

The Shadow Lamp - Project Documentation

Made by Lucjan Trojnar and Mihai Iancu

Part 1: What is the Shadow Lamp?

The Shadow Lamp is a customizable lighting device that can create different visual effects based on the lampshade placed over it. At its core, it functions as a simple lamp, but with the addition of specially designed covers, it can be transformed into a mood-setting centerpiece or a unique decorative piece for any space.

By simply changing the lampshade, users can dramatically alter the atmosphere of a room, from soft, ambient lighting to striking shadow patterns projected onto surrounding walls. This flexibility allows the Shadow Lamp to adapt to different settings, events, or personal preferences, making it both a functional light source and a creative design element.

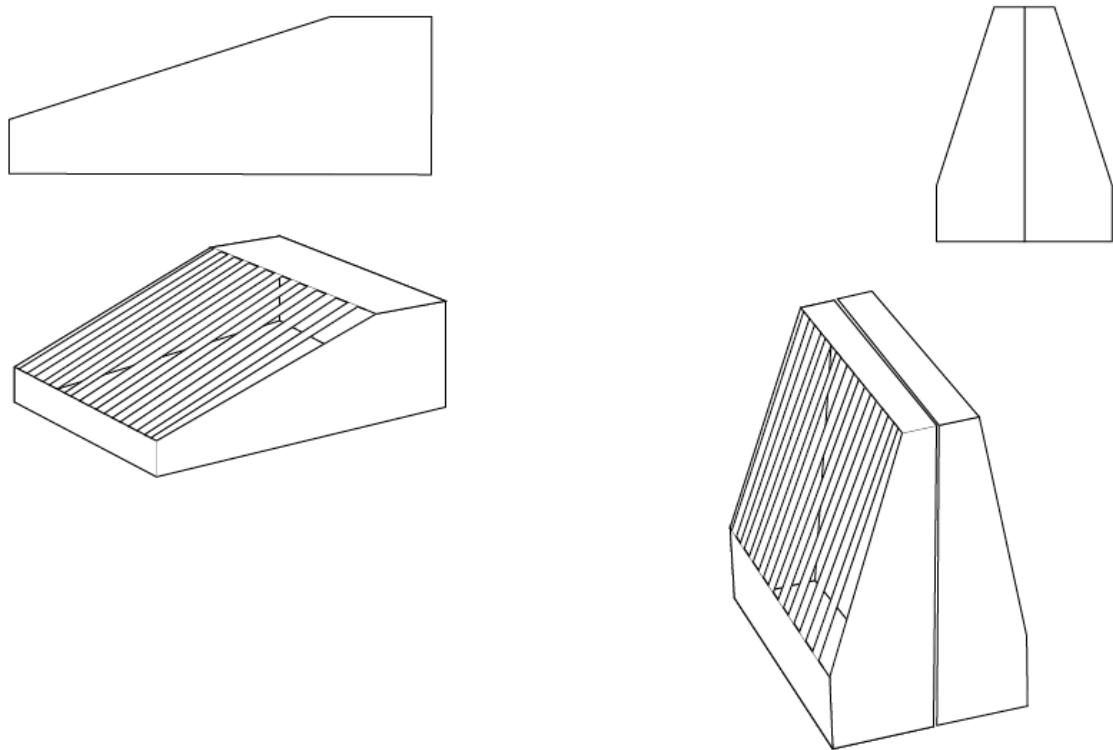
Part 2: What is the objective?

This lamp is more than just an illuminating device. It is designed to function as a dynamic art piece, aimed at enhancing the visual experience of the user. Beyond providing light, the Shadow Lamp transforms ordinary spaces into immersive environments, where light and shadow interact in creative and unexpected ways. Each interchangeable lamp shade acts as a new canvas, offering users the ability to personalize their surroundings and express their style. In this way, the lamp serves not only a practical purpose but also becomes a form of visual storytelling within a room.

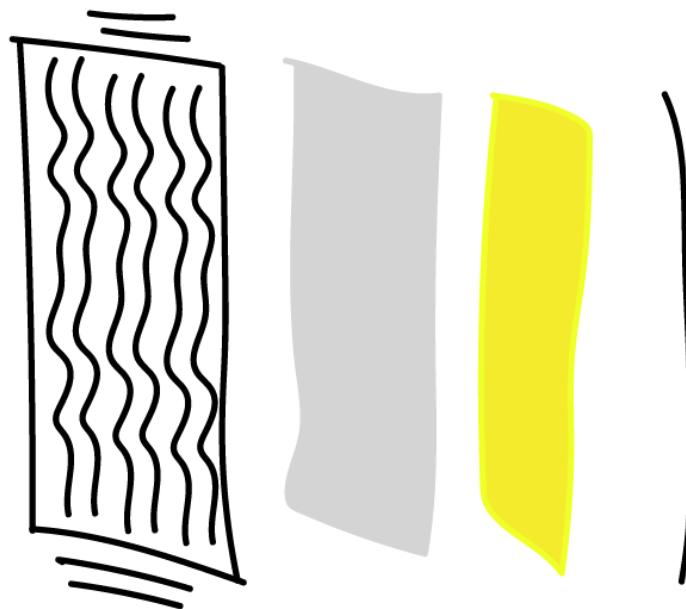
Part 3: Design Process

When we first began designing the Shadow Lamp, we quickly realized that its artistic nature allowed for a wide range of creative directions. Because the concept was not bound to a strict functional form, it opened up many possibilities in terms of shape, materials, and visual effects. This flexibility encouraged us to explore different design approaches, resulting in a variety of early concepts and prototypes.

For the first concept we went with something simple to showcase how it would work.

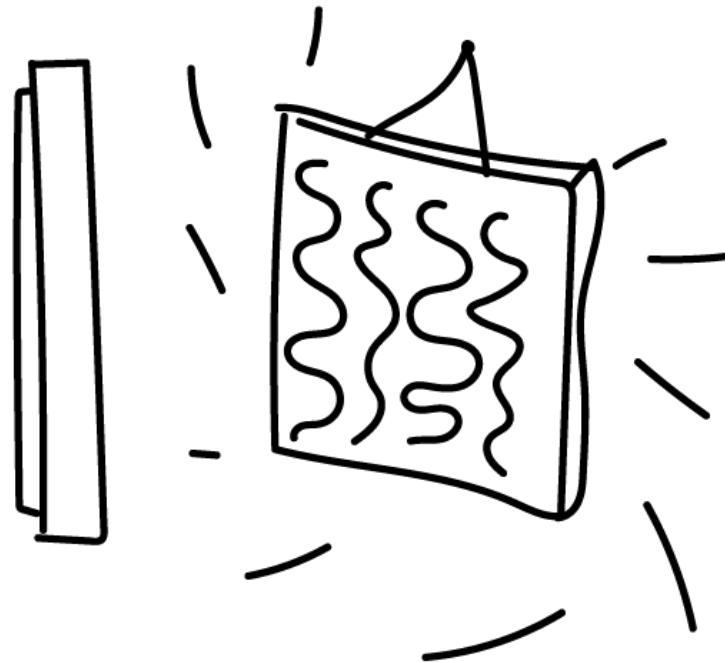


The lightbulb would sit in the middle, behind those lampshades. The visual effects of the Shadow Lamp are created by the cuts in the lampshades. As the light shines through these openings, it casts patterns and shadows onto nearby surfaces.

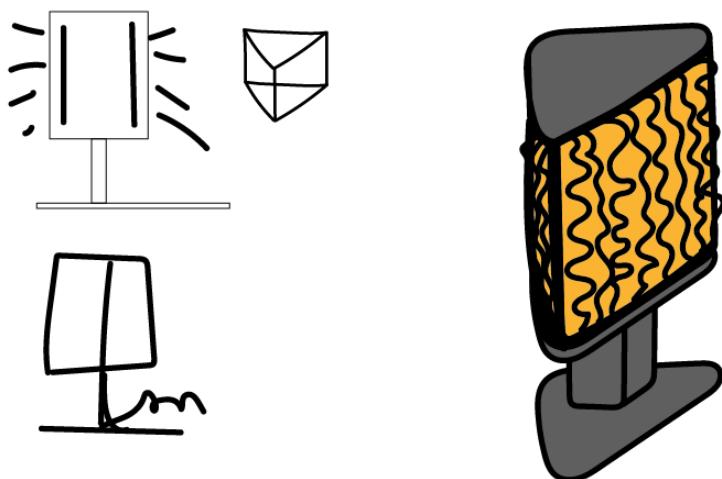


This design represents only the base idea and was never meant to be a real version of the product.

For the first actual version of the product, we thought of a TV like design. The lightbulb is replaced by a panel of LEDs. The light only comes from the front (like a TV) and in front of it there is a lightshade that gives off the effect.

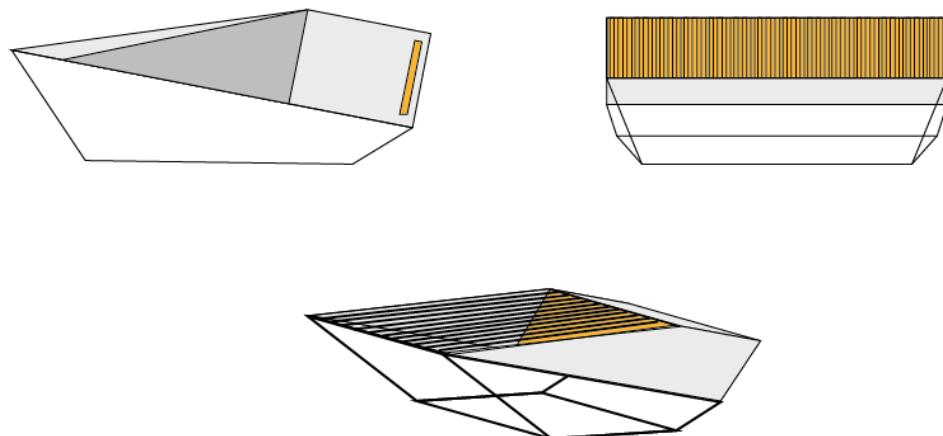


The problem with this design is that, while a decent art piece, it functions terribly as a lamp. With this product we want to enhance the lamp experience without killing the functionality. For the second design we went back to the basics and built a normal lamp with the effect giving panels instead of regular ones. We also thought of a spinning feature that would allow the effect to move.



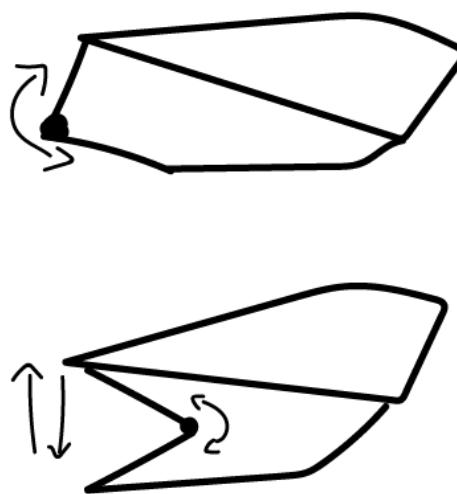
Unfortunately, again, some problems arose with this design. The engine that spins the lamp would make noise, killing the immersion. Also, we realised that this isn't the road we want to take. Back to the drawing board it was.

One thing we wanted to keep was the idea of a "shifting lamp", where the user could alter its form.



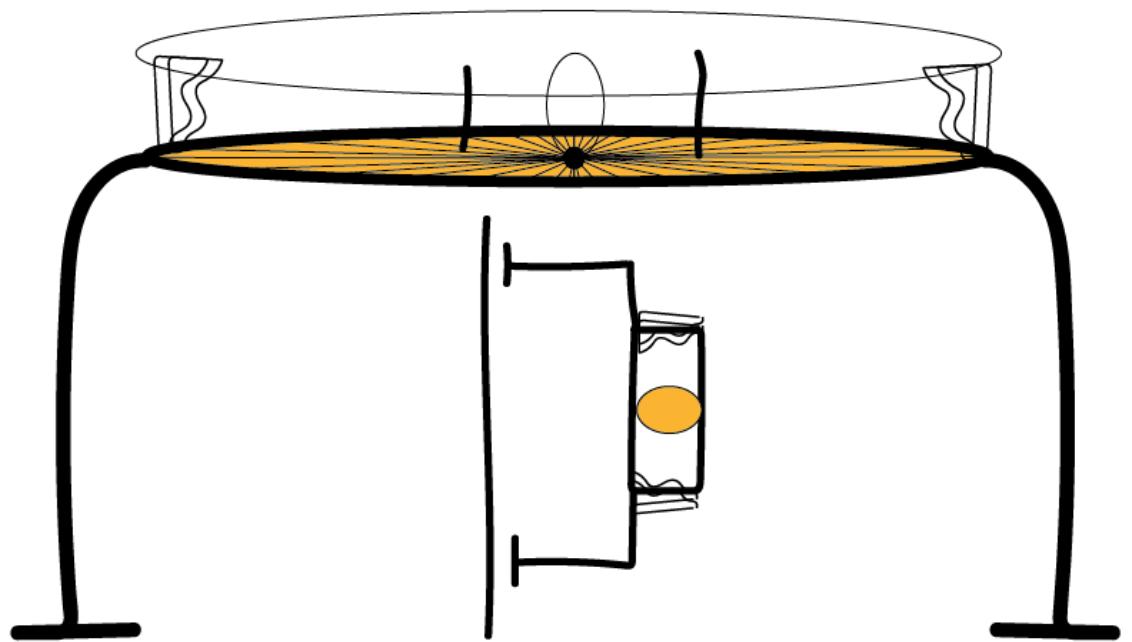
77

Shadow lamp



Inspired from the original design, this one allows the form of the lamp to be altered using hinges. We felt we were on the right path, but there were more changes we could

make to improve the design. In the final design, which also represents the product we're going to build, we kept the "shifting parts" idea but shifted it to the legs of the lamp. The legs move to adjust the position of the lamp. The lamp itself has a round shape with a flat top and bottom.



The lampshades will sit all around the circle, creating a 360 degree effect. These covers are modular, so the user can change the effect or make the lamp give off no effect at all, transforming the product into a regular lamp. The legs can also be attached to a wall, allowing the user even more freedom when using the lamp.

1. Materials and components:

List of components:

- 4 legs
- a base on which the panels sit
- a lightbulb
- panels that form a cylinder
- a top that covers the lamp
- a cable and switch

For the legs we will use aluminum while the base will be made from wood. The panels we want to create digital molds that can then be edited (for customizability) and 3D printed very easily. The material we want to print the panels out of is PLA.

2. How does it work?

The lampshades feature carefully designed cuts that partially block the light, allowing only certain patterns to pass through. When the lightbulb is turned on, the light shines through these openings, casting unique shadows and creating a distinctive bubble effect on the surrounding surfaces. This effect is a direct result of the shape, size, and arrangement of the cuts, which work in harmony with the light to produce dynamic and captivating patterns. Additionally, the covers are modular, allowing them to be easily swapped out. This interchangeable feature offers users the ability to customize the lighting experience, changing the overall ambiance and visual impact simply by switching the lampshade, making the lamp adaptable to different moods or settings.

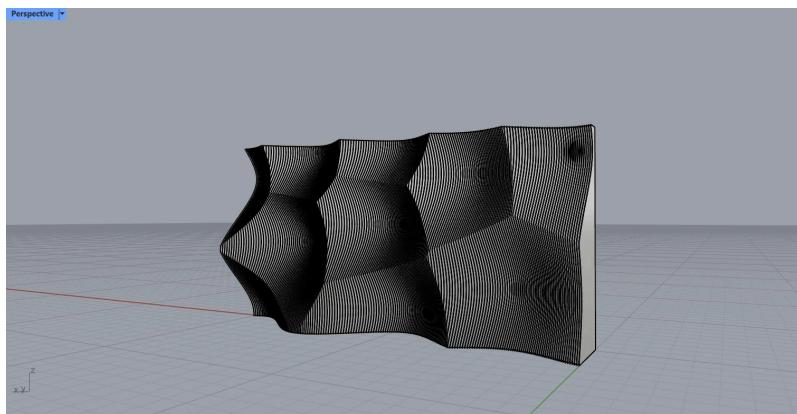
3. Development process

For this project, we designed a lamp using Rhino and Grasshopper. Rhino is a 3D modeling software that's great for building precise, complex shapes, and Grasshopper is a visual programming plugin for Rhino that makes it easy to play around with parametric designs - perfect for testing out variations quickly.

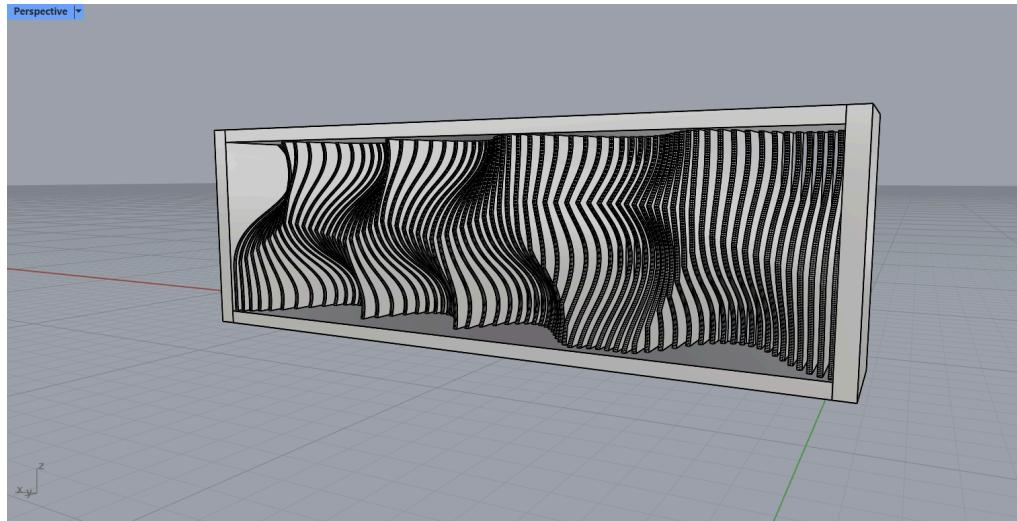
We went through a bunch of different design ideas, but eventually landed on a coffee table concept with a light source in the middle. The lampshade is made up of multiple panels that create a bubbly, organic effect when the light shines through them. The look was inspired by radiators - we were drawn to the way they repeat and create structure and rhythm. While designing, we also leaned on a few online sources and tutorials to help figure out the panel construction and form.

The design also considers the idea of a whole family of interchangeable parts. Both the shade panels and the tabletop can be swapped out for other versions, opening up possibilities for customization or future variations within the same product line.

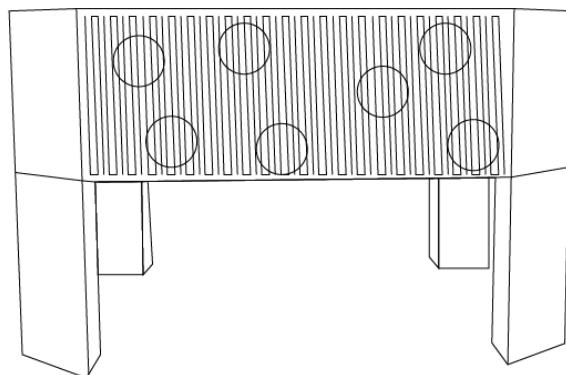
We started off with something like this (this design of course had hundreds of panels and would be impossible to make with the equipment we had available):

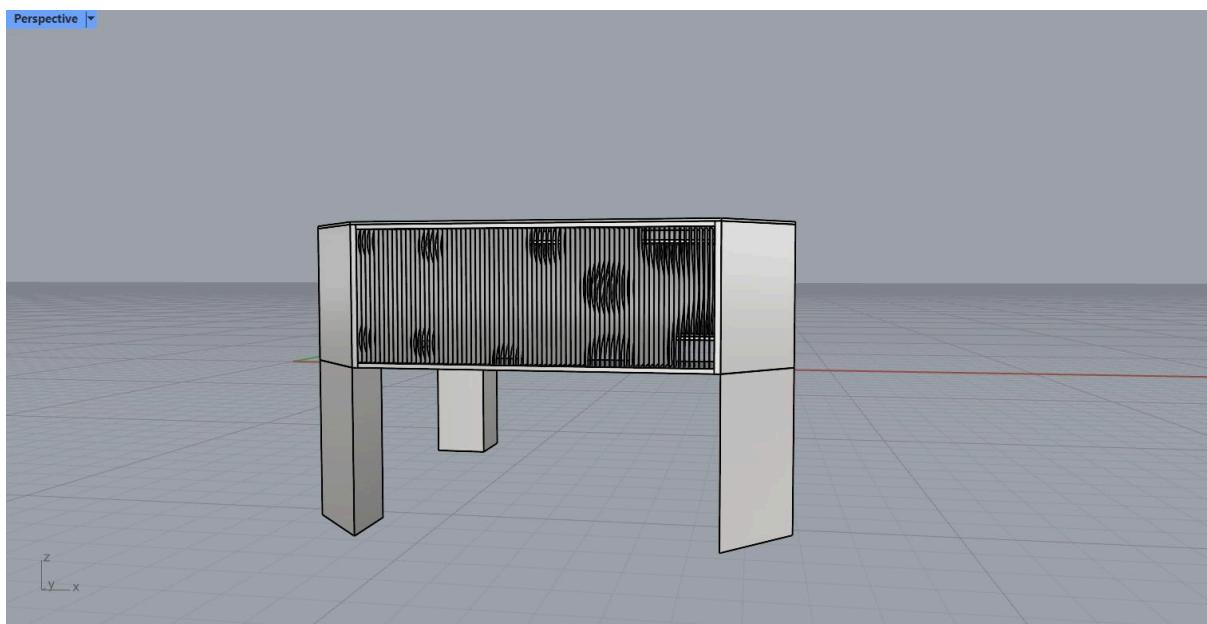


So we had to iterate a bit and limit the number of panels in there as well as specify a thickness that the 3D printer could work with. Each panel came to be around 1,5mm thick. We also made a cover for it. (This particular model got printed as the blue prototype)



Before starting to build the lamp we 3D printed a cover to see how the shade looks. When we created the 3D model we realized that our initial design had a few issues. For example the effect wouldn't work if the shade was circular. So instead of one circle we changed the lamp to be a square. (Below is a drawing of what we wanted to do and the 3d model based off of it)





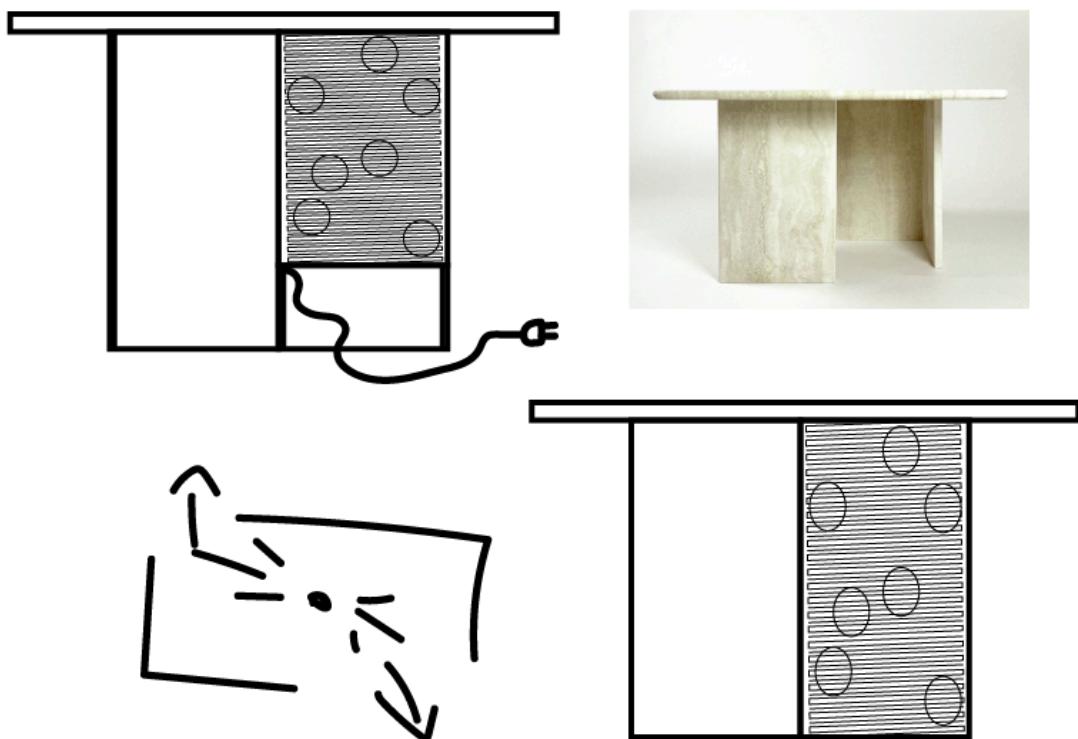
This means that instead of 6 modular pieces we would switch to 4. We have decided to print one of these sides.

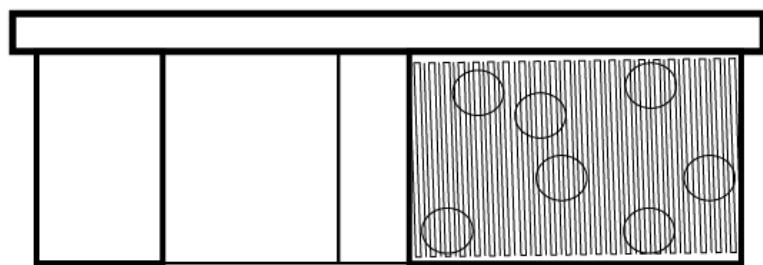
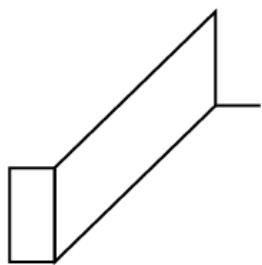
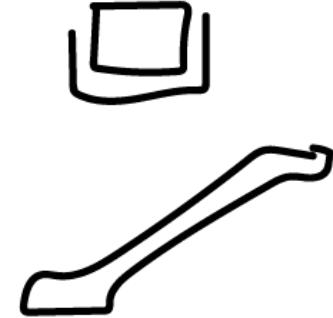
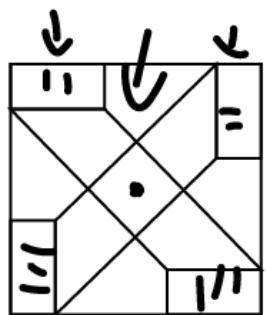
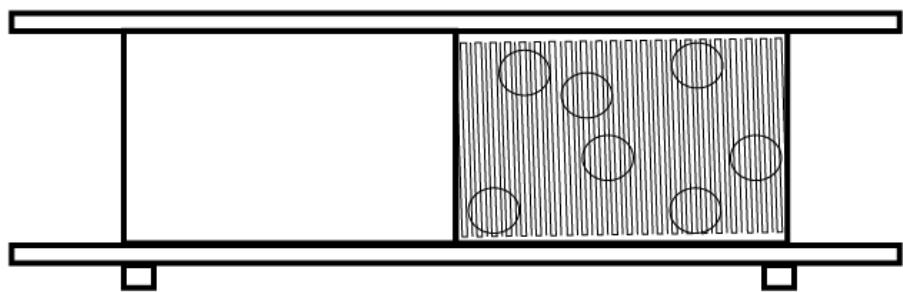
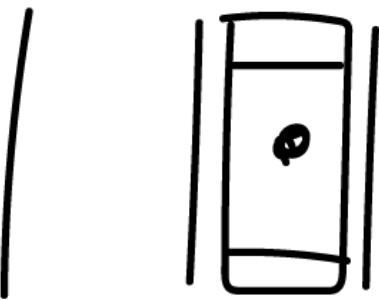


This is just a prototype meant to test the light effect and to see if the 3D printer can print it. With a tangible shade we could actually visualise how the lamp would look like.

We designed the original lamp in a way to avoid having it be a square. Seeing we can't achieve this we decided to shift from the original design. We saw that our lamp started to resemble a table so we decided to do just that. We integrated the lamp into a coffee table. This way it keeps the "light effect" functionality while also having a second purpose.

With this new concept in mind, we went back to the drawing board and started refining the design. Our goal was to make it more visually appealing, while ensuring that it remained practical and producible. After several rounds of sketching, discussing, and revising, we developed three distinct designs. Each one maintains the light feature while presenting a unique silhouette, something that stands out but still fits within a modern interior. They are functional, interesting, and most importantly, true to the spirit of the original idea, even if that idea has taken on a new form.





These are the 3 designs we came up with.

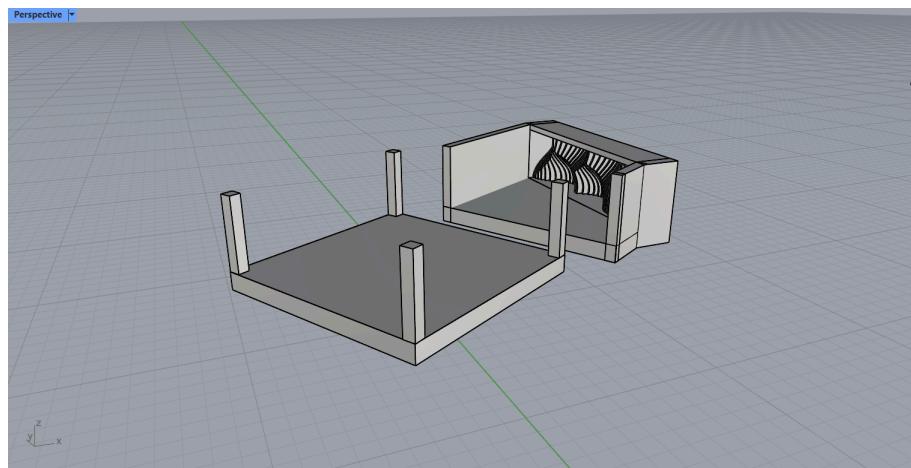
- The first one is more similar to a desk than a coffee table. Here we could only fit 2 shades but they would be bigger.
- the second design resembles more of a classic coffee table. It is very short and it has no room for legs. Unfortunately this has the same problem where we couldn't fit more than 2 shades
- The 3rd design is the most original one yet. It has 4 short legs that are represented by the shades themselves. . They are connected in an "X" pattern and covered with a table top.

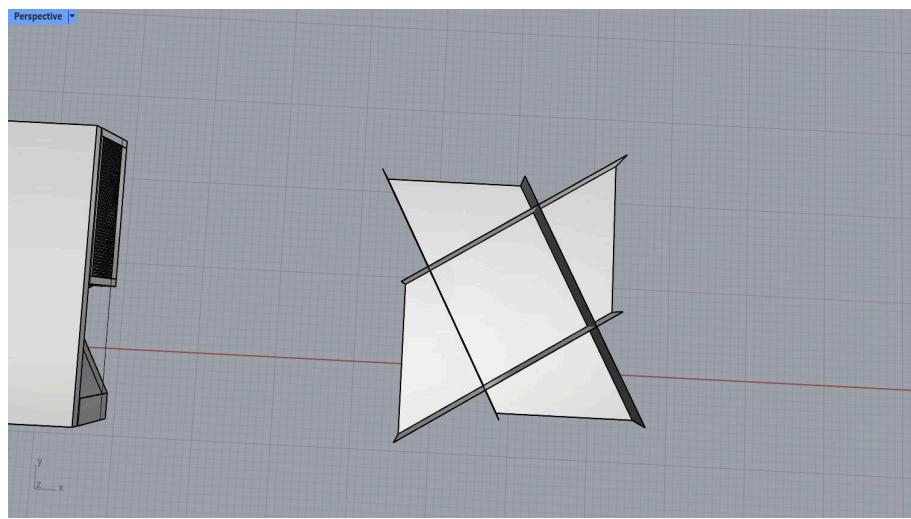
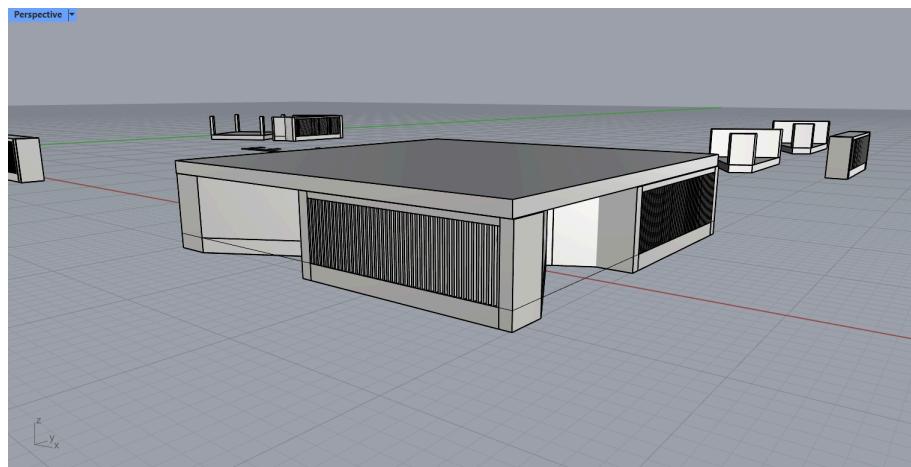
From these 3 designs we decided to go with the 3rd one as it is the most original and interesting one. Now that we finally had a complete plan for the lamp we got to building it. Before building anything we needed to design the components. For the shades we already had an idea of how to build it but we also wanted to add a sliding mechanism that allows them to be removed.

Materials and components:

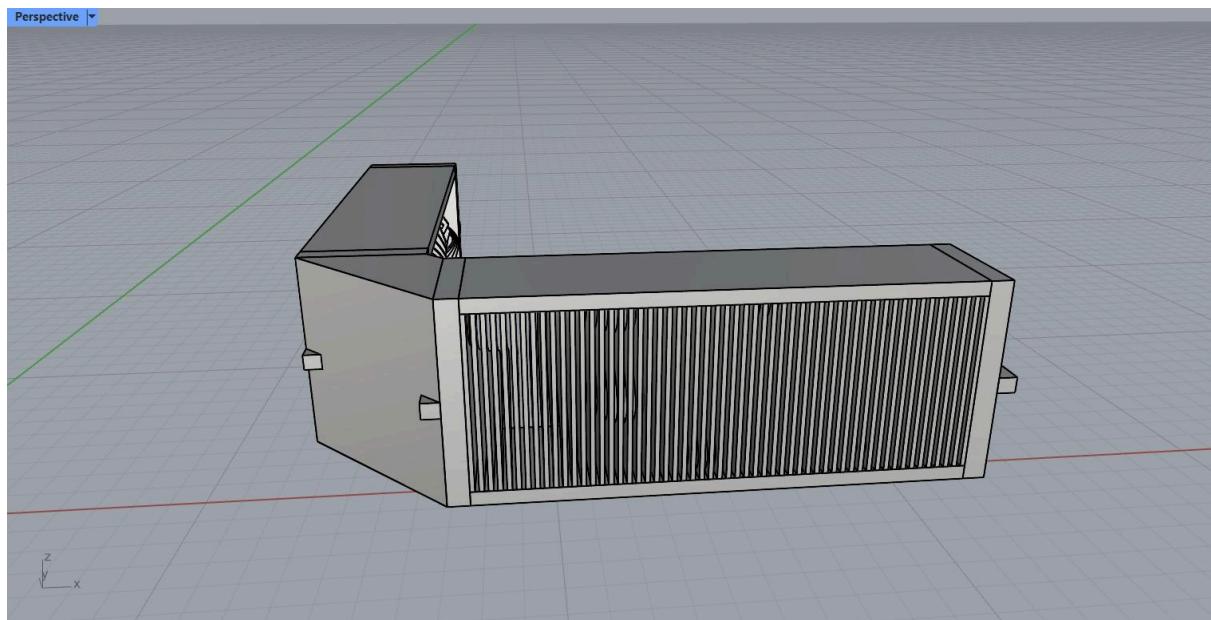
List of components:

- MDF wood boards (that we laser cut to build the table)
- a lightbulb
- 4 shade panels/modules
- a cable and switch

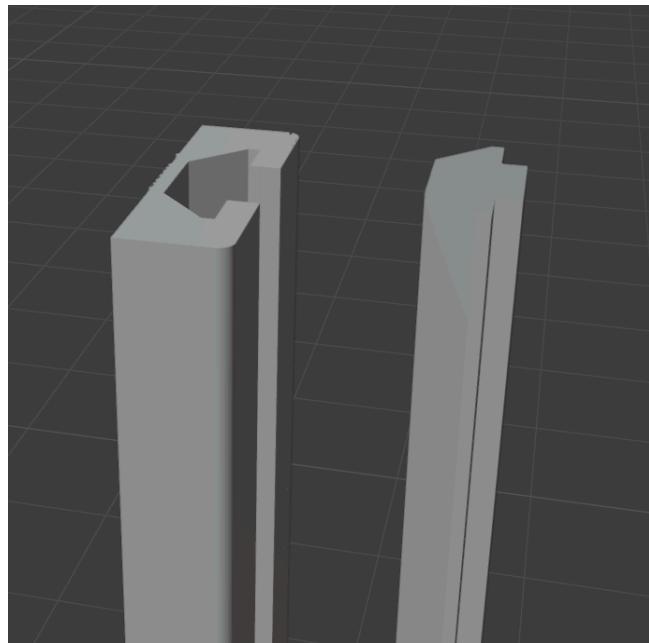




Our first design represents the concept visualised in 3D. We have a center where the 4 sides are attached and a table top. We decided that the sliding would happen between the shade and the leg itself rather than the leg with the center. This means that the legs would be attached to the center and the shader would be a different piece (as originally planned).



This is the sliding mechanism we developed after several iterations. (Picture above is one of the first versions of this idea where it would slide into a corner piece) One side is securely attached to the shader, while the other connects directly to the leg of the structure. It's a simple yet effective solution that allows for smooth movement and keeps the design clean and functional. Getting this mechanism right was a crucial step in the process—once we figured it out, we were finally able to move forward with printing our shaders with confidence.



To produce them, we purchased a spool of brown PLA plastic. The color choice wasn't accidental. We specifically wanted a material that would complement the natural tones of the wood, helping the shaders blend in visually while still allowing the light to do its work.

With the mechanism and material sorted, we could begin 3D printing the shaders and testing them on the physical prototype.

This is the first shader we printed:



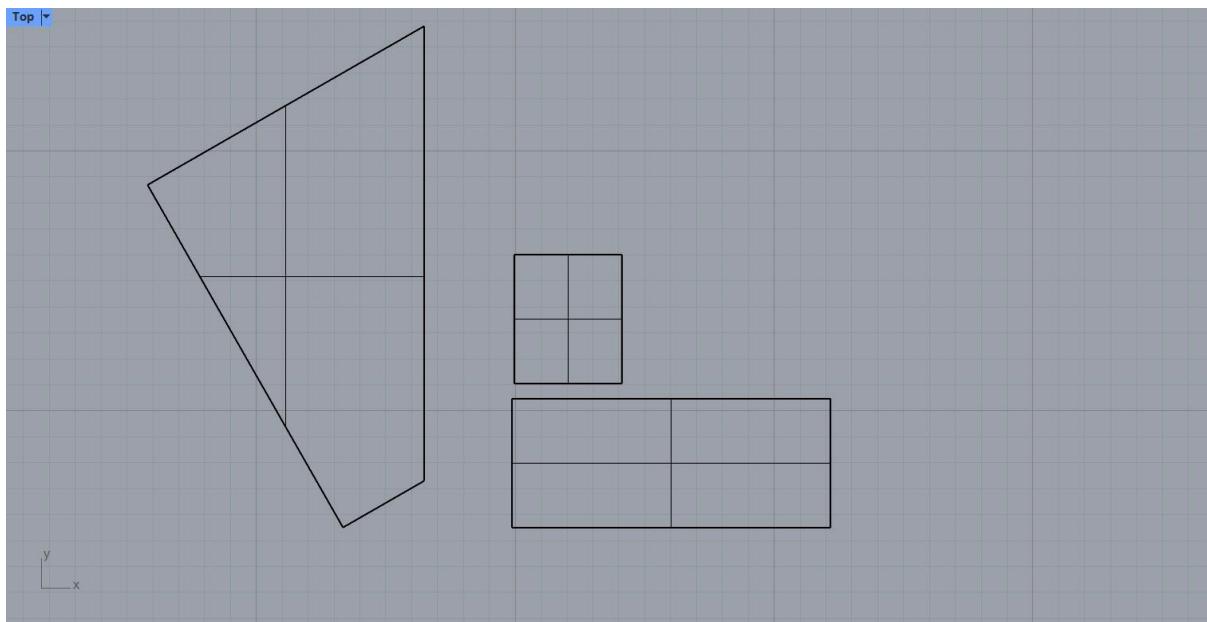
It is very similar to the blue one we printed before but with a few changes (mainly dimensions to shorten printing time as the prototype took 8h to print which was a bit too much and we deemed it inefficient) We integrated the male part of the slider and made everything smaller (20 cm).



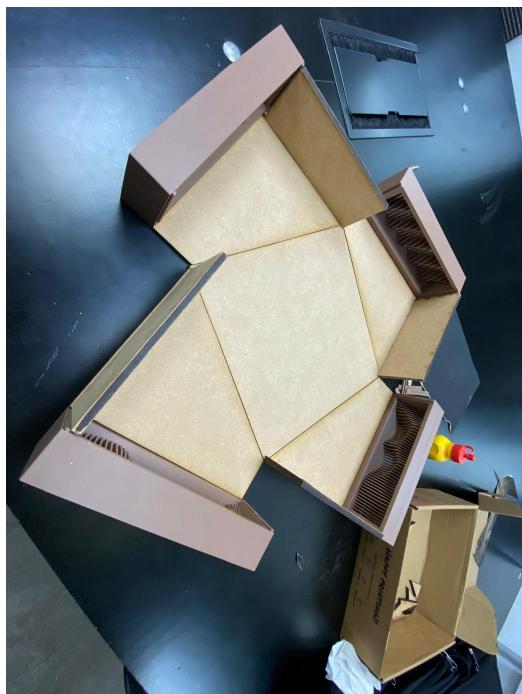
We decided to make 3 of the same shaders and 1 different one to prove our idea of interchangeable parts works out. Each shader took around 6 hours to print so we had to be precise with planning.

With the shaders figured out we could focus on the other parts. We laser cut the structural parts of the table such as walls, floors, supporting beams and of course the main table plate itself. We used various thicknesses of wood for different parts of the table due to financial and dimensional constraints.

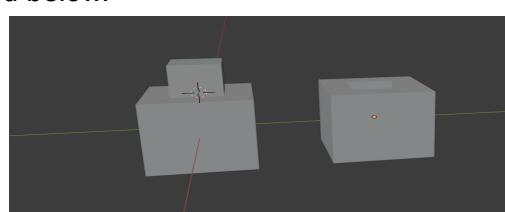
We flattened the 3d model and got the shapes we needed to laser cut (picture below):



This is our first assembly attempt. The entire table is 48x48 cm (still missing a few pieces but the essence is there):



To support the table plate and to allow the removal of it to access the inside of the table and to remove/replace the shade panels we printed out small joint connectors that we placed on 4 pillars in the central space of the structure (the big square in the center). Picture included below.





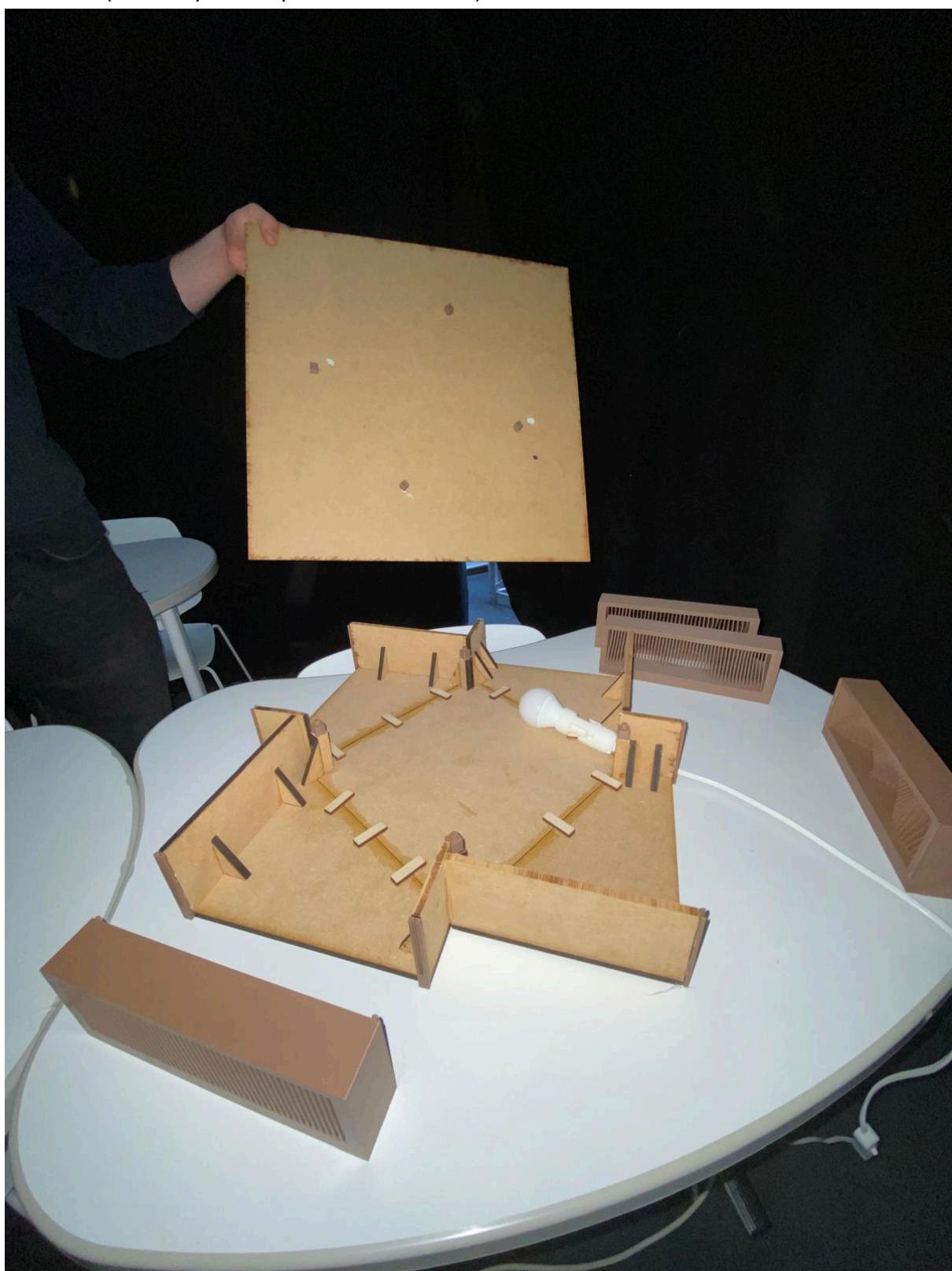
We painted the first tabletop brown and laser cut a simple pattern into it to add some detail.

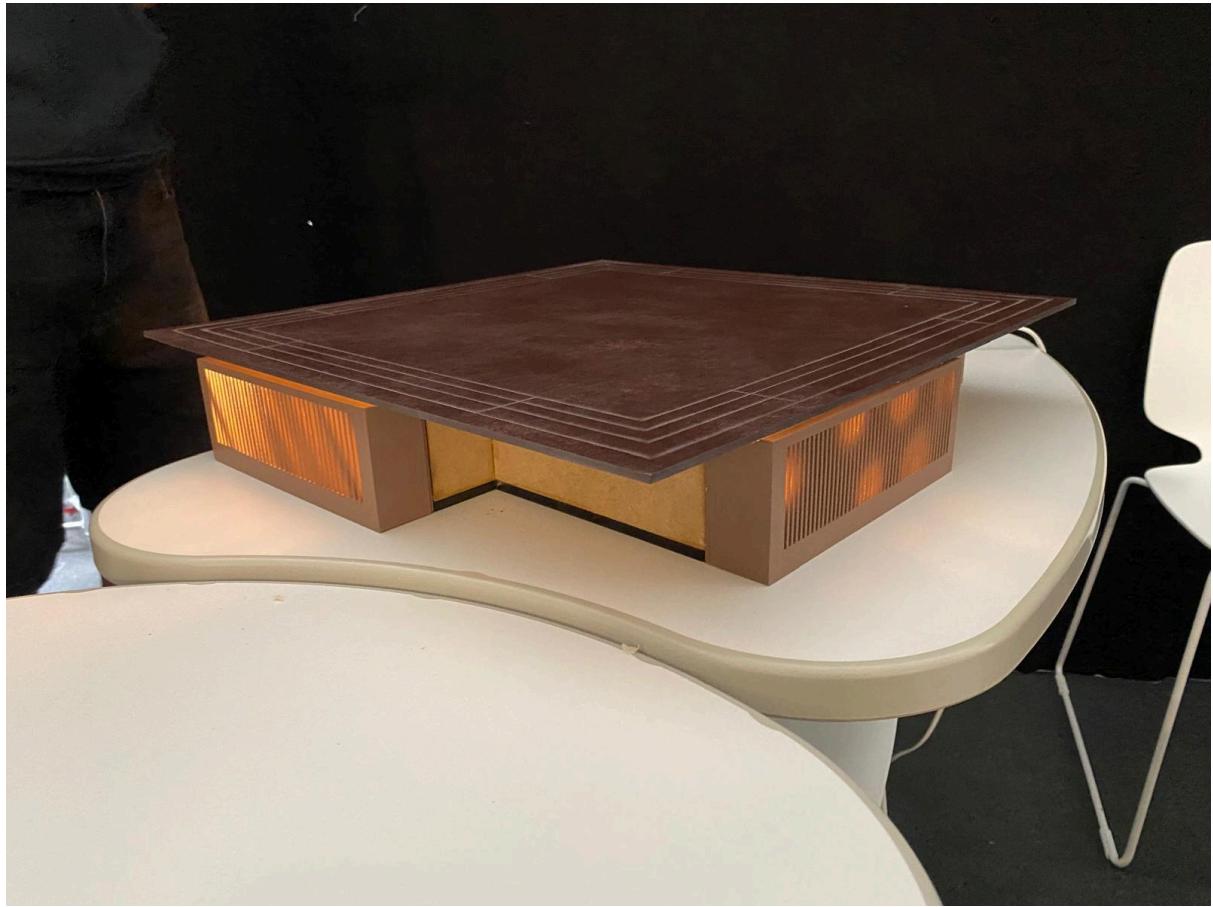
Below is a picture of the tabletop unattached with the lamp turned on.



The lamp goes through one of the walls and can be removed when the tabletop is off.

This is a photo with everything removed. You can also see the inside supports of the table structure. (The lamp in this picture is loose still)





Here is a photo of everything assembled and with the lights turned on.

Afterwards we wanted to add some variety to the tabletop itself perhaps. So we designed a pattern based on some art nouveau designs and also changed the tabletop shape by shaving off some corners to create a hexagonal shape.



This is a picture with the extra tabletop attached (showcasing the pattern) and the lights turned off.