. Mappings= how controls relate to each other
5. Feedback= communicating results of an action back to the user

With these characteristics in mind, the following list of requirements was developed specifically for controls:

- Controls do not require visual contact
- Good grip and tactile materials
- Facilitate clear conceptual model
- Signifiers communicate where the action should take place
- Feedback communicates results of an action back to the user
- If mistakes are made, they are easily fixable

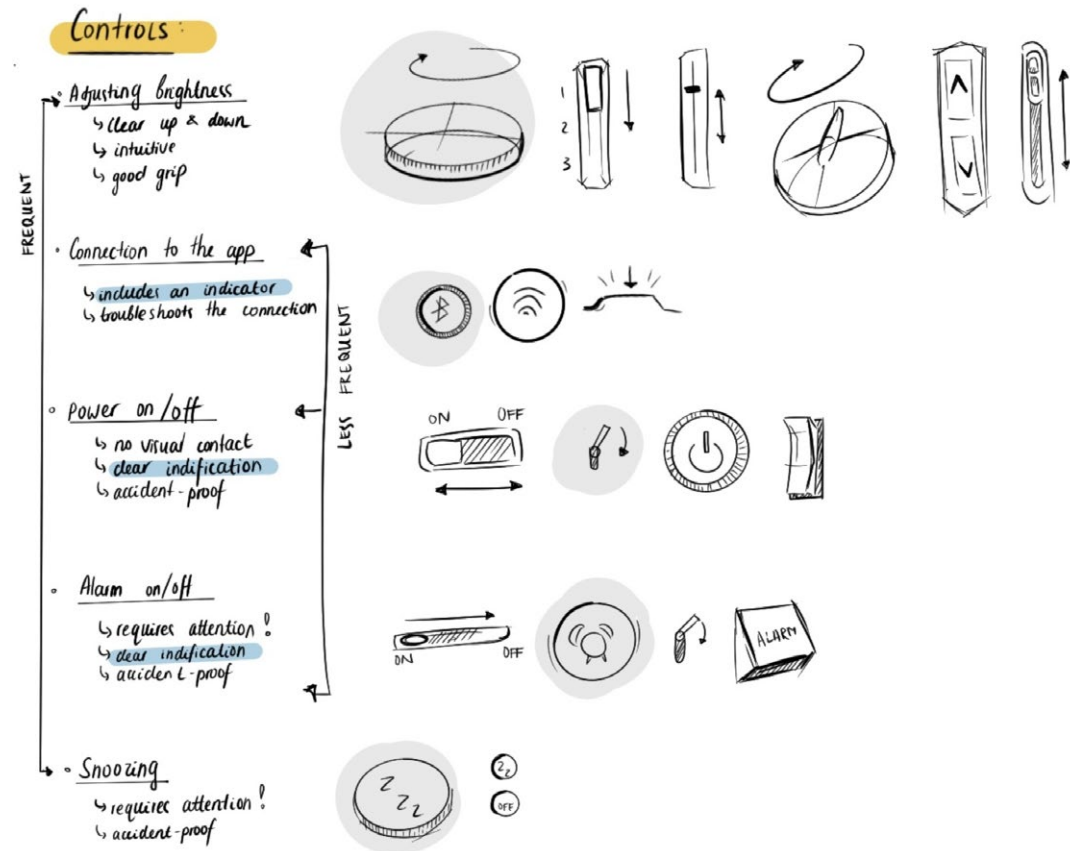




# Controls ideation

Based on the research and functionality breakdown, the controls were sketched out to see different interaction possibilities and how they can be labelled. The controls were also separated into "frequent" controls which are most likely to be used daily and "less frequent" controls that are only necessary in special cases. The most frequently used controls are brightness adjustment and snoozing. Therefore, it was decided to combine them and place them on top of the device, to make it as accessible as possible.

Less commonly used controls are app connectivity, power on/off and alarm on/off. Those are placed at the back and separated for better clarity. Another important consideration for these type of controls is the fact that they should require the user to pay conscious attention while operating them. This is done to avoid situations when the user accidentally turns off the alarm and fails to wake up on time the next morning. To prevent this, the buttons are placed in a less accessible place and give visual feedback on the front panel of the alarm clock- for example, when the device is connected to the app, a green light appears on the front panel.



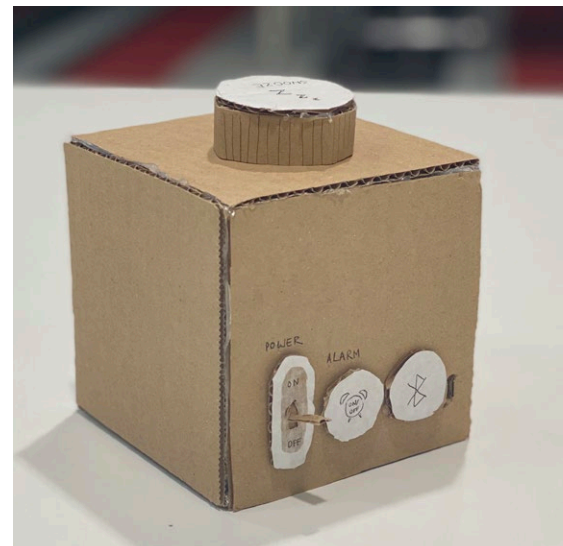
# User testing controls

Once the controls were chosen, they had to be tested. The goal of this research was to determine whether the controls are clear and intuitive for a first time user. To do this, a simple carton box was made with “buttons” of a contrasting colour. The reason for simplifying the shape is to allow the testing to be focused on controls, instead of overall form design. There is a limitation to this method of testing since the flower petals were not taken into account, which could potentially obstruct access to the top dial.

The following insights emerged from user testing:

- The power button is not necessary, since the alarm clock can be turned off by unplugging it from the power source.
- It is not clear that the brightness dial can be twisted, so a new solution is necessary.
- Users liked the idea of replicating feedback on the front panel of the device, which makes device settings more clear.

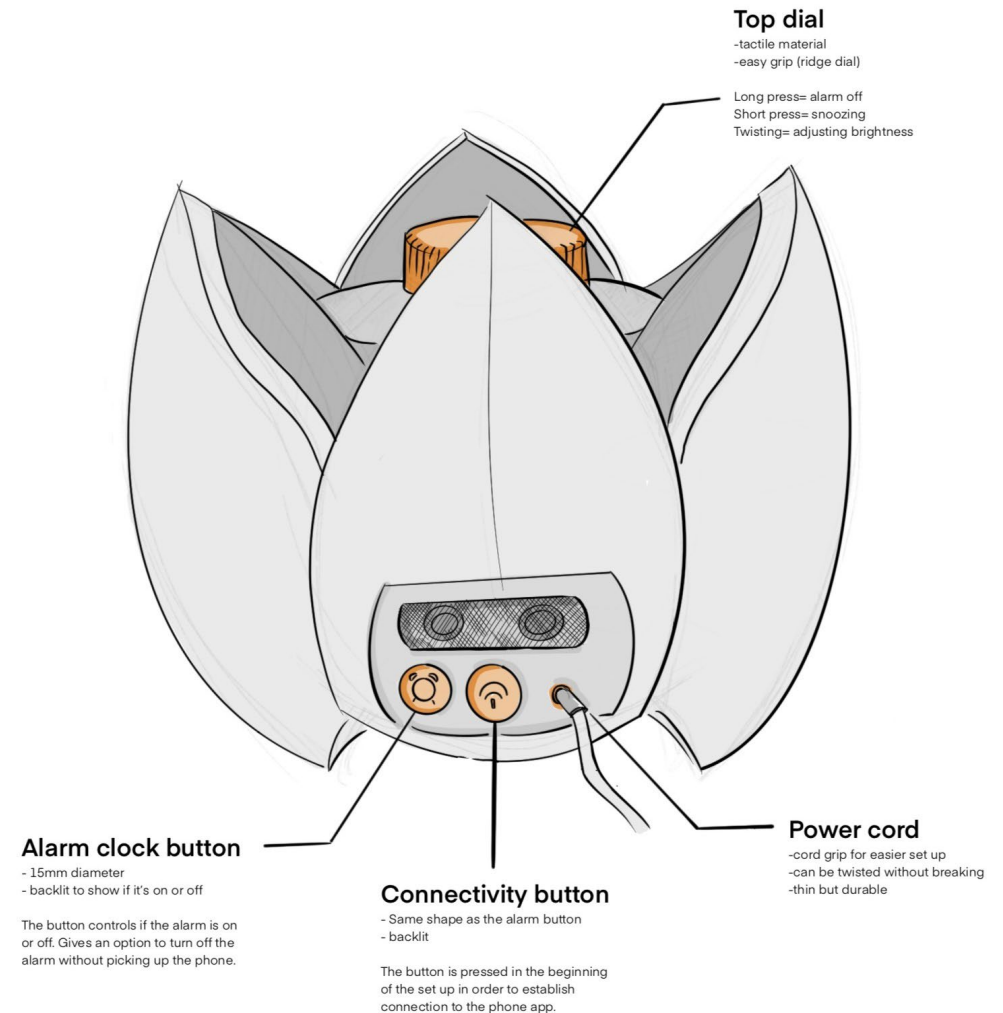
- The snooze button is very clear and easily accessible.
- It's not obvious that the button on top is a dial for changing light brightness.
- The power on/off is clear, but the alarm is not. It's confusing that two types of controls are for similar functions.
- Is there a need for the power button? The power can be turned off by plugging out the cord.
- The bluetooth button is clear, but not sure what the difference is between short press and long press.



# Controls improvements

Based on user testing, some adjustments were made for the final set of controls. These controls were then evaluated based on the requirements made during the analysis stage:

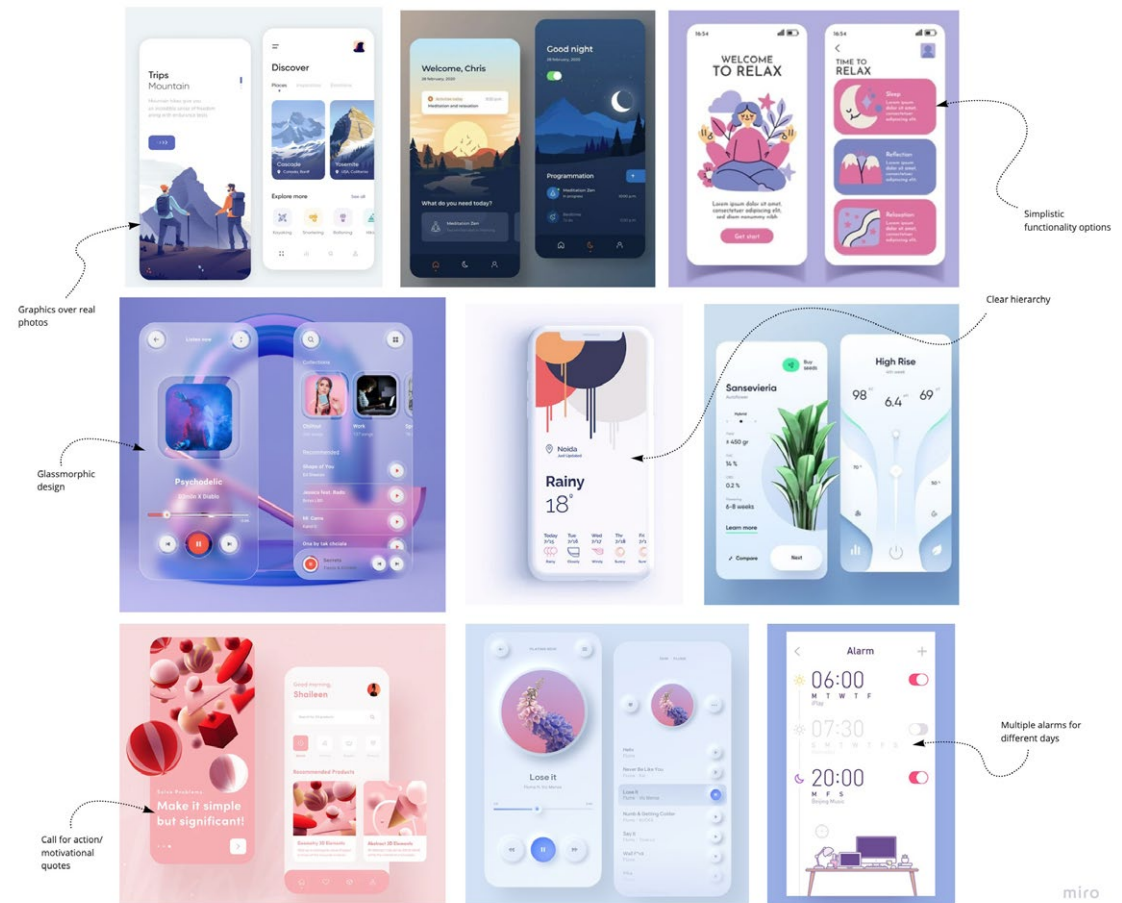
1. Controls do not require visual contact ●
  - The top dial can be used without directly looking at it, however, the back buttons need visual contact since they have the same size and need visual distinctions. This is intentional since back buttons are used less often and require more conscious attention from the user.
2. Good grip and tactile materials ●
  - The buttons are inviting to press and the dial is fun to interact with. The ridges on the dial allow better grip and less slip ups.
3. Facilitates clear conceptual model ●
  - The dial is very intuitive to use and it's clear that it can be pressed or twisted. However, the back buttons are less obvious, since they are so similar. They are not used often, so conceptually it makes sense to put them at the back.
4. Signifiers communicate where the action should take place ●
  - The ridged side of the dial invite the user to pinch and twist it. The buttons are 3D and have a backlit identification, which makes it clear that they can be pressed.
5. Feedback communicates results of an action back to the user ●
  - Once the dial is twisted, the brightness of the light increases or decreases depending on the direction of the twist. Snoozing/turning off the alarm is also instantaneous. Connection and alarm on/off buttons are represented in the front panel.
6. If mistakes are made, they are easily fixable ●
  - Actions done using the controls are easily reversible.



# App development

Once physical controls were decided upon, the next step was to start app development process. Some UI trends were analysed and the following design requirements were made:

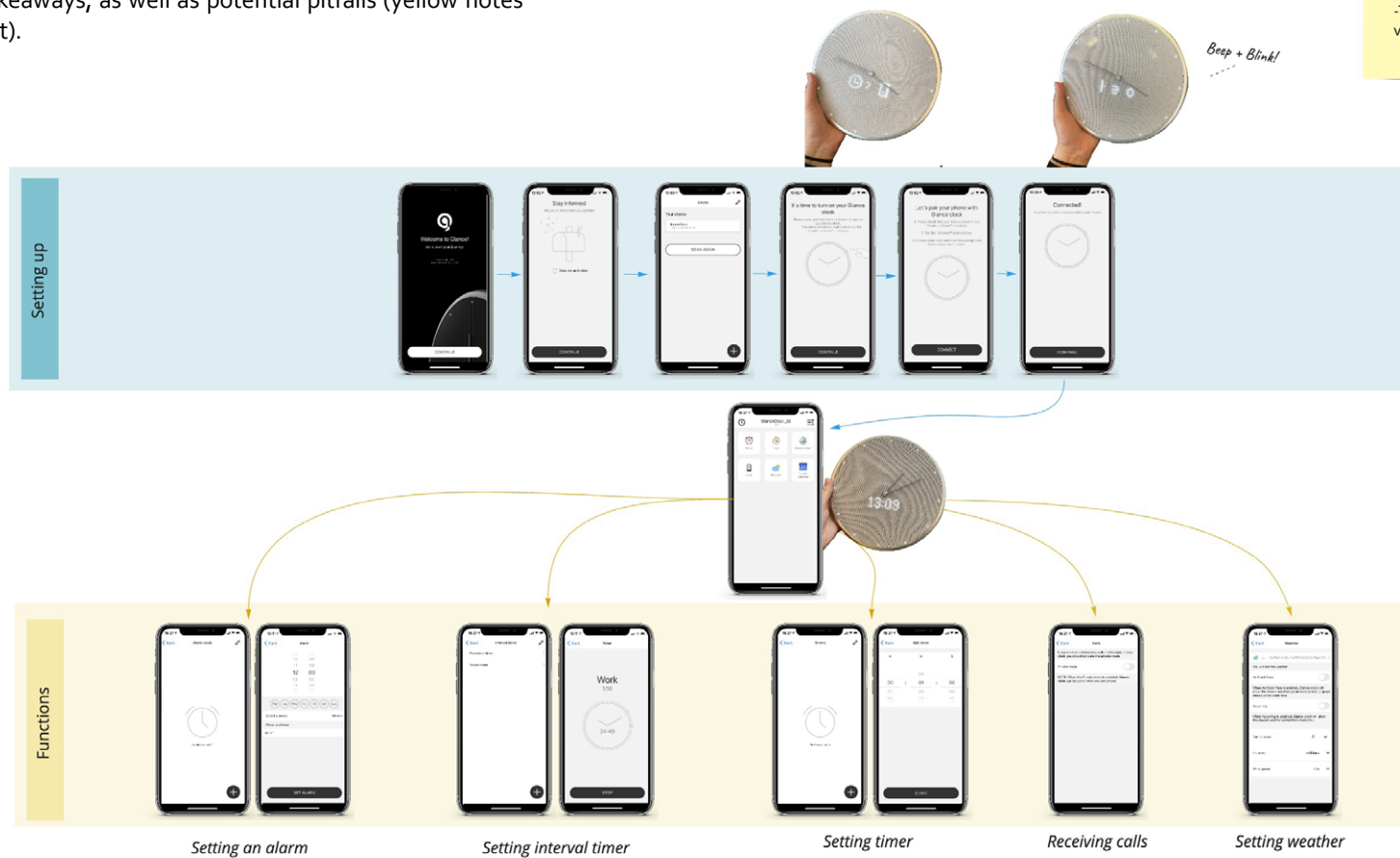
1. The app must be intuitive, enough for people to use it seamlessly for the first time.
2. The icons must be self-explanatory/ intuitive.
3. UI should follow a consistent style.
4. The user should be able to complete their tasks as efficiently as possible.
5. The information provided in the sleep section is relevant and engaging.
6. Interface must invoke reliability (the alarm will go off at the desired time).
7. The UI design evokes a sense of serenity and peace.
8. The app allows the user to set multiple alarms for different days.
9. The app visualises information using appealing graphics and animations.
10. The app has a good connectivity with the alarm clock, which means the user has a good control of the set up process.
11. Every app setting change is accompanied by feedback from the alarm clock.
12. Error messages are written in a clear way, which makes it understandable for the user, with a clear solution tactic.
13. The app is able to sync with current alarm clocks in the system (Clock apps).
14. The app adapts its aesthetic depending on time of the day.
15. The app should clearly convey the settings at a glance (not many timeline pages).





# Glance clock analysis

Glance clock is a product which was recently developed by NeXtime. It is a smart clock which also has an accompanying app. I looked at the user experience process for this device, in order to get insights on how the product can potentially interact with the phone app. From this analysis I found some positive takeaways, as well as potential pitfalls (yellow notes on the right).



## Pluses/ Takeaways:

- Every change in setting is accompanied by feedback on the clock (sound/visual)
- Clear set up process
- The functions are clear and are meant to be updated

## Minuses:

- The connectivity was not too smooth
- Sometimes you feel like you are not in control in terms of what the clock shows you
- The app is not aesthetically engaging, very simple

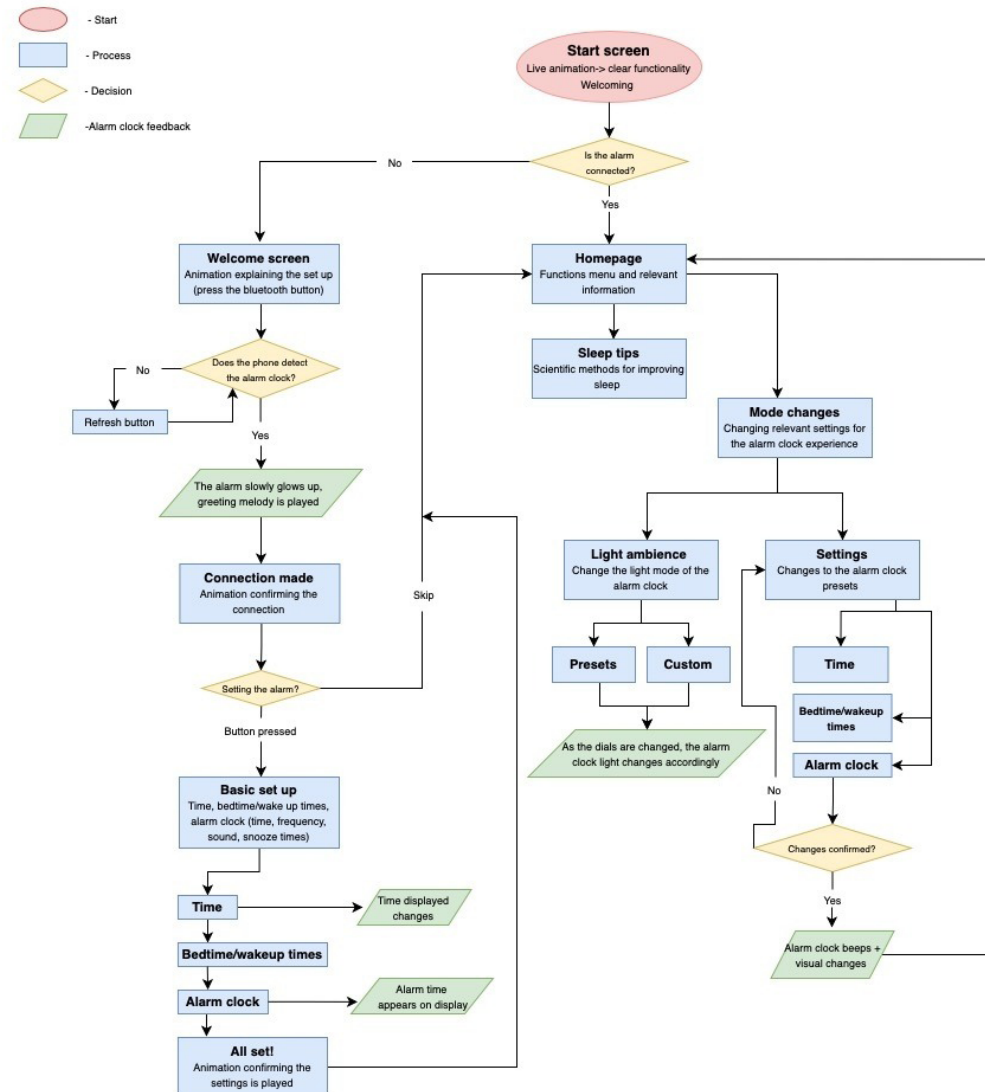
# App wireframe

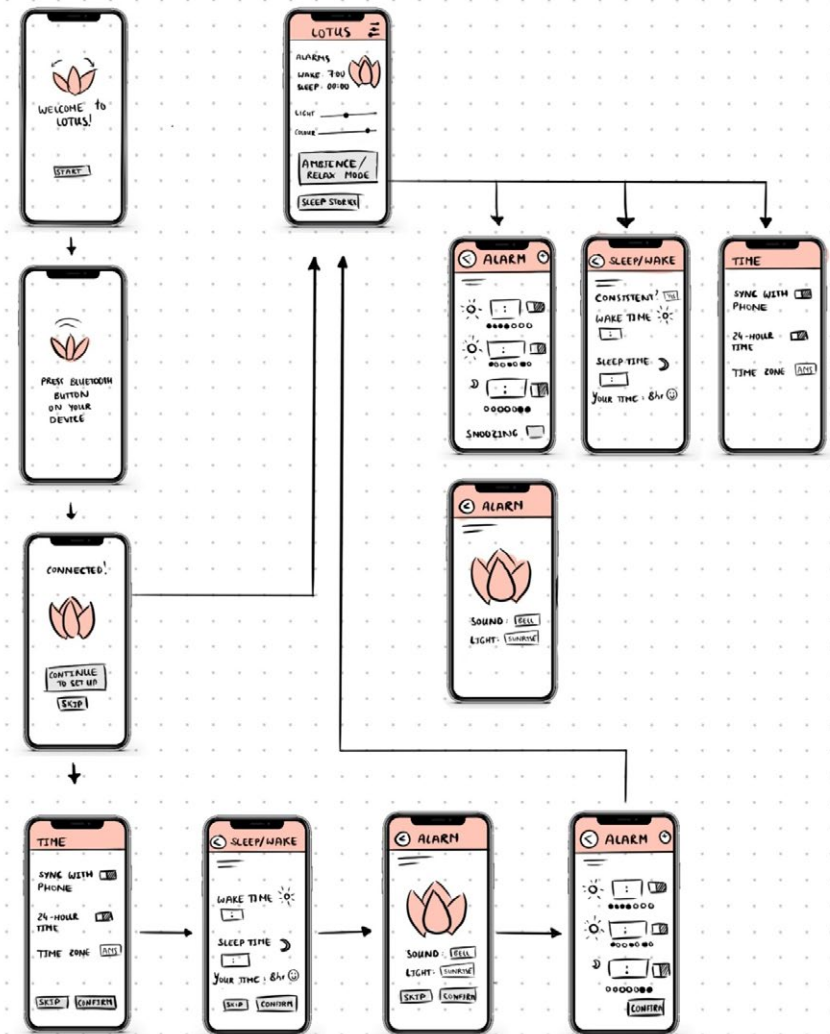
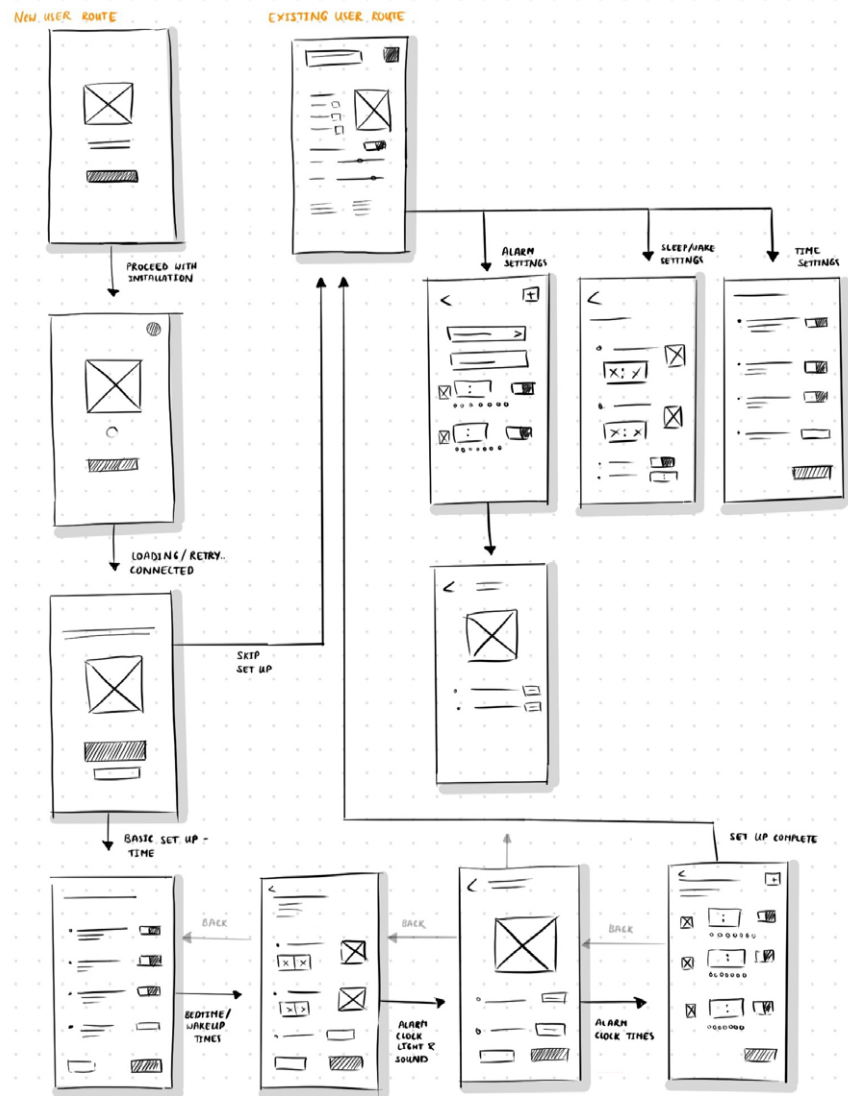
In order to build the app, the entire customer journey was analysed and broken down into a flowchart, which showed process steps as well as accompanying device feedback. Glance Clock research showed that the best way to make the setup process satisfying is to have clear visual and audio communication between the app and the device.

The following design considerations were also addressed:

- What kind of values should be given to the user through the app?
- How can the process of setting up the alarm be shortened?
- Which features are being controlled by the user and which are preset?
- How can the app ensure a change in routine?
- How can the app be used without compromising the idea of digital detox?

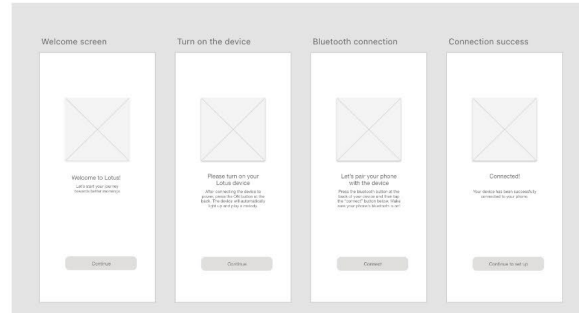
Based on the flowchart, a wireframe was built with some follow up detailing. Those sketches can be found on the next page.



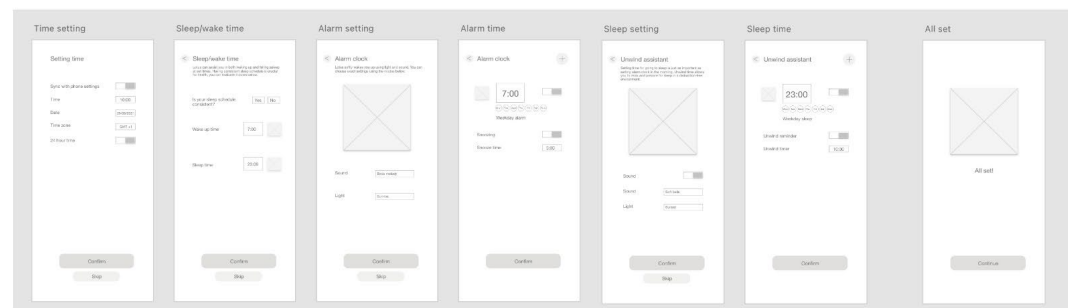


# App prototyping

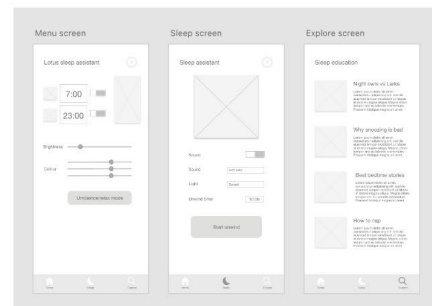
a. Establishing connection



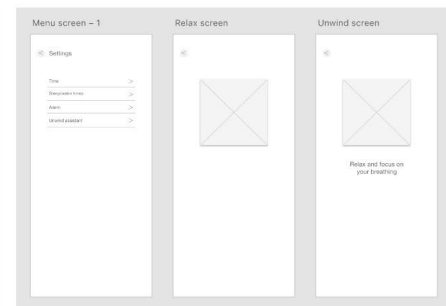
b. First time set-up



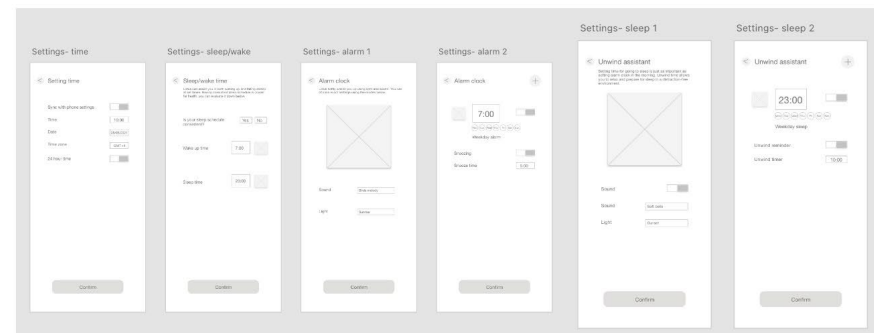
d. Menu screen



e. Menu sub-sections



f. Settings



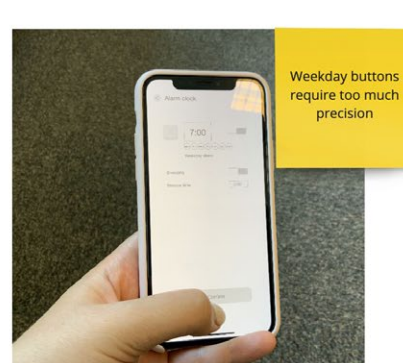
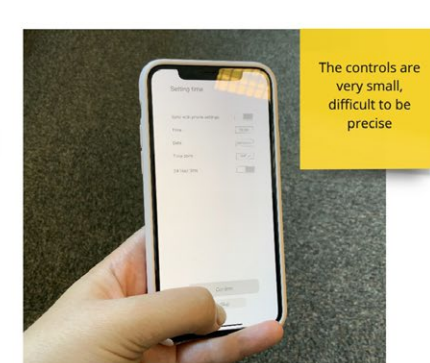
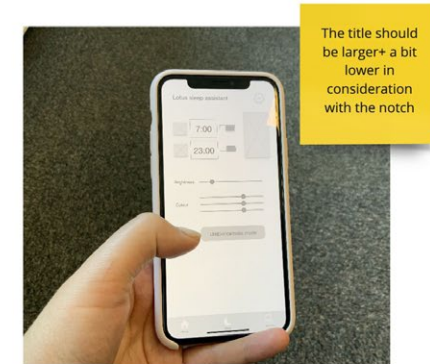
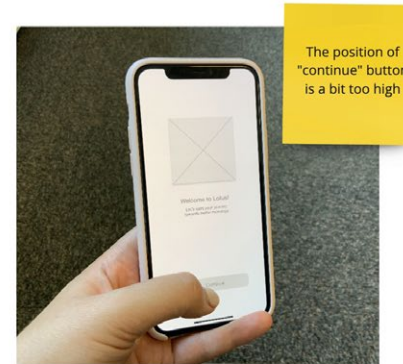
miro



# User testing

In order to test usability of the app, it was first prototyped in Adobe XD. The prototype is black and white and has very simple transitions, in order to keep the focus on the overall flow and key buttons. The goal of the testing was to see whether the app is easy to navigate on an iPhone screen.

Some key insights included the fact that iPhone notch should be taken into consideration while designing the layout. Some buttons were too small and required a lot of precision to navigate and menubar at the bottom of the screen was too close to the exit bar (also difficult to access). These changes were then implemented in the new iteration of the app.



miro

# Current app

At this point, the app is simplified and lacks graphics. This is adequate for the project's scope, where the overall goal is to develop a concept direction. However, in the future, the app's aesthetics should be created in collaboration with an app designer and a software developer. The significance of this step cannot be overstated, as failure to create a meaningful app experience can degrade the entire product and lower its value.

The app should have the following characteristics:

1. Intuitive
2. Calming
3. Engaging
4. Efficient
5. Informative

In addition, app-specific requirements must be considered and tested.



# Model prototyping

After the controls and the app were developed, it was time to move onto concrete form renderings. During initial concept sketches, I already noticed the challenges that this shape might pose, especially since it was very non-geometric and organic.

At this point, I only had my foam prototype and concept sketches as a reference of what the final product would look like. The foam prototype had its limitations and accuracy issues since it was made using the material subtracting method and the curves were not even. Therefore, it was decided that another 3D prototype is necessary before starting CAD modelling. The material chosen for this version is clay since it gives freedom to form very organic and natural shapes.

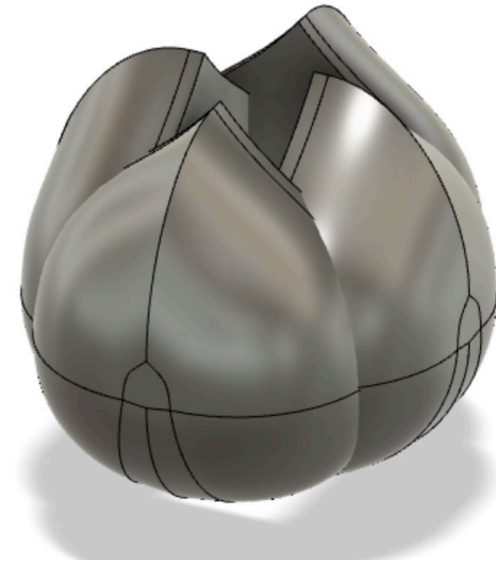
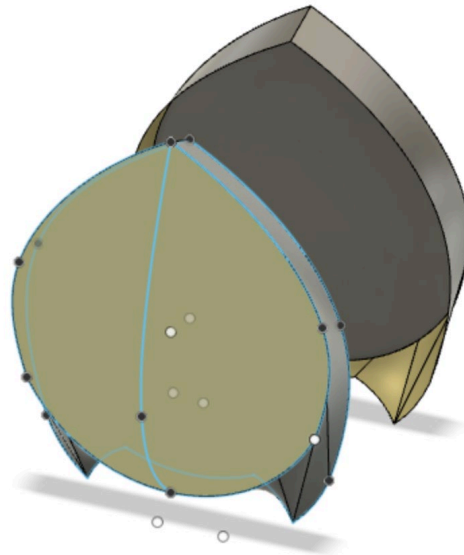
The clay prototype gave me a clearer idea of what my design should look like, however, it had some issues such as thick petal walls that could not be made sharp because of how malleable the material is. Moreover, the legs of the form could not be made since the bottom clay flattened out due to the overall weight of the model. Another issue faced with this model is its scale, it is much smaller than the product envisioned in concept art. Nevertheless, it was an important starting point for product rendering.



# 3D modelling

The purpose of CAD modelling was to visualise the concept in 3D and communicate form decisions to stakeholders. Since technical accuracy was not a priority, Fusion 360 was used.

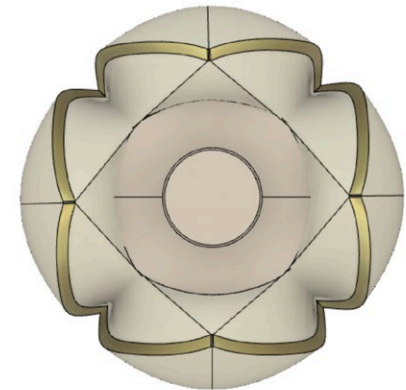
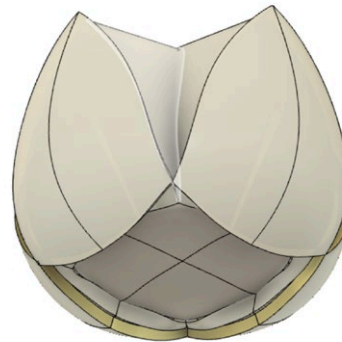
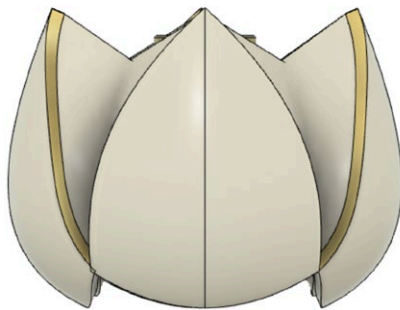
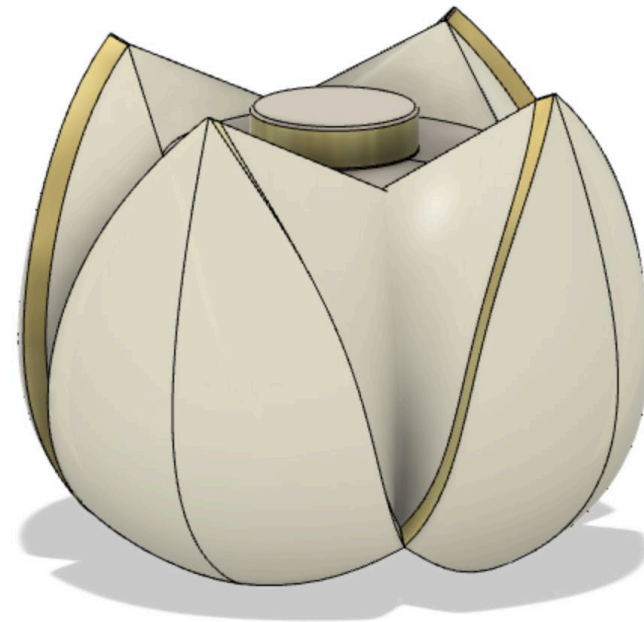
The first iteration of the model was made using a form moulding tool, as a way to make the petals curved with inner lines flowing from one petal to another. There was a limitation to this approach since the model is a solid body and cannot be broken down into different components. The second attempt was made using sketches and extrusion. A petal was made and then extruded outward, with edges curved using a fillet tool. However, this approach made the pattern of petals too rigid and square-like. On the third attempt, lofts were used to patch the surface of the sketch, which also had legs. However, this method did not yield desirable results, since the section could not be extruded into a curved petal shape.





# Final model

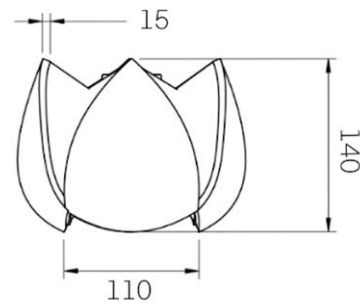
After some trial and error, the final approach to modelling was determined. The petal sketch was surfaced using the sweep feature and then thickened to make a solid body. Afterwards, the petal was repeated in a pattern that follows a circular path at the model's base. The core was then made using form modelling and the petals were connected to it using surface lofts. Although the form is not exactly the same as in the concepts sketches (here all petals are the same, whereas the ones in the concept have a dual mirror line), the result of this modelling can be easily broken down into components for assembly. The legs are also changed from the original concept, so ideally this model would be 3D printed and tested for stability. However, due to time constraints, this form will be used.



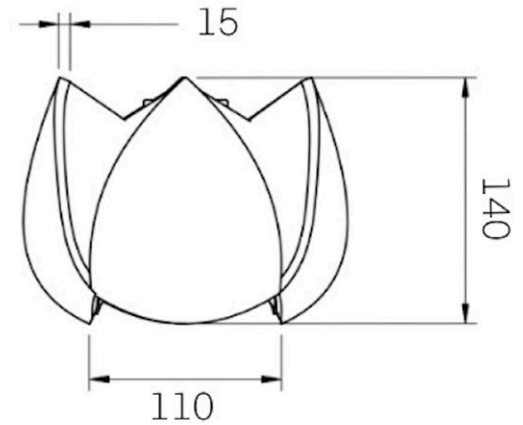
# Technical parameters

Once the model was made, it became clear how the form can be broken down into separate components. Three key components are the core, petals and top button. The core is split into two sides for easier assembly and each petal is a separate piece for cheaper manufacturing. In total, there would be seven key components (which do not include inner electronics, back buttons and the power cord).

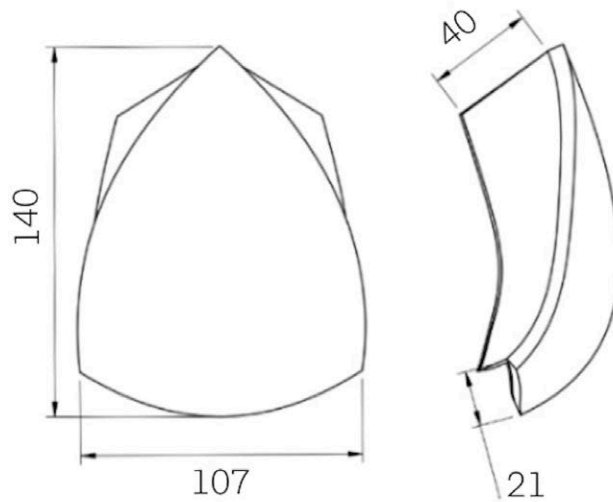
*a. Core parameters*



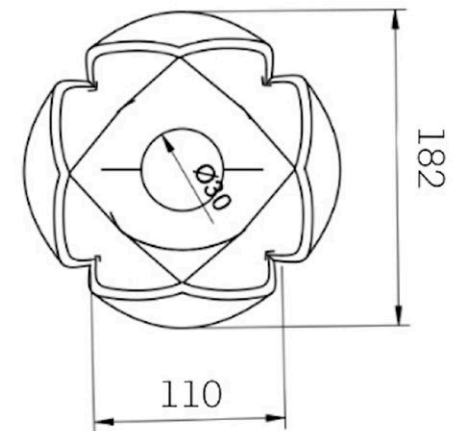
*b. Side parameters*



*c. Petals parameters*



*d. Top parameters*

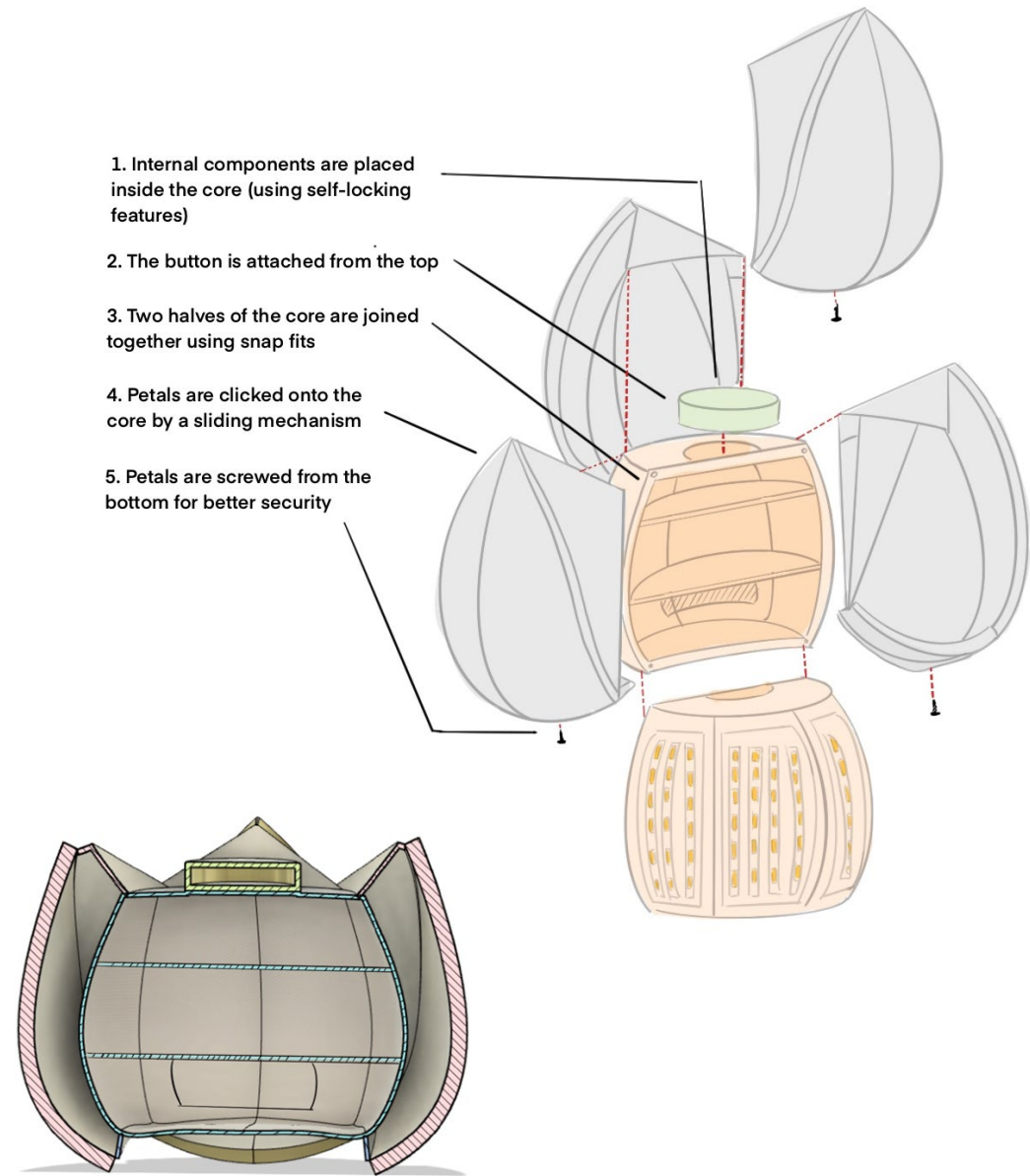


# Assembly

Optimising the design for manufacturing is a process that is difficult to achieve within the time frame of the graduation project. However, a basic assembly line needs to be considered for viability and feasibility assessment of the product.

As mentioned before, seven basic components make the form of the product. To provide easier stability during assembly the core is put together first. The internal components are placed inside and two halves of the core are joined together. Afterwards, the petals are clicked onto the sides of the core and screwed from the bottom for better security. This assembly does not include the exact placement of internal components and the placement of light-emitting diodes on the surface of the core. Therefore, for better feasibility evaluation these steps need to be discussed with an engineering expert.

Another challenge for manufacturing is distinguishing the petals since one of the petals will have to include the time component. The orientation of these parts is crucial so that the internal components align with controls at the back of the device and the time is shown on the correct side. These points need to be addressed by NeXtime Hong Kong office in order to prepare the product for mass manufacturing.



# Manufacturing

The alarm clock's internal components are standard and can be obtained from a pre-existing electronics catalogue. The core and the petals, on the other side, are special for this project and need to be custom made.

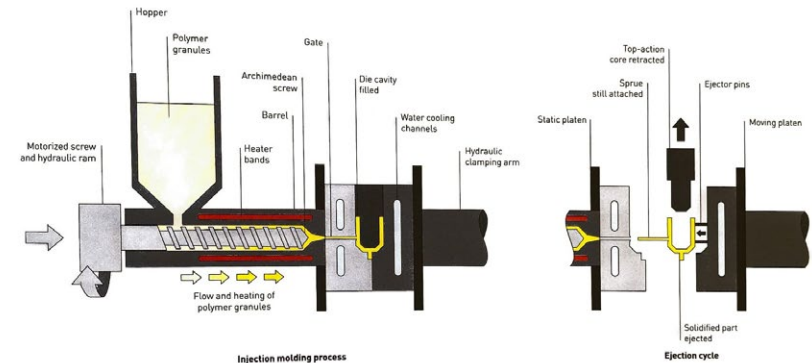
Several manufacturing methods were considered for their production- injection moulding, blow moulding and thermoforming. After considering those choices, injection moulding was selected since NeXtime has experience with mass production using this process and will be able to organize the tooling with the assistance of their partners. However, this method requires certain material and design considerations to be taken into account. Injection moulding operates at high temperatures and uses high pressure to inject plasticized material into the die cavity. This means that problems may arise as a result of shrinkage and stress accumulation. Since assembly of some parts requires snap-fits, it is important to preserve the shape and dimensions of the form, so polymer specialists and engineers need to be consulted on potential error margins of this method.

Another method that was investigated is in-mould decoration, which can be used to apply gold paint on the petal edges. This method applies print to plastic products during injection moulding, eliminating the need for secondary operations like printing and spraying. This can potentially reduce manufacturing costs since it reduces the number of process steps. However, initial tooling costs will be higher. Therefore, the Hong Kong office must be consulted for an exact quotation and method comparison.

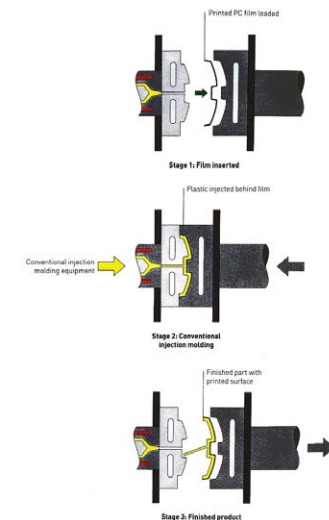
Pros:  
-Very low unit costs  
-High quality surface finish  
-Suitable for high volume mass production  
- NeXtime is highly experienced in injection mold manufacturing

Cons:  
-High tooling costs

## Injection Molding Process



## In-mold decoration process





# Components research

Once the form was decided upon, inner components had to be researched. The following key components are necessary for the concept functionality:

1. Light-emitting surface
2. Digital time
3. Speaker
4. Connectivity component
5. Motherboard
6. Buttons
7. Battery

The functionality of each was researched and some basic requirements were derived. However, an electrical engineer is still necessary to figure out exact specifications for electric components and their placement within the alarm clock core.

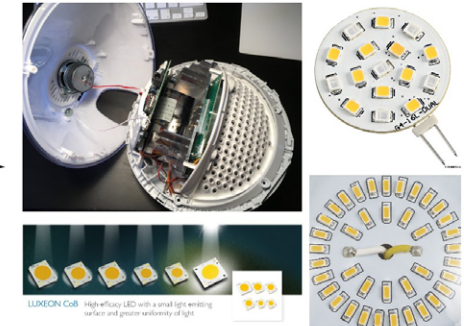
## Light emitting surface

= 3/4 of the lotus petals are covered in light emitting surface, which create different ambiances according to settings.

Small LEDs of different colours are connected to a motherboard and covered by an opaque plastic surface. That way, the light is dispersed in a natural way and can be controlled by the app.

### Requirements:

- The light emitted is even and consistent
- The components do not overheat (the alarm clock can be safely touched even after hours of light being on)
- The individual LEDs cannot be seen through the plastic
- The LEDs provide a good range of colours and control



## Digital time

= At the front of the lotus alarm there is digital time, along with bluetooth+alarm indicators and date. The day of the week is also visible.

### Requirements:

- The light is contrasting and sharp enough to be easily readable, but not too bright to look at night.
- The precision of the time component is high enough to contain all the information+ indicators.



## Sound emitting speaker

= The speaker plays a melody during the awakening and falling asleep process. The melody increases in volume or fades away depending on the setting. The user cannot set their own songs, but the preset melodies are not simple buzzing.

### Requirements:

- The alarm clock should have a range of sound between 50 and 80 decibels.
- The speaker grill should not look too "cheap", in order to convey the quality of sound.

50	Limited sound	Refrigerator working, car driving past
55		Percolating coffee-maker
60	Audible	Sound of human voice, machinery
70	Irritating	Television set on loud, vacuum cleaner, several people on the telephone
75	Constant sound	Busy restaurant around lunchtime
80	Unpleasant	Alarm clock, freight traffic, doorbell
85	Loud	Sawing, mixer
90	Extremely unpleasant	Truck close by, screaming, yelling, shouting
95	Pain	Drill, violin
100	Extremely unpleasant	Machine in a factory, compressor, fighter jet at 300 m.

## Motherboard

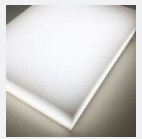



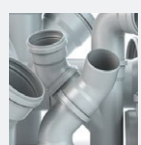


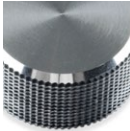

=Motherboard controls different components of the alarm clock. It's compact and placed at the centre of the device.

### Requirements:

- The motherboard has enough connections to control LEDs around the device.
- It is space and heat efficient.



# Material selection

Component	Requirements	Options	Decision made
Petals (front and sides)	<ol style="list-style-type: none"> <li>1. Translucent material which evenly disperses light from LEDs.</li> <li>2. White appearance once the light is not off.</li> <li>3. Can be formed using injection moulding</li> </ol>	 <p>Acrylic</p>  <p>Polycarbonate</p>  <p>PTFE plastic</p>	<p>Acrylic plastic was chosen because it met the requirements and is commonly used to disperse light evenly. Polymethyl methacrylate in its pure form is entirely transparent and resembles glass. As a result, a more frosted variant of this material must be used.</p>
Core	<ol style="list-style-type: none"> <li>1. Cost-effective.</li> <li>2. Can be formed using injection moulding.</li> <li>3. Not brittle, resistant to heat.</li> </ol>	 <p>Acetal</p>  <p>PVC plastic</p>  <p>PBT plastic</p>	<p>PVC plastic is best suited for the device's core. It is rigid but not particularly tough, and its low cost makes it a cost effective engineering plastic. Because of its quick cooling times, it is suitable for injection moulding.</p>
Top button	<ol style="list-style-type: none"> <li>1. Cost-effective.</li> <li>2. Pleasant to the touch, good grip.</li> </ol>	 <p>Brass</p>  <p>Steel</p>  <p>Aluminium</p>	<p>The top knob/button of the device is made of brass because its finish is similar to the concept direction. Because it is commonly used in the manufacture of knobs, this component can be obtained from an existing catalogue. This saves money on the cost of customizing this component.</p>

# CMF proposal

Apart from physical properties, materials have aesthetic characteristics, which contribute to the overall feel of the object. CMF (colour, materials and finish) is an area of industrial design that focuses on the chromatic, tactile and decorative identity of products and environments. For this project specifically, CMF should be considered, since it can determine the product's overall value.

A collage was made to convey the overall feel of the product. White plastic and translucent, light conveying materials are dominant, with some golden highlights. According to the concept, the product has golden finishes which elevate overall elegance of the design and bring visual contrast to the petals.

According to research and value analysis, the product should have the following characteristics:

*Colour:* pale white with golden accents, flexible towards light changes for different modes ("sunrise", "sunset")

*Material:* opaque plastic, steel frame

*Finish:* smooth frost, gold finish on steel details



**PANTONE**  
**489 C**



**PANTONE**  
**7604 CP**

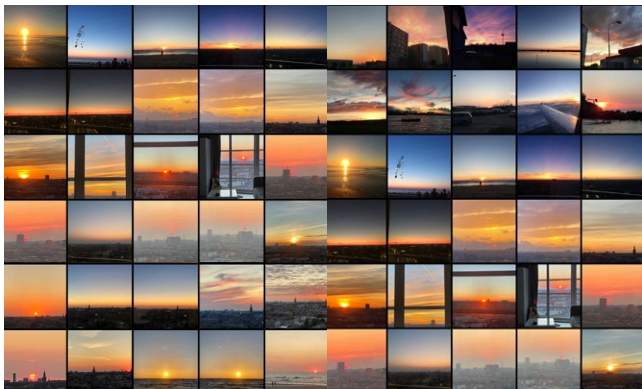


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**2015 C**

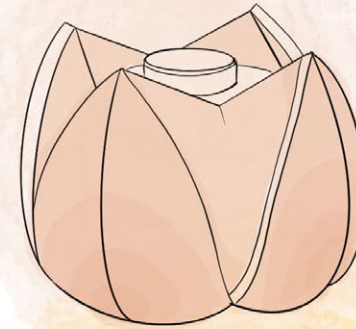
# Light inspiration

Although the materials of the alarm clock are set, their appearance will depend upon the light emitted by diodes at the core. Part of the vision direction for this concept is to make the alarm feel more natural, playful and adaptive. In order to achieve these characteristics, sunsets and sunrises from different days were analysed to create a desirable colour palette for the diodes.

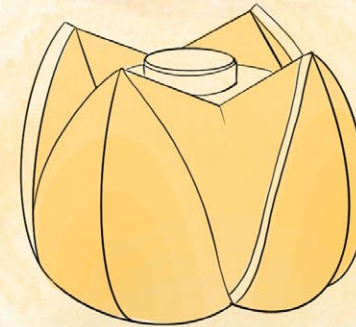
The settings can be adjusted more precisely by the user, but the three main modes for the alarm clock are sunrise (soft pink), sun peak (bright warm yellow) and sunset (lighter blue). These transitions will help the user with falling asleep and waking up. The ambience created by this light can also make the room feel cozier, which adds to the alarm's value as a decor piece.



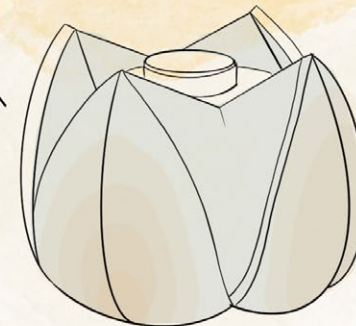
Sunrise



Sun peak



Sunset









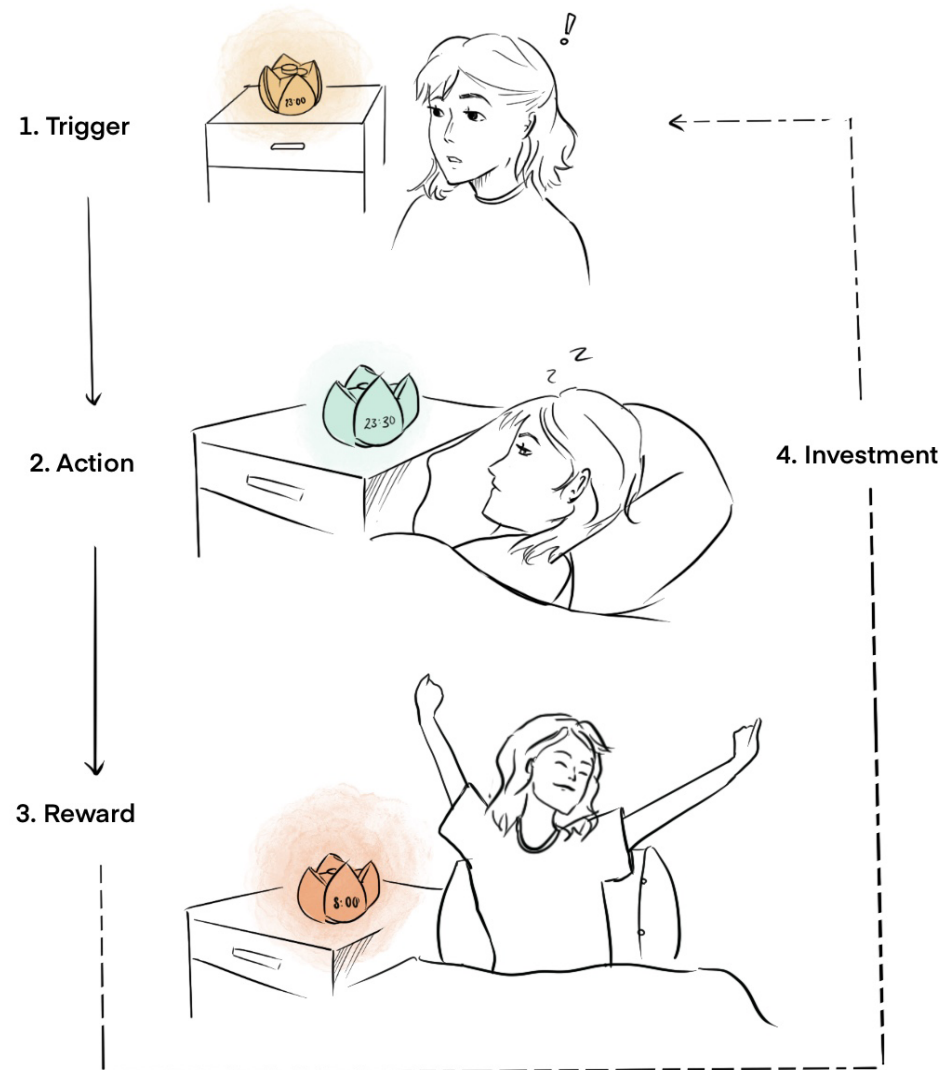
# Customer journey

STAGE	AWARENESS	CONSIDERATION	DECISION		DELIVERY & USE			LOYALTY & ADVOCACY	
CUSTOMER ACTIVITIES	Hear from friends, see offline or online	Compare and evaluate alternatives	Add alarm clock to the wishlist	Make an order	Receive the order	Contact customer service	Enjoy the product	Order again (e.g. as a gift)	Share experience
CUSTOMER GOALS	To find a substitute for phone alarm clock, telling time from the nightstand	Find the most suitable alarm clock (price/aesthetics/function)	Find suitable alarm clock, plan spendings, get inspired	Order effortlessly	Receive the order effortlessly, undamaged and on time	Get help if problems appear, request for refund	Have better wake up experience, improve habits	To share good customer experience	Share feelings, give feedback
TOUCHPOINTS	Word of mouth, social media, Google/Facebook targeted ads	NeXtime website, Google/Facebook ads, Amazon, Bol.com	NeXtime website, Amazon, Bol.com	NeXtime website, Amazon, Bol.com	Delivery service, tracking number	Phone, email, website chat	Packaging, app	NeXtime website, Amazon, Bol.com	Word of mouth, Amazon & Bol.com reviews, social media
EXPERIENCE									
BUSINESS GOAL	Increase awareness and interest	Increase number of website visits	Increase conversion rate (visits to purchase ratio)	Ensure smooth payment process	Deliver on time and minimise delivery window	Increase customer service satisfaction, minimise waiting	Make the alarm match expectations	Increase loyalty, encourage purchase of other NeXtime products	Turn customers into advocates
KPIs	Number of people reached	Unique website visitors	Conversion rate, sales	Online sales, conversion rate	On time delivery rate, average delivery window	Customer service success rate, waiting time	Product reviews	Order value	Google search frequency, customer satisfaction
ORGANISATIONAL ACTIVITIES	Create marketing campaigns and PR	Marketing campaigns, targeted ads	Optimize shopping experience- all info provided, clear pictures	Optimise online purchase funnel, order handling	Warehouse organisation, delivery	Organise customer service	Ensure high quality product standards, upkeeping the app	Target marketing	Manage feedback and social media
RESPONSIBLE	Marketing & communications	Marketing & communications	Customer service, IT	Customer support, warehouse, logistics	Warehouse, logistics	Customer service	Product development	Marketing, IT	Customer service, marketing


# Habit installation

Part of the problem statement for this project was that people use their phones as alarm clocks, which frequently leads to time wasted on social media and news. This wasted time can occur both before going to sleep and during waking up. This type of habit is so deeply ingrained that it is difficult to change. The lotus alarm clock contributes towards breaking this vicious cycle.

There are four steps to developing habits, according to Nir Eyal's book "Hooked". Firstly, a "hook" is created that serves as a trigger for the subsequent action cycle. The alarm clock signalling the start of bedtime preparation with light is that trigger. The user prepares for sleep and falls asleep in the next 30 minutes. The last 10 minutes before actual sleep time, the light guides the user to sleep. This discourages the user from using their phone. The reward of this action is easier morning awakening, which is inevitable due to longer sleep hours. The user then invests time and effort into building the new habit of going to bed and waking up at set times. This habit is difficult to ignore, since the alarm is placed closely to bed on a nightstand (providing constant visual reminder). This new habit leads to better overall sleep health, leaving the user with a positive outlook on the product and experience as a whole.







# Chapter 5

# Evaluation

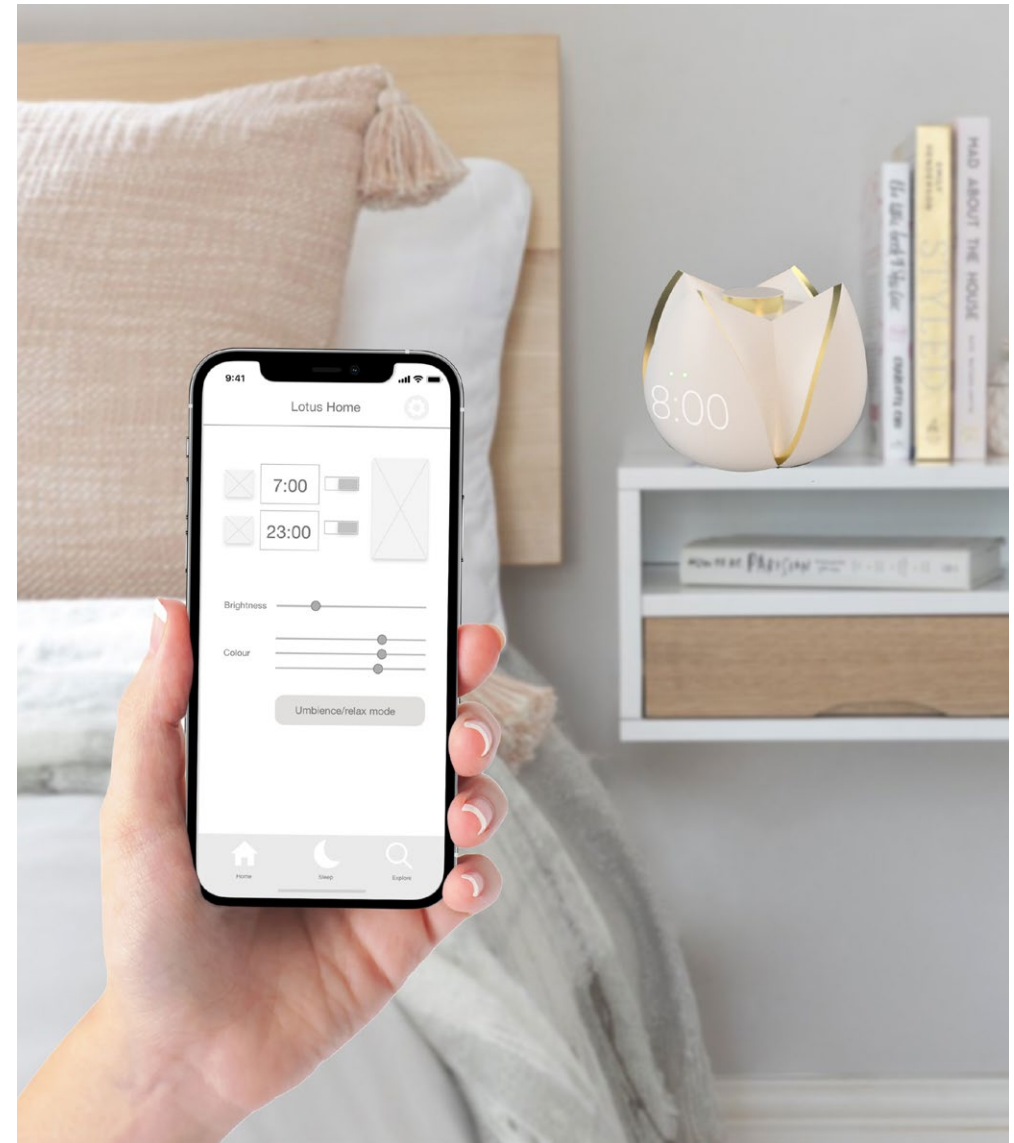
Project overview  
Requirements  
Further development  
Acknowledgements

# Project overview

The goal of this project was to design an alarm clock, which would effectively wake up people on time while keeping stress levels low. During concept development, the vision was refined: the alarm clock should instil a sense of calm in users by assisting them with both nighttime and morning routines.













This vision was achieved with a lotus alarm clock, which comes with an app that controls its settings and educates the user on the importance of sleep. It gently wakes up the user with light and sound, hence facilitating better awakenings. Illuminated petals undergo colour changes via an underlying strip of LEDs, which replicates the colours observed during sunrise and sunset. This focus on light encourages the user not to use their phone in the moment of awakening and falling asleep, which leads to healthier sleep habits. The app itself does not take the user's attention unnecessarily, instead, it helps users who use phone alarms normally to preserve and advance the feature set they are used to.













The product was developed as a result of careful integration of human values, however, it also possesses market and technological benefits. For NeXtime, lotus alarm clock would be a strong addition to the catalogue. It has a clear marketing story that can be targeted towards young people with busy schedules as a solution to chaotic morning routines. Since the final concept is a system of hardware and software, it's upgradable. This system increases product life span and makes it more sustainable.



# Requirements check

● *Fulfilled*
● *Not Fulfilled*
● *Needs further testing*

	Hard	The alarm clock should relieve stressful morning awakening.	<span style="color: green;">●</span>	<p>Sleep inertia is reduced by making the awakening gradual (instead of instantaneous loud signal) and using light. According to research, this is a very effective way of reducing a sense of disorientation in the morning.</p>
	Hard	The alarm clock should reduce the effects of sleep inertia in the morning.	<span style="color: green;">●</span>	
	Soft	The alarm clock sound system should make natural, non-intrusive sounds.	<span style="color: green;">●</span>	
	Hard	The alarm clock should be effective, not too annoying for people to stop using it.	<span style="color: green;">●</span>	
	Soft	The alarm clock should provide information that is usually checked on the phone first thing in the morning.	<span style="color: red;">●</span>	<p>Currently the alarm clock displays time, whether the alarm is set and connectivity.</p>
	Soft	The alarm clock should stimulate more than one sense to wake up the user.	<span style="color: green;">●</span>	<p>Although the alarm clock is successful in making morning awakenings peaceful, there is no guarantee that sound and light would be sufficient signals for deep sleepers. This needs to be further investigated.</p>
	Soft	The alarm clock should imitate natural light patterns to signal the wake up time.	<span style="color: green;">●</span>	
	Hard	The alarm clock is especially suited for people who struggle to wake up in the morning.	<span style="color: yellow;">●</span>	
	Soft	The alarm sound should be melodical to reduce the effects of sleep inertia.	<span style="color: green;">●</span>	
	Soft	The alarm clock should have multiple snooze time options.	<span style="color: green;">●</span>	<p>Setting flexibility is achieved through the app. During the set up the user is asked to indicate their typical wake up and sleep time. There is an option to indicate how those times change over the week (workday vs weekend).</p>
	Hard	The alarm clock should have different modes for the weekday and weekend awakening patterns.	<span style="color: green;">●</span>	
	Soft	The alarm clock should create a sense of serenity and controls by only taking the user's attention when necessary.	<span style="color: green;">●</span>	

	Hard	An emotional attachment should make sure that the alarm clock does not have a negative connotation attached to it.	●	<div>The intention for the fulfilment of this requirement is that the user would focus on the light changes of the alarm clock and would get distracted from using the phone. However, this still needs to be tested.</div>
	Hard	The alarm clock actively promotes the value of not using the phone first thing in the morning.	●	
	Soft	Privacy should be an important value realised through the product design.	●	<div>The alarm's time is shown in thin white light, however different displays need to be tested to confirm night visibility.</div>
	Hard	The time should be visible enough in the dark, but not too bright.	●	
	Hard	The alarm clock should have different modes (sleep/wake/nap).	●	<div>Naps were not considered as a separate mode setting. It can be an idea for a future app update, depending on the interest from the customers.</div>
	Hard	The alarm clock should be made from high quality tactile materials.	●	
	Hard	Easy to set up for the first time, as well as during the use.	●	
	Soft	The alarm clock should show the user that it can make him/her a morning person.	●	<div>The product aims to build better habits around sleep by installing bed time and wake up triggers. However, the success of this method still very much depends on the user and their motivation. Improvement of sleep habits needs to be tested and if successful, it can become another opportunity for effective product marketing.</div>
	Hard	The alarm clock should have a strong story/usage scenario, which makes it marketable online.	●	
	Hard	The product is realistic to develop and manufacture within a year.	●	
	Hard	The alarm clock should have an overall cost effective manufacturing.	●	
	Hard	The alarm clock should have a power backup feature, in order to avoid losing settings in the event of a power shortage.	●	

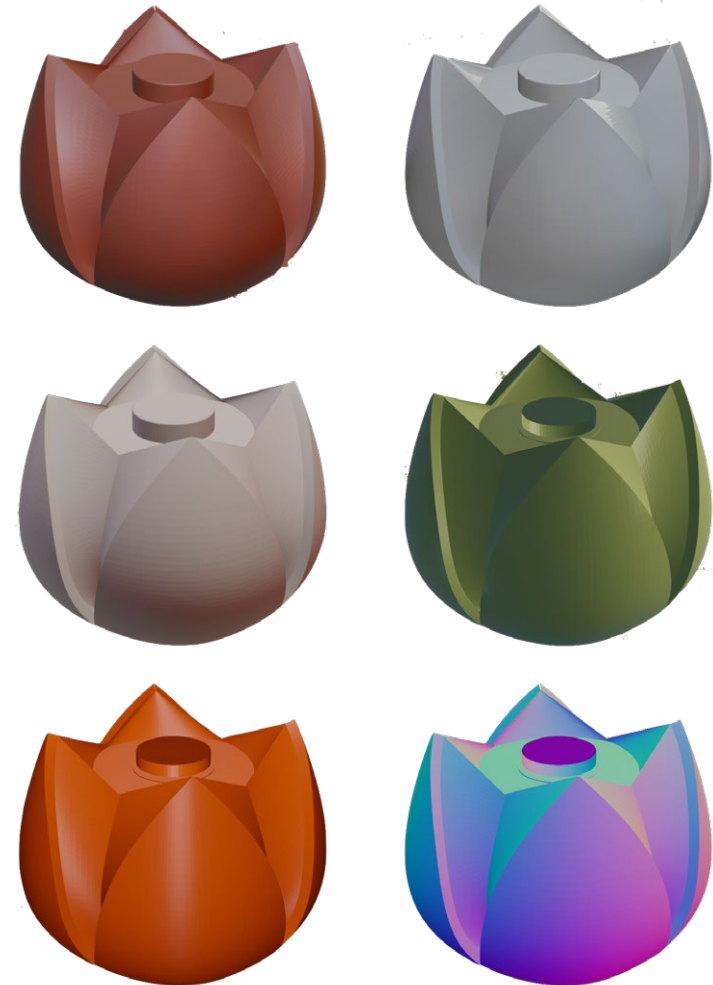


# Further development

Given the time frame, the project was successful in terms of developing a conceptual overview of a new alarm clock. However, having a solid idea is only beginning of the design process. Many aspects of the design still need to be optimised, in particular for making the product manufacturable. In it's current state it cannot be assembled from components. A first step for solving this would be to model snap-fits and 3D print the model to see how the components come together.

Another area of development is inner components. An electric engineer must be consulted to see how the concept functional requirements can be technically fulfilled. Hardware needs to be prototyped and tested to see if the final product fits the intended vision. The wireframe of the app can be a starting point for a UI designer to finalise the look of the app. Afterwards, software developers need to connect the app with device's electronics and make it reliable. Finally this type of project requires efforts from the marketing team to bring it to the customer. Online campaigns and social media ads are necessary to bring awareness to this product.

There is still a lot of work ahead before this product can be sold to the customer, however, I hope this concept directionary can help NeXtime in making decisions in the upcoming stages of product realisation.



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