

Hactive

A design inspired by STANDA

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ABSTRACT

This report presents the design process of Hactive. The design process is based around the existing STANDA design, which was created with the goal to reform a day at the office by motivating the user to become more physically active. With STANDA as initial position, Hactive was created throughout an 8 week design process, during which the team went through multiple iterations of orientation, ideation, conceptualization, realization and validation. The concept Hactive has become the literal "Heart of the meeting room."

Authors Keywords

design; office; active; lifestyle; posture; heart; meeting; room; visualization; environment;



Figure 1: 3D render of Hactive

INTRODUCTION-HEALTH AND VITALITY

"The physical energy to do something, the motivation to achieve personal goals and the resilience to face challenges. Vitality is thus a kind of "fuel" that influences behavior and performance. A lack of vitality makes someone feel lethargic and weak. "

Vitality is the combination of three elements[8], as explained by Dorien Simons, vitality expert at Mensura:

Physical health, mental well-being and motivation determine the energy level. Although they do have a different specific weight. Physical health is the foundation: it stands or falls with vitality. Sufficient exercise, a balanced diet and a regular sleep pattern are a must.

Mental well-being is the second building block. "It is closely linked to the physical component. A healthy mind effectively starts with a healthy body. And just like with physical strength, emotional and mental energy can be trained, also in the workplace. For example, by teaching employees how to recognize problematic stress and how to deal with it in the right way. "

The final but driving force of vitality is motivation. Personal motives determine the direction that someone chooses in his personal and professional life, what goals he pursues and what persistence he displays in doing so. Motivation arises from a combination of personal and situational characteristics. Some get motivation from themselves, others are more motivated by external stimuli.

INTRODUCTION-VITALITY IN THE OFFICE

Health and vitality plays an important role in everyday life. Vitality plays an essential, yet undervalued role in the office, especially now that the retirement age is rising and we continue to work longer. There are increasing amounts of health problems related to prolonged sitting, also resulting in more injuries that hinder employees in their work, such as back pain, neck pain or a mouse arm. Fortunately, there are a number of effective methods to increase vitality in the office.

The ideal sitting position does not exist, but there are a number of health and safety standards that you can pay attention to. Use a sitting instruction to properly adjust your office chair. In addition, it is necessary to vary the way you sit. Continuously straight sitting is not good for the body, always look for a new position. Sitting for long periods is not healthy and therefore the best working posture is alternation. Use a sit-stand desk or flexible workstation for this and keep moving enough. It is also a good idea to switch to activity-based working, also called Activity Based Working, where you look for a suitable workplace for each activity.

Activity Based Working [5] is the successive design concept of "flexible working". This has nothing to do with cost reduction, as is still widely thought today. It is precisely the productivity and efficiency of employees that is central to activity-related working.

Not the personal position, but the activities determine in which working environment should be worked. With this concept, the office is divided into various rooms that seamlessly connect with the activities, such as concentration rooms, brainstorming rooms, telephone rooms, lounge areas and meeting rooms.

It is important to relax sometimes, even between work. Physical exertion often leads to mental relaxation. Moving while working increases labor productivity, despite the reduction in hours worked. In addition, more exercise also reduces absenteeism.

So a vital employee is someone who comes to work with a lot of enthusiasm, but also stays positive when things aren't going well. From that perspective, vitality in the workplace is more relevant than ever. After all, the number of long-term sicknesses and employees with a burnout increases every year [1]. The consequences for employer and employee cannot be underestimated. For example, the costs quickly rise to 200 to 250 euros in direct wage costs per day of absence (i.e. with a gross salary between 2,500 and 3,000 euros).

In addition, the direct colleagues sometimes have to take over the tasks of the absent employee, which causes them extra stress. If this situation persists for a long time, the company risk even more burned-out employees. As an emergency solution, the company can possibly find a temporary replacement, but that is often a time-consuming task. Moreover, it is usually difficult to have an expert position replaced by a temporary worker.

The healthier your body and mind, the more vital you are. For example, if the employees perform physically demanding tasks, it is important that they also take care of their bodies after work. After all, repeated physical strains can cause injuries. Spending a whole day at the office isn't much better though. Although sitting employees have to endure less strain, sitting too much is also detrimental to their health. Flemish adults spend an average of 8.3 hours sitting down: 57% of the day [9]. This can ensure that employees come home exhausted in the evening and find it difficult to find the courage to exercise or cook a nutritious meal.

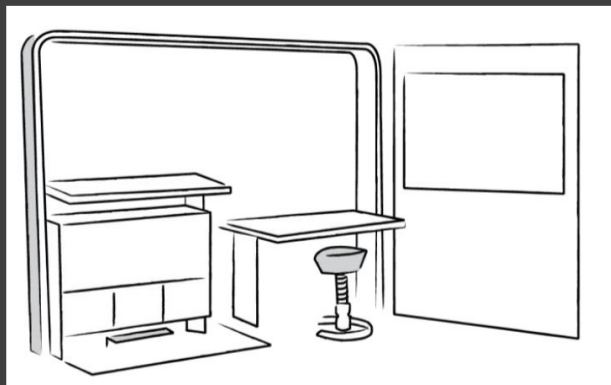
This is problematic, because healthy food contributes to the (mental) well-being of your employees. Did you know that a healthy diet improves concentration, problem solving, creativity and productivity? It can even reduce the risk of stress and depression. It is usually not due to knowledge about healthy food. Rather, it is about choice behavior. In addition, employees who exercise regularly are less often absent from work. If they do drop out, it is usually for a shorter period than colleagues who do not exercise much. Those who exercise generally also feel better about themselves and are more productive at the office.

In short, prevention is and remains better than cure. And that is possible with Hactive. Standa senses social and working behaviours during meetings and nudges workers to stand up more, change activities, or continue their meeting in the form of a walking meeting. Standa stands against the standard and question our ways of working.

RELATED WORKS - ACTIVE IN THE OFFICE

Active Office: Towards an Activity-Promoting Office Workplace Design

In this paper, the problem of physical inactivity in the context of office work and a new concept of working "in-motion" with high potential to reduce prolonged sedentary behavior and related degenerative phenomena is introduced. A paradigm shift in workplace design towards an integrated supportive environment that provides opportunities for office workers to seamlessly change between different work environments is discussed, as well as associated opportunities and challenges for HCI design to encourage people for the adoption of a physically active work process in a more natural way[7].



The sedentary office: An expert statement on the growing case for change towards better health and productivity

In this paper, a group of experts provides guidance for employers to promote the avoidance of prolonged periods of sedentary work. These recommendations were developed from the totality of the current evidence, including long-term epidemiological studies and interventional studies of getting workers to stand and/or move more frequently.

The evidence was ranked in quality using the four levels of the American College of Sports Medicine. The derived guidance is as follows: for those occupations which are predominantly desk based, workers should aim to initially progress towards accumulating 2 h/day of standing

and light activity (light walking) during working hours, eventually progressing to a total accumulation of 4 h/day (prorated to part-time hours). To achieve this, seated-based work should be regularly broken up with standing-based work, the use of sit-stand desks, or the taking of short active standing breaks[2].

Workspaces That Move People

This article explains about how spaces can be designed to produce specific performance outcomes—productivity in one space, say, and increased innovation in another, or both in the same space but at different times[6].

A distributed location system for the active office

This paper discusses distributed systems for locating people and equipment, which will be at the heart of tomorrow's active offices. Computer and communications systems continue to proliferate in the office and home. Systems are varied and complex, involving wireless networks and mobile computers. However, systems are underused because the choices of control mechanisms and application interfaces are too diverse. It is therefore pertinent to consider which mechanisms might allow the user to manipulate systems in simple and ubiquitous ways, and how computers can be made more aware of the facilities in their surroundings. Knowledge of the location of people and equipment within an organization is such a mechanism. Annotating a resource database with location information allows location-based heuristics for control and interaction to be constructed. This approach is particularly attractive because location techniques can be devised that are physically unobtrusive and do not rely on explicit user action. The paper describes the technology of a system for locating people and equipment, and the design of a distributed system service supporting access to that information[4].

An evaluation of the impact of office environment on productivity

The goal of this paper is to develop a validated theoretical framework for the evaluation of office productivity, which includes components to represent both the physical and the behavioural environment. It is proposed that by adopting such an approach, insights into the dynamic nature, or connectivity, of office environments can be established. The main focus of this paper ays on the investigation of the effects of the office environment on its occupants' perceived productivity[3].

Factor	Name	Attributes	Cronbach's alpha
All			0.95
1	Comfort	Ventilation, heating, natural lighting, artificial lighting, decor, cleanliness, overall comfort, physical security	0.89
2	Office layout	Informal meeting areas, formal meeting areas, quiet areas, privacy, personal storage, general storage, work area – desk and circulation space	0.89
3	Interaction	Social interaction, work interaction, creative physical environment, overall atmosphere, position relative to colleagues, position relative to equipment, overall office layout and refreshments	0.88
4	Distraction	Interruptions, crowding, noise	0.8

Table 1: Four components of office productivity

Type of office	Cellular	16
	Open plan	83
	Total	100
Dedicated desk	Yes	96
	No	4
	Total	100
Time in the office (%)	0-20	1
	21-40	7
	41-60	16
	61-80	16
	81-100	60
	Total	100
Variety of tasks undertaken in the office	Very low	2
	Low	9
	Average	49
	High	32
	Very high	8
	Total	100

Table 2: Demographic results for individual process workers

DESIGN PROCESS - INITIAL POSITION

STANDA was developed with the design goal to motivate people in the office to get more physically active. Standa in this condition is a first concept and it isn't quite reaching its full potential. The design is pillar-shaped, which was a well thought-out design decision. First of all, the shape allows the user to work on it with its laptop or notebook. When the users are having a meeting, they need to be able to work productively, and a flat surface is required to allow that.



Figure 2: STANDA - the original concept

In addition, it had to be possible to sit on the object, so that users can take a break from standing, while the design goal for STANDA was originally to make standing more normal during meetings. The concept was also created based on this vision, yet it must remain possible to be able to sit during a meeting. Especially considering people who are pregnant or who cannot stand that long due to a medical condition. STANDA's shape allows sitting through turning the pillar on its side, so that it becomes a sofa. The only downside to this, is that the user has no longer a spot to place their laptop or tablet.

Another aspect that is present in this design is the way in which the user is made aware of their sitting behavior. This is done here with light feedback. This was chosen because light is a fast and strong output. However, the problem with this may be that the light to the user appears too invasive and distracting. Whether it is too subtle and therefore ignored, this must of course be prevented. So a struggle is to find a good compromise here.

The lights are placed on the sides of the pillar, so that both when the user is sitting and standing the feedback is visible to him. So if the pillar is laid flat (and used as a sofa), the light would turn on. After some time, the light will flicker and slowly increase in speed. At some point, the flickering would be so intense and annoying that the user would get up. When this happens, positive feedback is given in the form of rainbow colored lights. In this way, it motivates the user to get up more during meetings, but also offers an opportunity to sit down.

DESIGN PROCESS - ITERATION 1

The first decision made during this iteration, was to focus on the design case, and to let go of the current STANDA design. This was decided as a result of the fact that STANDA did not achieve the design goal in the way the design team was tending to.

A couple days of researching (section *Related Work*) resulted in new insights. These include conclusions about the current status of activity in offices, the effects of a deficit of physical movement and currently applied techniques to get people moving. The new insights, in combination with multiple brainstorming sessions, as well as a lot of sketching and visualizing, lead to a new general concept.



Figure 3: 100 sketches challenge

DESIGN PROCESS - ITERATION 2 - NEW CONCEPT

The freshly created concept was based on the vision that this concept should use more of the potential than STANDA did. A system consisting of 2 components was to be installed in a meeting room.

One of the components was to measure either the environmental aspects, such as air quality, or human posture. On one hand, environmental aspects would be the easier way to go, on the other hand, posture would be very interesting to look into, yet also quite hard. This was a decision left for later.

The second component would supply the feedback to the person(s) in the meeting room. When the detection part comes to the conclusion that it is about time for a break and to get some movement, the feedback part communicates this back to the user and guides him/her out of the room using a light pattern on the wall or glowing footsteps on the floor.



Figure 4: Glowing footsteps create a path towards the door

DESIGN PROCESS - MIDTERM

This concept was presented during the midterm, and this gave some really valuable feedback to work with. The concept was not coherent enough, and it was not clearly enough motivating people to actually get moving. This, alongside some other insights, got us back to the drawing board to adjust the concept.

DESIGN PROCESS - ITERATION 2 - FINAL CONCEPT

After demoday, the concept required a new fresh twist. The only thing that was allowed to stay, was the system of using 2 components. Inspired by the research about health, the new design goal became to make a literal "Heart of the meeting room" and use visual feedback through light to notify the user about the current situation. Since focussing on posture would reduce the feasibility, the choice fell on using the environment and measure aspects as humidity, ozon and CO₂ levels to get a good reading of the air quality. Air quality also has a quite large impact on work-efficiency, making it a good aspect to consider. Other aspects as posture were moved towards the list of future possibilities, since making a working prototype using either a lot of very specific pressure sensors, or quite advanced software for rigid body tracking would bring the feasibility close to null given the amount of time and tools.

The new concept called "Hactive" could in our opinion only be shaped in the form of a heart, since the design was to become the literal heart of the meeting room. This also resulted in the name H(eart)ACTIVE.



Figure 5: 3D render of Hactive

The heart itself is a separate component from the holder. The holder contains all the sensing and uses wireless transmission to stay connected to the heart. It also has a screen which, after the user taps one, shows what exactly is wrong in the room.

After the user taps twice, the screen lets the user know what can be done to improve the current state. The heart is made of a semi-transparent material, to allow the LED's inside to give clear feedback to the user.

When everything is normal, the heart has a calm red pulsing glow, resembling a heart beat. If the holder detects that temperature levels are rising, and the efficiency of a meeting is endangered, the light will change. The pulsing will get a different rhythm, the light will fade down over time as the room status gets worse.

The heart will change into different colors depending on what exactly is going on. Say for example that the temperature is getting cold, the heart will go from calm and red to a bit shaky and dark blue before slowly fading off. If the user sits with a bad posture, the heart will turn dark grey and get more inconsistent pulses before slowly fading off.



Figure 6: The heart gets dark and then slowly fades off

These colour combinations are only suggestions, the user can always set the colours in every way that works for him/her.

At this point the user notices the process of changing colour and pulse, and decides to act and revive the meeting room. The user taps the holder once to see what's wrong, and twice to get advice about how to solve the issue. The holder tells the user to open all available windows and in the main time go for a walk to get some fresh air for 15 minutes. The user picks up the heart, takes it outside for a walk and comes back to a fully refreshed meeting room, also personally feeling better thanks to the break and the fresh air.

DESIGN PRINCIPLES

Interactive

To achieve the design goal, it is important that Hactive allows for multiple interactions. The user has to actually act and stand up to revive the heart, while restoring efficient working conditions in the office.

To get the user to act, he/she needs to know what to do. To inform the user, the holder has a screen implemented. When the user taps the holder once, the screen will explain what the exact problem is. After the problem is revealed, double tapping will change the information from problem to solution. In this instance, tapping was chosen because of the simplicity of the interaction, and the decision on double tapping was made based on the risk of potential accidental tapping through, which could happen easily if only one additional tap is required.

To get users to actually get some physical movement themselves, it is required to take the heart away from the holder during the restoring process. The heart itself also needs refreshment, just like the user does. For that reason the holder's information doesn't end with how to get the room refreshed, it also tells the user to go for a walk for example, or to walk to the canteen and get some water.

Sensing

One of the shortcomings of the STANDA concept is the lack of data collected. STANDA uses pressure sensors to detect a user when the pillar is being used, yet there is nothing else being monitored. Aspects as air quality or even data about the user could have played a big part in accomplishing the design goal.

Hactive was originally designed to make use of real time environmental data, such as humidity, temperature and CO₂ levels, but the possibilities are much vaster than the environment. Especially in the office, it is not uncommon for people to spend their day sitting at a desk. This could have a negative long-term impact on the workers' health. With the use of rigid video analysis, or even pressure sensors in the chair, the posture of the worker can be measured and feedback can be provided to save the worker from possible back problems in the future.

Aesthetics & Feedback

The design team was quite interested into the whole health aspect of the design case. After the midterm demoday, a new concept was created, and what stayed with us was a sentence from the research: "The heart of the meeting." The decision was made to implement that, and create a literal physical heart of the meeting room. The basic glowing colour of the heart in neutral state is red, yet the user has full control over what colour represents what state. This way people can choose whatever makes sense to them, and colorblind people can select tints which they can see without having all sorts of confusion. The heart also pulsates using the glow, this is done to resemble an actual heartbeat. The heartbeat will also change rythm and strength together with the color, details on how it will chance depend on what issue it should represent.



CONCLUSION

Evaluation

The main focus of this design project was about explore the experience of taking an existing design concept, and give a new and different twist to it, resulting in a new concept. The design case consisted of making people more active during the working hours in an office environment. Our focus was quickly set at getting people to get physical active. We took, for this situation, the environment as trigger, since this had an impact on work efficiency and, at the same time, was also the most feasible option as well.

Our main discovery during the demoday presentation, was that our concept is interpretable in multiple ways. Somebody thought for example that the red heart had a more romantic symbolism, and that a different color would have been a more convincing choice. Other people thought that the red heart was a really nice resemblance of the 'healthy and alive' vision.

Future work

Given all the delay and setbacks, the design team wasn't able to do proper user testing. A good round of testing would give new insights to work with. The next phase in the design process would then be to start a new iteration based around the implementation of the posture measuring.

DISCUSSION

The final product, the older with the heart on top had the aesthetics we expected, but did not reach the final phase. The first obvious finding, which had a lot of influence, was how hard it was to measure somebody's perfect sitting position, this was possible with a lot of sensors or a camera built in artificial intelligence, but due to time and not enough experience with such products, this sent our product in a whole different direction, to focus on the environment first instead of posture. The final product was far different from the first prototype, because of the lots of changes to the concept during the process. A lot of time was lost which could have been used to improve other aspects of the final product. Another part, which we had to take out of our prototype as a whole, was the electronics, this was due to private problems. In the report a nice base is made for a product, unfortunately it is not physically finished, yet the research to the creation of this final concept and problems you can bump into while designing a product are clearly shown, and the process up till this point creates a good base for a solid concept.

APPENDIX 3 - SKETCHING CHALLENGE HIGHLIGHTS

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Shaped seats

- Lounge
 - Inspired by a lounge chair, it supports sitting upright, lying, sitting with feet up or at 90/90/90.
 - Uroševič, T., Heeriksen, L., van den Broek, A., Dubbels, K., Cherprenkova, O., Bontoliver, H., & Jakeman, C. (2020). Postural/Posture Stimulating Position Changes During Meetings. Extended Abstracts of the 2020 CHI Conference on Human Factors in Computing Systems. <https://doi.org/10.1145/3399438.3399440>
- Stairs
 - This object supports several postures: cross-legged sitting, half-sitting, leaning and standing (or even as a laptop stand).
 - Uroševič, T., Heeriksen, L., van den Broek, A., Dubbels, K., Cherprenkova, O., Bontoliver, H., & Jakeman, C. (2020). Postural/Posture Stimulating Position Changes During Meetings. Extended Abstracts of the 2020 CHI Conference on Human Factors in Computing Systems. <https://doi.org/10.1145/3399438.3399440>
- Balcony
 - Different version of the lounge. Because you sit with your feet on the floor, you can lean your back against the hypotenuse, the laptop can sit on your knees.
 - Based on my own inspiration / experience.
- Work surface
 - Because you can sit completely in the form, but also put it upright (as a support pillar) to make you posture. Because of the shapes you can relax and work at the same time, because you can lean back if you have concentrated on the laptop.
 - Based on my own inspiration / experience.
- Couch
 - Expansion of the current design, because there is now a hunk that like a solid three forms comfort for the user.
 - This is an improvement of the already existing design.
- Bridge
 - Creative variation on the existing model.
 - Based on my own inspiration / experience.
- Slope
 - Modern take on different leaning and half-sitting positions, the slope is pretty steep and that takes some effort to sit in it.
 - Uroševič, T., Heeriksen, L., van den Broek, A., Dubbels, K., Cherprenkova, O., Bontoliver, H., & Jakeman, C. (2020). Postural/Posture Stimulating Position Changes During Meetings. Extended Abstracts of the 2020 CHI Conference on Human Factors in Computing Systems. <https://doi.org/10.1145/3399438.3399440>

Smart furniture

Because why not?

- Lot of talking
- At the start of the meeting, everyone should say a sentence so that all votes of the meeting members are known. When he measures that a certain person has not said anything for a long time, a personal announcement is made through the pillar. For example: "Anouk, you haven't said anything for 10 minutes."
 - Based on my own inspiration / experience.
- Calculating concentration
 - To keep the concentration of the members good / active, random calculations are shown on the display of the pillar every so often. The outcome must then be spoken aloud so that the pillar can detect it.
 - Based on my own inspiration / experience.
- Fresh airing (on stands)
- The pillar measures the air quality present in the room. If it is no longer good / optimal, it blows fresh light into the room.
- Based on my own inspiration / experience.

Shaped furniture

APPENDIX 2 - BRAINSTORM/CONCEPT SKETCHES

INPUT:
 - ENVIRONMENT (MAKING IT BETTER)
 - POSTURE (CORRECTING)

LIMIT:
 - AIR QUALITY
 - TEMPERATURE
 - SLEEPING ZIT HOLDING OVER 2YD

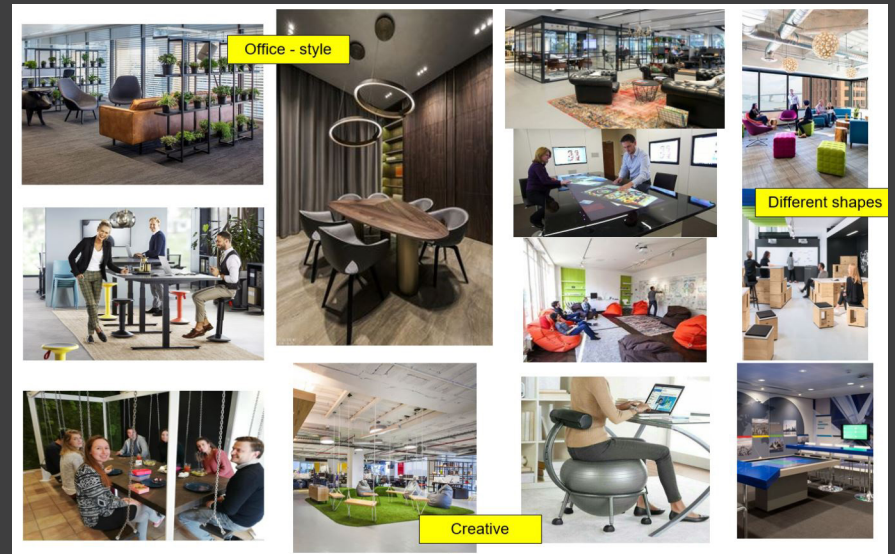
OUTPUT:
 - PHYSIO BALLS TO SHOW A.Q.
 - FOOTSTEPS/PATTERN TO MAKE USER FOLLOW THE ROUTE OUTSIDE

CONCEPT:
 - ENVIRONMENT
 - AIR QUALITY → go for AQUAL
 - DIRECTION NAAR → how the air is not ideal
 - how AIR induced health of meeting efficiency (70% - 100%)
 - BALLS SHOWS STATUS
 - FOOTSTEPS SHOW RESPONSES → go for A WALK

INPUT:
 - ENVIRONMENT (MAKING IT BETTER)
 - POSTURE (CORRECTING)

LIMIT:
 - AIR QUALITY
 - TEMPERATURE
 - SLEEPING ZIT HOLDING OVER 2YD

OUTPUT:
 - PHYSIO BALLS TO SHOW A.Q.
 - FOOTSTEPS/PATTERN TO MAKE USER FOLLOW THE ROUTE OUTSIDE

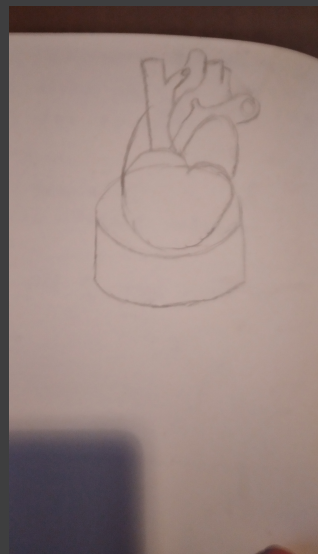


1. ENVIRONMENT NOT IDEAL, SHOWS
 2. ADVISE WHAT TO DO
 3. DURING A WALK

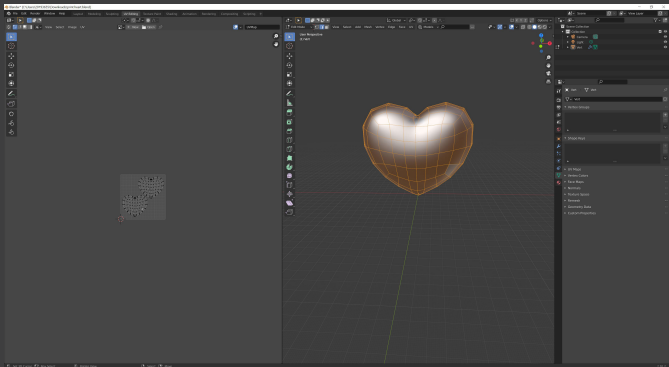
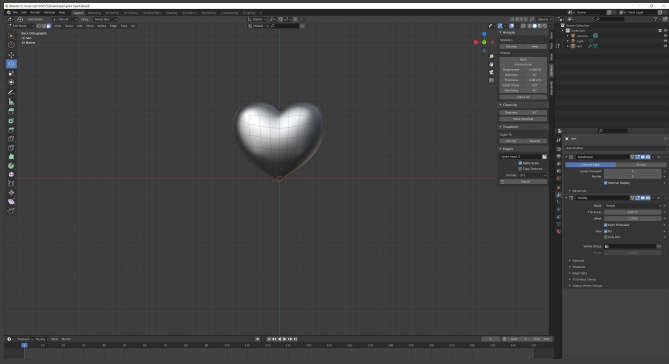
- ADDITIONAL
 - ON VIBRATION MEASUREMENT

STEP 1 → next stage in

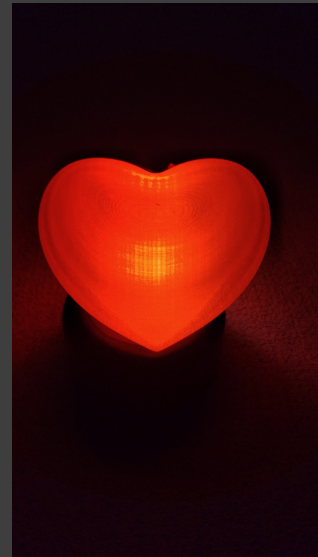
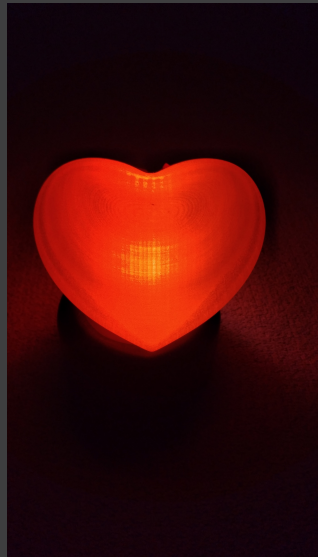
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APPENDIX 3 - IMPROVISED PROTOTYPING



APPENDIX 4 - FINAL RESULT



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