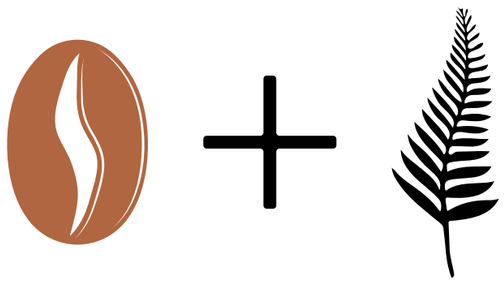
Recycled Beans
Semester 1 Project



Project Brief:

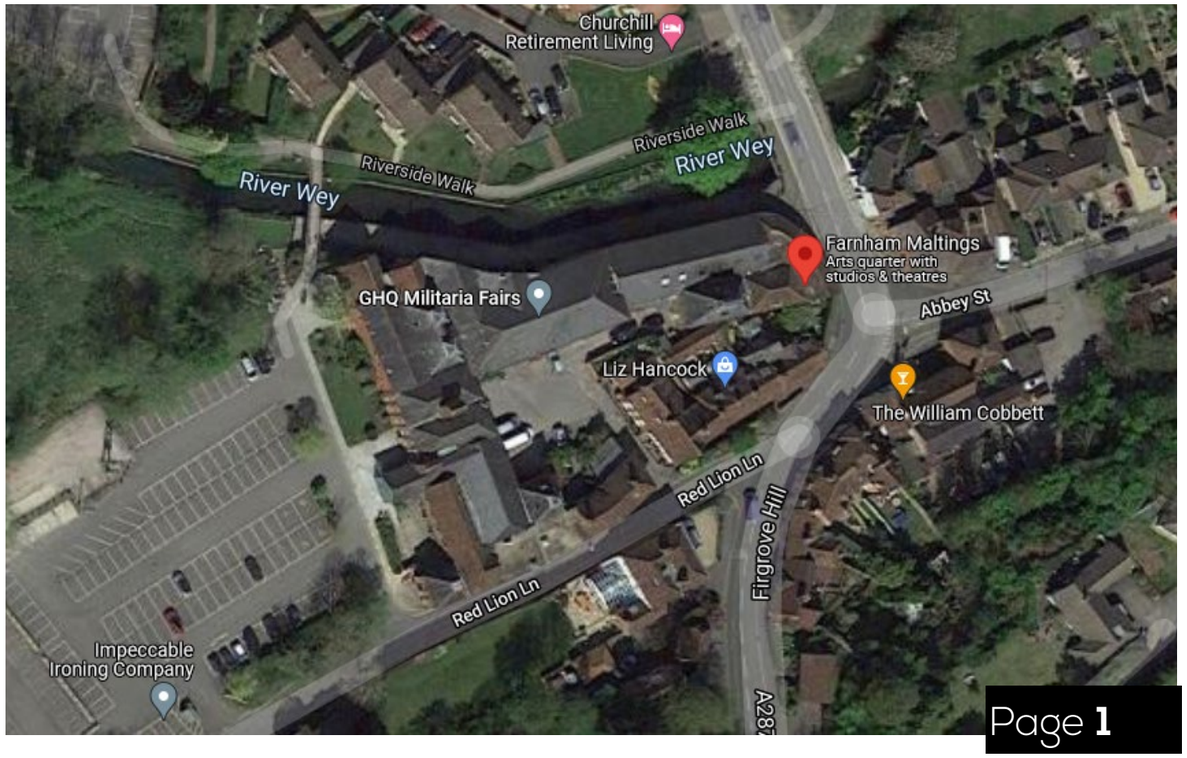
Design a product out of waste/bi-product that will be sold from it's origin point of the waste.

CONTENT

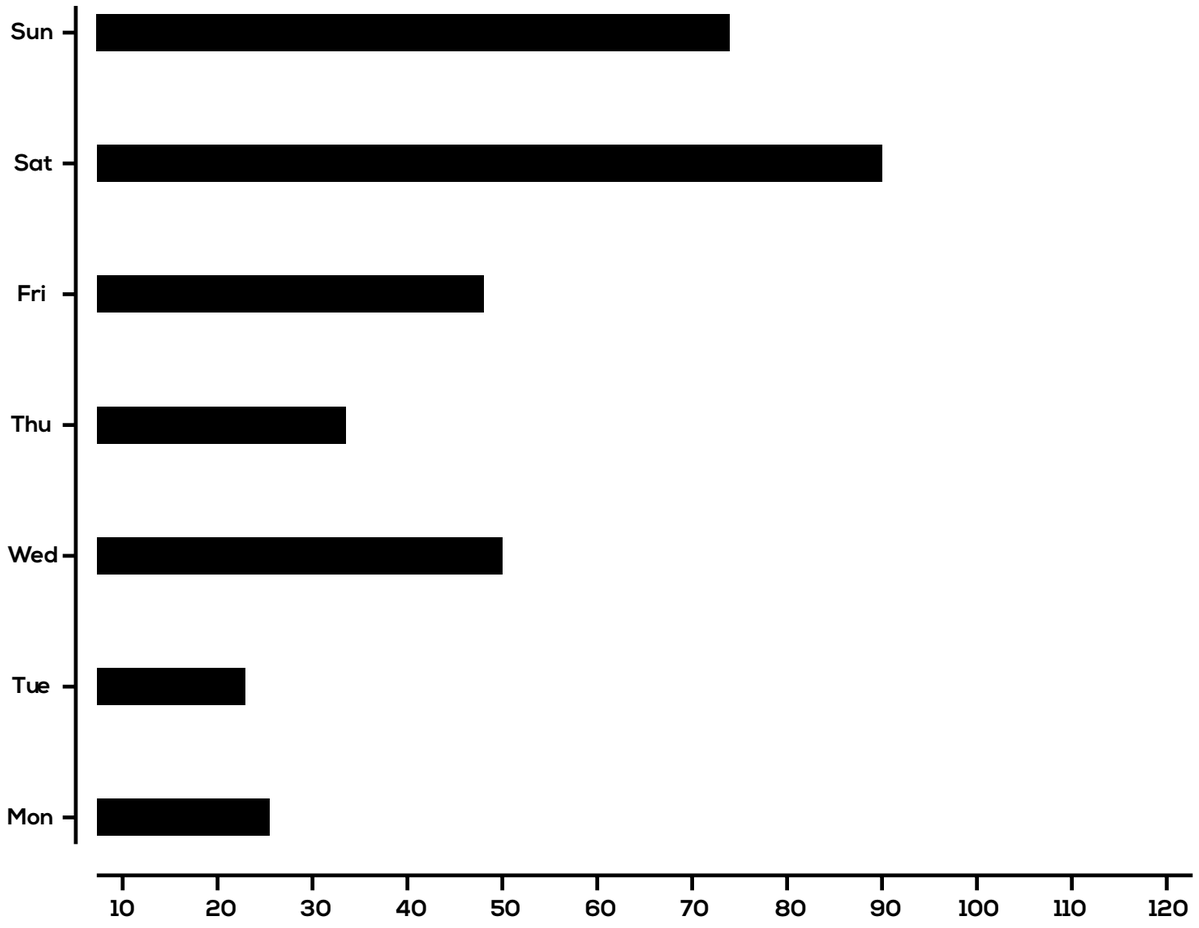
Farnham Maltings Cafe

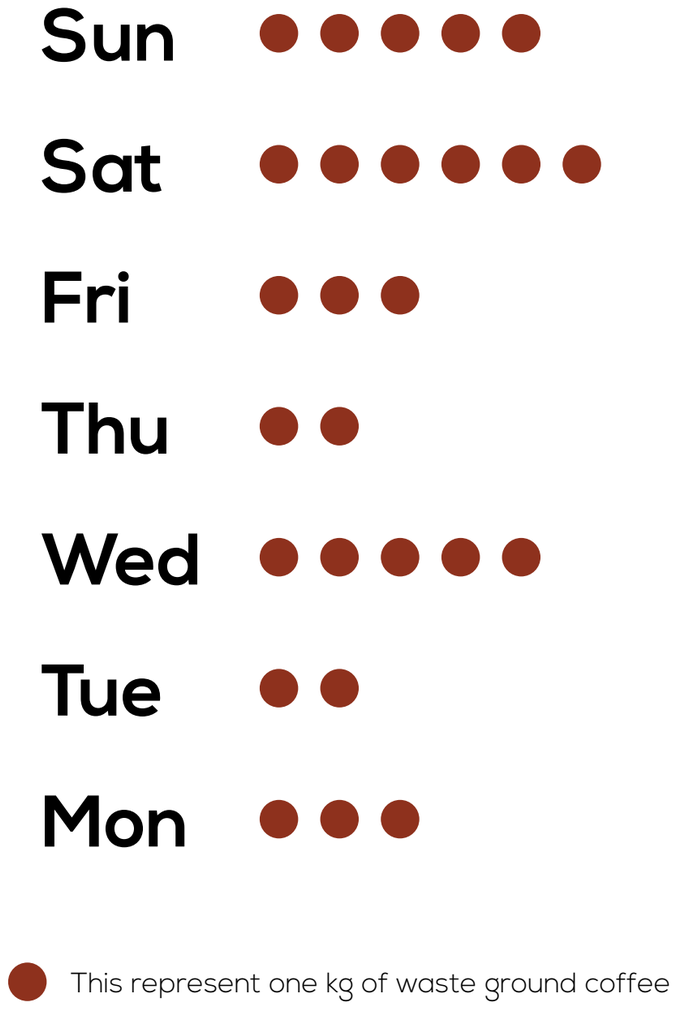
Farnham Maltings is an ART CENTER of the city. Many local artists and students of UCA come together and promote various types of art disciplinary. The purpose of the Farnham Malting is to capture and preserve the various types of culture that was initiated or brought in to the city.

The cafe is the central recreational/relaxation place of the Farnham Malting. It unites people and communities together for discussion and socializing purposes. There are fair amount of customer visits on the week, out of which Wednesday and the weekends seems to be one of the busiest days due to a screening event in the Farnham Malting.



Cafe Data Collection





Depending on the events that occurs in the Farnham Malting, the number of customers shall differ on day to day basis. But on an average week, there is a screening event that occurs on Wednesday and the weekends by default. Hence, in the chart you may notice the growth of customers and coffee usage increases accordingly.

Post **Coffee Disposal Process**

Most of the coffee waste are being recycled to as a fertilizer for farming and gardening purposes, which is inexpensive and efficient usage to reduce this type of waste. But since there is a large surplus of ground coffee, the usage speed of this waste is slower comparatively. Hence, there are many landfills of just ground coffee which causes imbalance of habitation that leads to decay and soil erosion.

Farnham Maltings Store

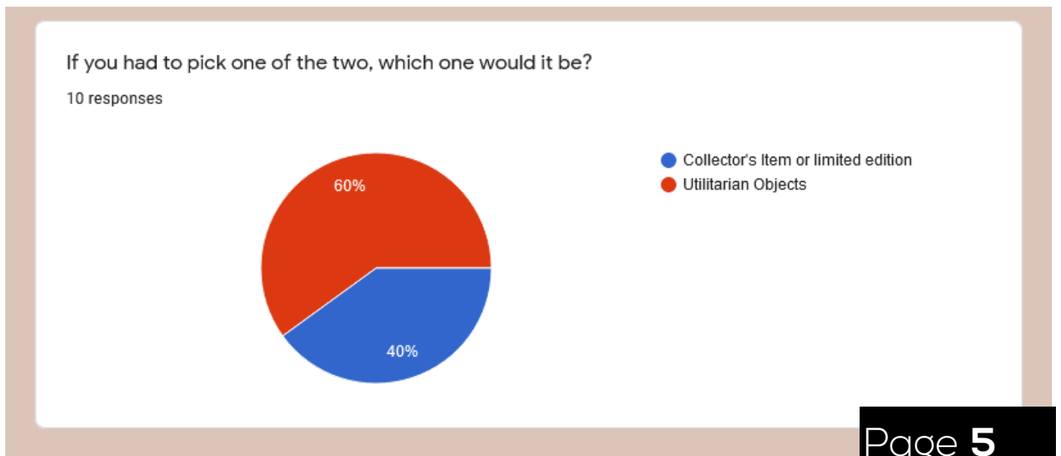
The Farnham Maltings Store is a collection of people's artwork and craftsmanship to be sold to the public, tourist, community, visitor etc. A point of observation, most of the products/craft-work are mainly focused on recycled and sustainable material to centralize the topic of Green Life and Eco-Friendly lifestyle. For example, there were two lamps that were made from discarded vinyls. One of the lamp had the vinyls molded to the shape of a lamp-head like. There were also baskets that were made from recycled plastic. The focus of the store is to bring out the culture of Farnham and the products speak about the city itself. Some of the products can be considered as a souvenir and some can be considered home centralized purpose.

User research for the store

The project is focused on re-using a waste/bi-product and re-selling the product at the origin point of the waste. The Farnham Malting were producing coffee waste from it's cafe which can be converted to a product and can be sold at it's store. There were two days spent in the Farnham Malting Store observing and inquiring about their views/opinions about the store and what they like. As per the research majority were adults and senior citizen who visits on a daily basis and have interest in crafts or a tableware product, which gave an idea about how the audience to be targeted. A question was asked regarding the product sold in the Farnham Malting Store to be a collector's item or utility based product, which led to majority voting for utility based product. The Farnham Malting Store had more products that were made for tableware purpose or a decor piece which were designed artistically.

Hence, the testing of exploring a sustainable material will began with a tableware product which will be an easier phase to understand the basic property of the material that will be explored.

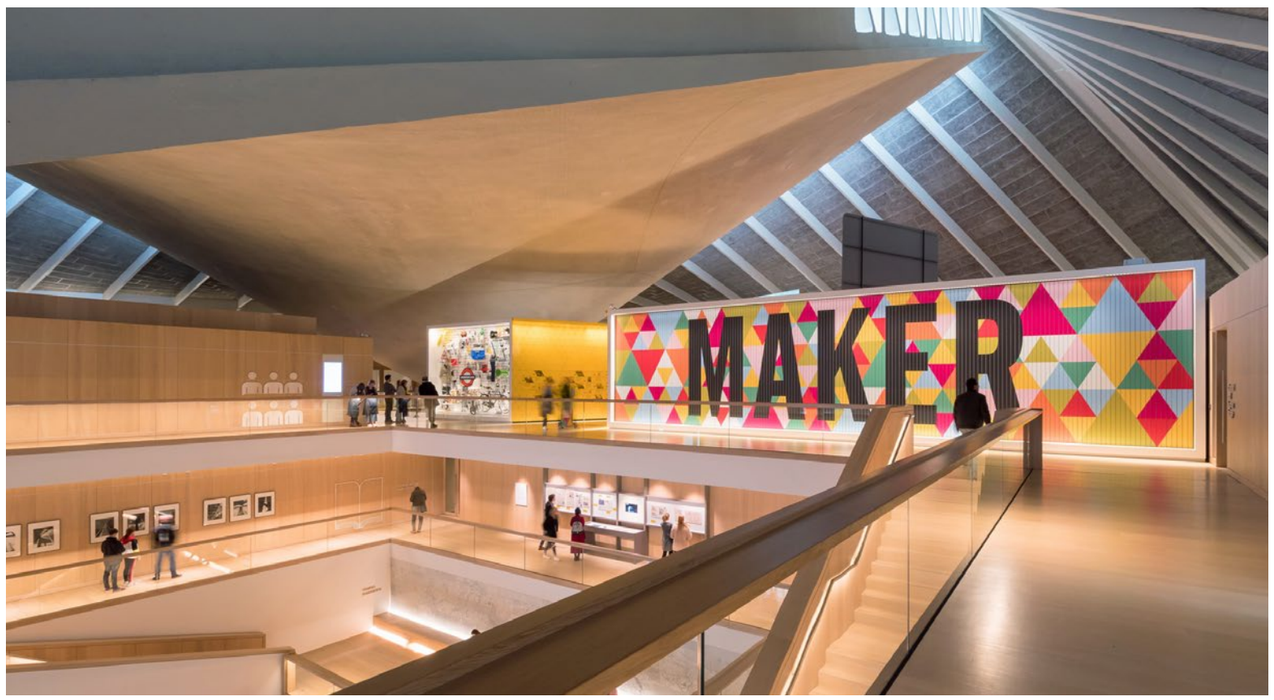
Age	Sex	If you had to pick one of the two, which one would it be?
22	Male	Utilitarian Objects
27	Male	Utilitarian Objects
67	Male	Collector's Item or limited edition
24	Female	Collector's Item or limited edition
45	Female	Utilitarian Objects
38	Female	Collector's Item or limited edition
23	Male	Utilitarian Objects
26	Female	Collector's Item or limited edition
55	Male	Utilitarian Objects
24	Female	Utilitarian Objects
22	Male	Collector's Item or limited edition
65	Female	Utilitarian Objects
32	Female	Collector's Item or limited edition
21	Male	Utilitarian Objects
19	Female	Collector's Item or limited edition
18	Male	Collector's Item or limited edition
23	Female	Utilitarian Objects
47	Female	Utilitarian Objects
29	Male	Collector's Item or limited edition
27	Female	Collector's Item or limited edition
33	Male	Utilitarian Objects
52	Male	Collector's Item or limited edition
48	Female	Collector's Item or limited edition
70	Female	Collector's Item or limited edition
14	Male	Utilitarian Objects
13	Male	Utilitarian Objects
12	Male	Collector's Item or limited edition
14	Female	Utilitarian Objects
36	Male	Collector's Item or limited edition
29	Female	Utilitarian Objects
44	Male	Utilitarian Objects



Research Phase

Design Museum Visit

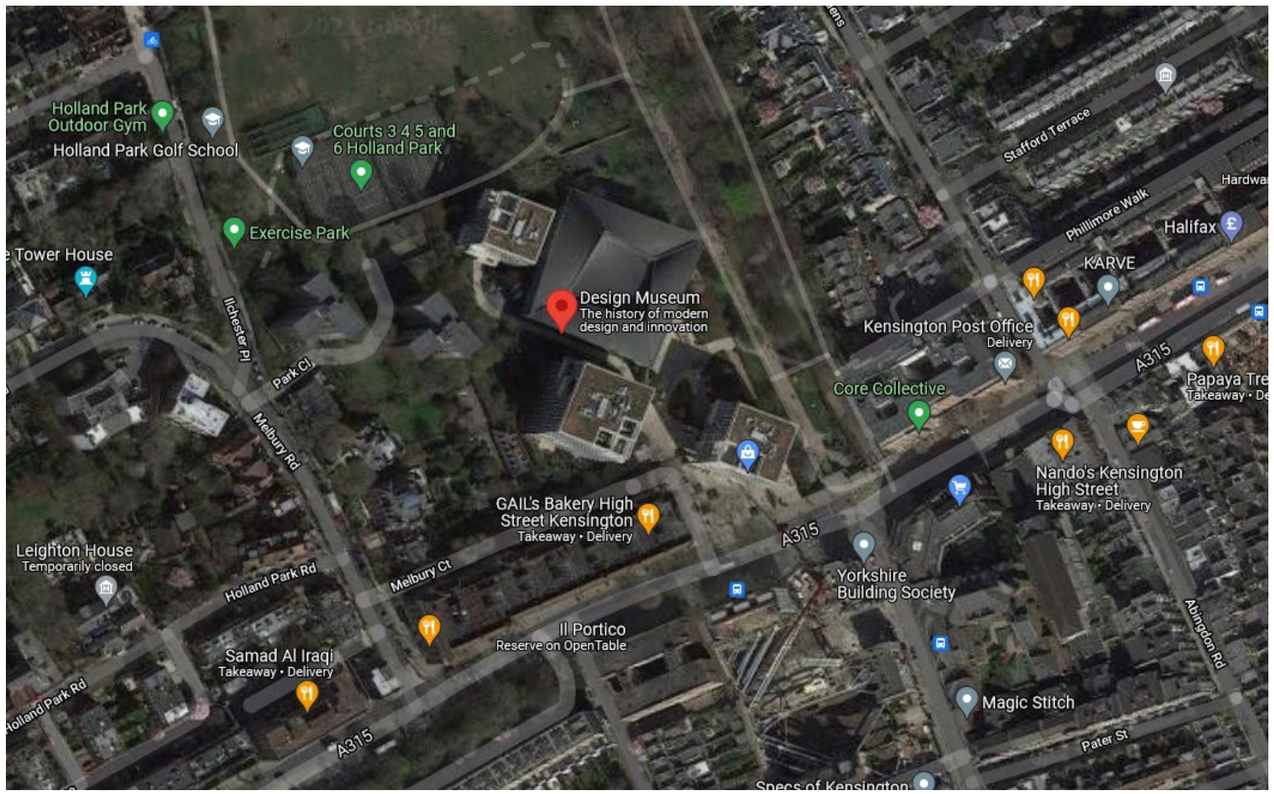
Design Museum, London

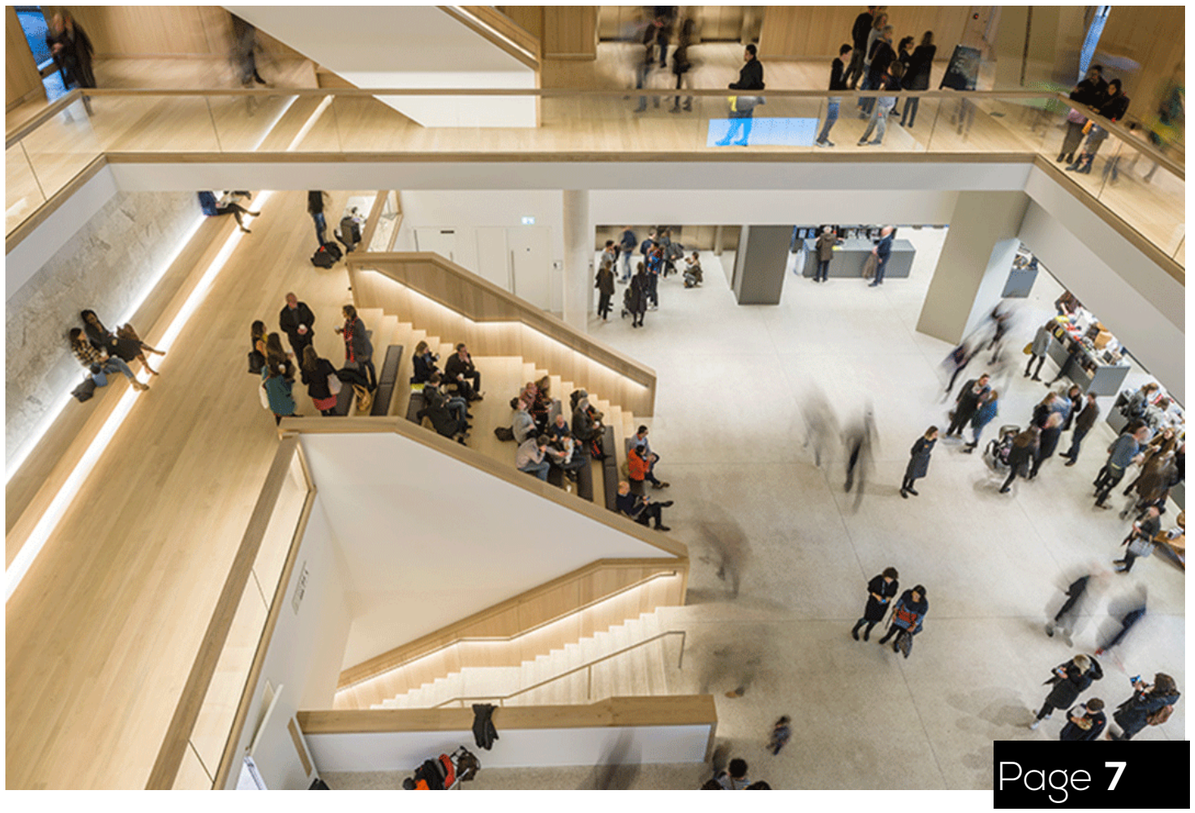


The Design Museum is a collection of Architecture, Fashion, Graphic Design, Product Design and Industrial Design historical inventions and moments.

This Museum is located in Kensington High Street, London. The architecture of the building resemble the design of an industrial era from the front with a futuristic language of the roof.

There are different exhibition events that happens occasionally. Currently there is Waste Age exhibition going on up till February 21'st 2022.



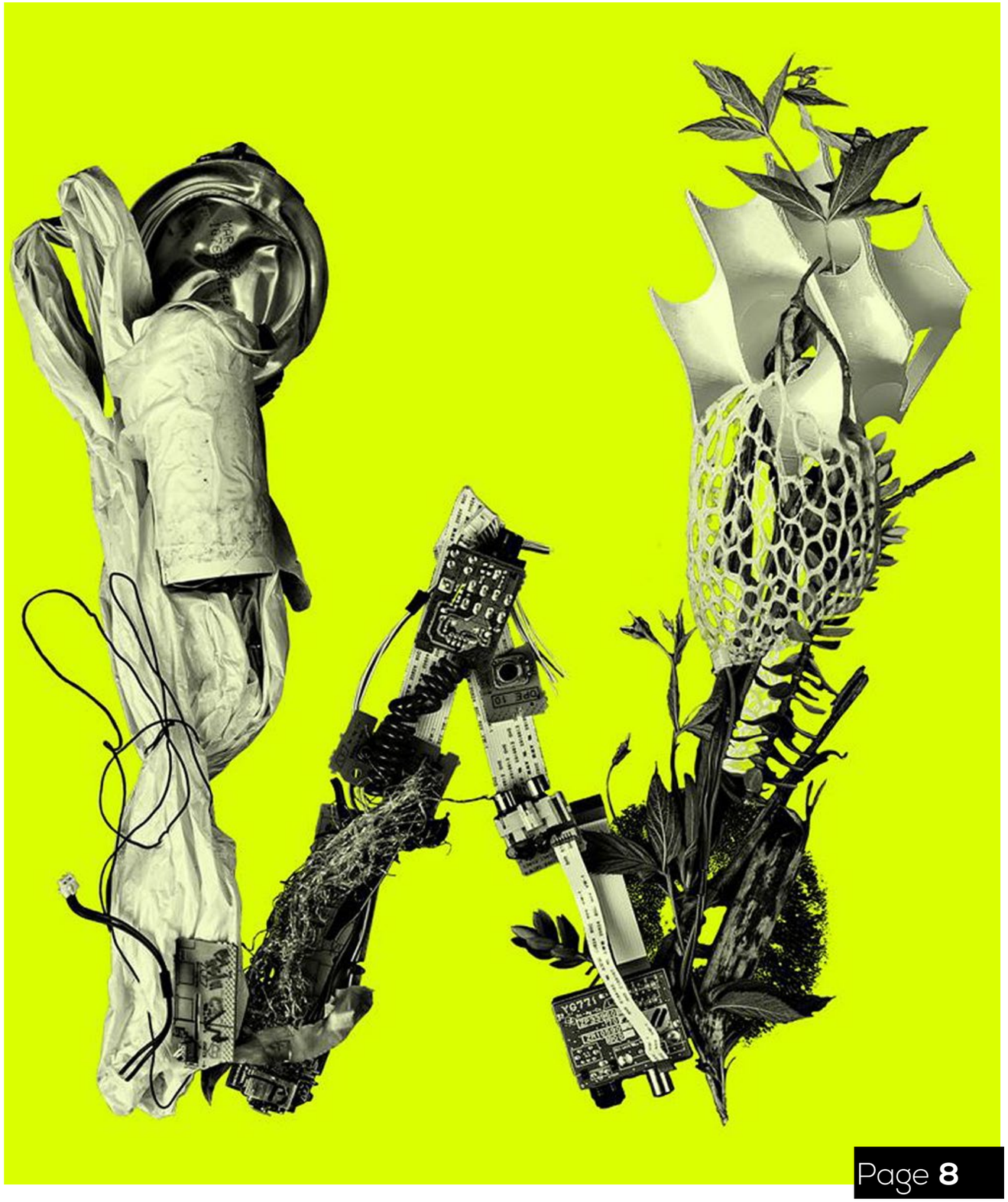


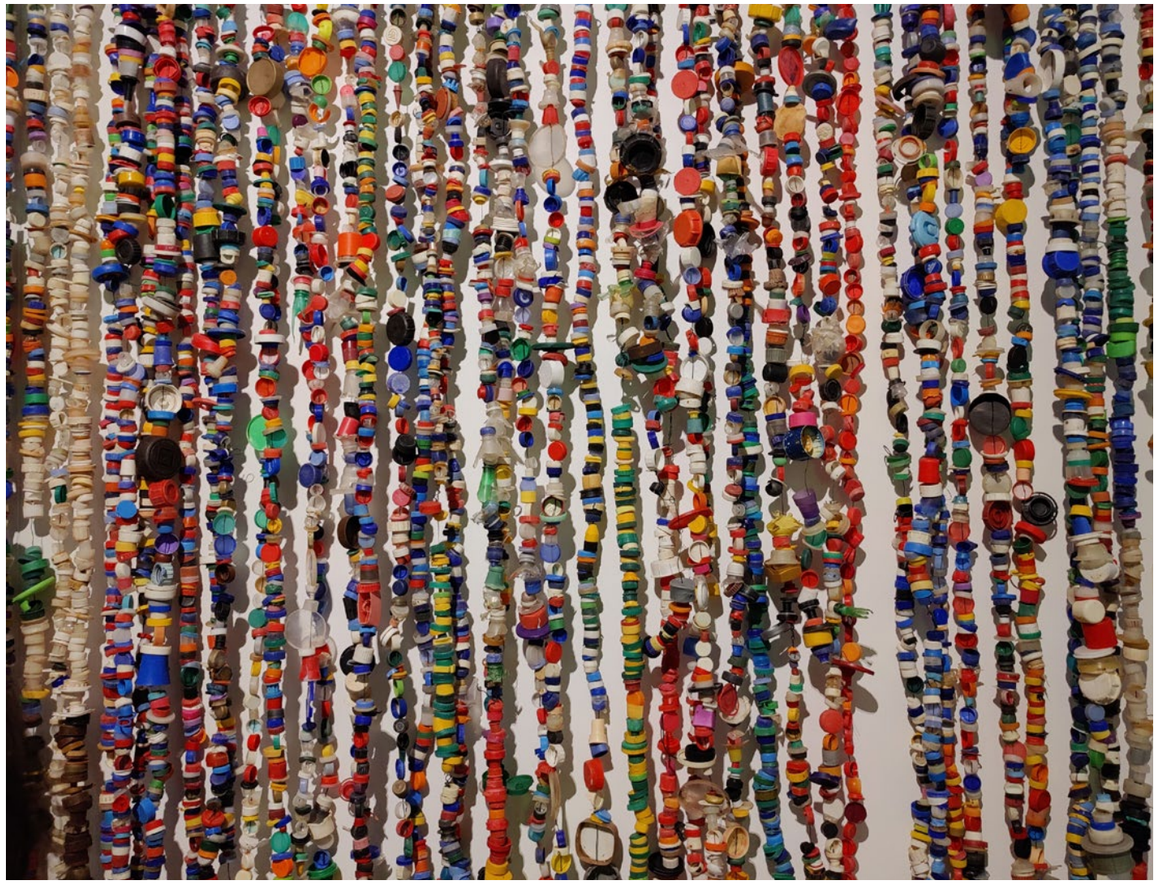
Waste Age Exhibition

"We are living in the age of waste. Is design the answer to leaving our throwaway culture behind?"

The Waste Age Exhibition is about promoting sustainable mindset and spreading awareness about mass wastage/ land-dump and sea waste (Great Pacific Garbage Patch).

There are multiple problems that were showcased and multiple solution displayed which catered to some of the issues.



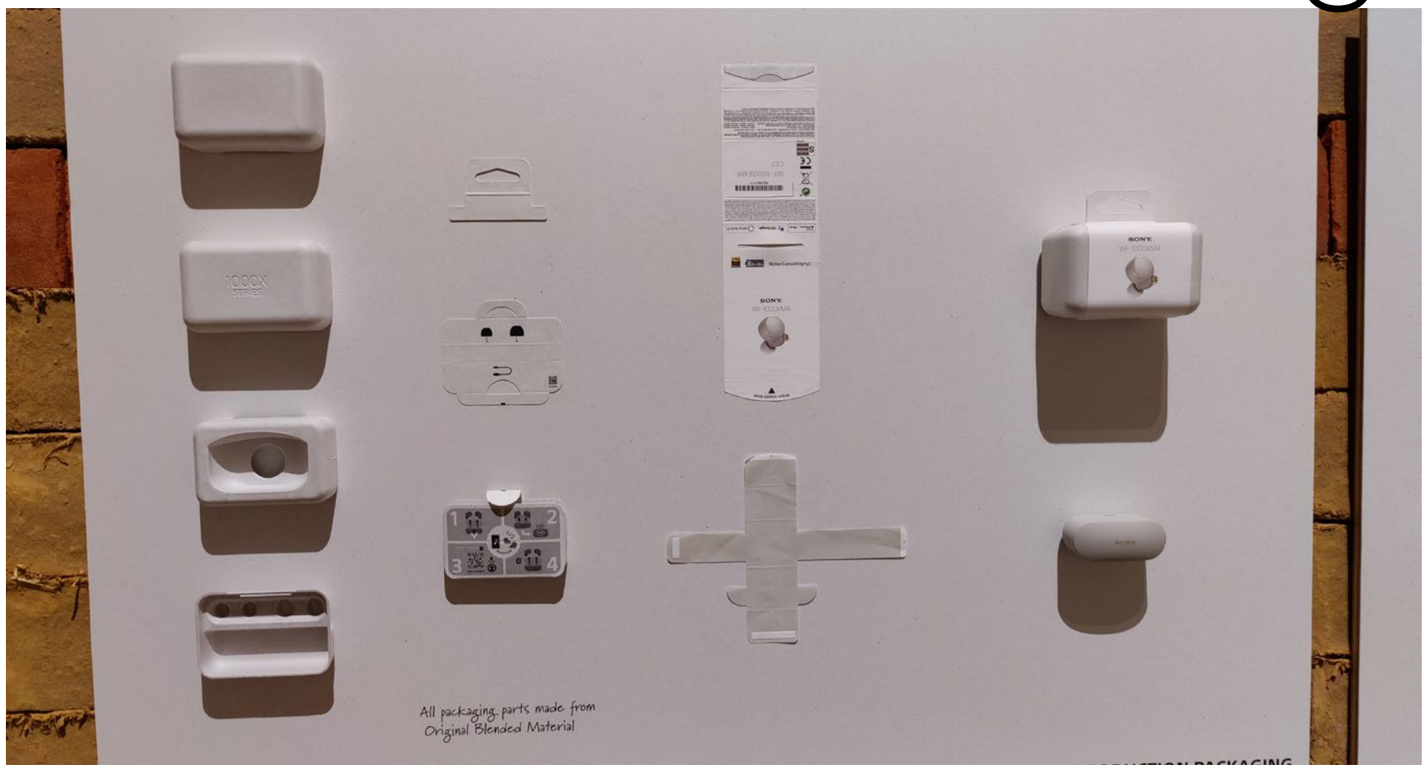


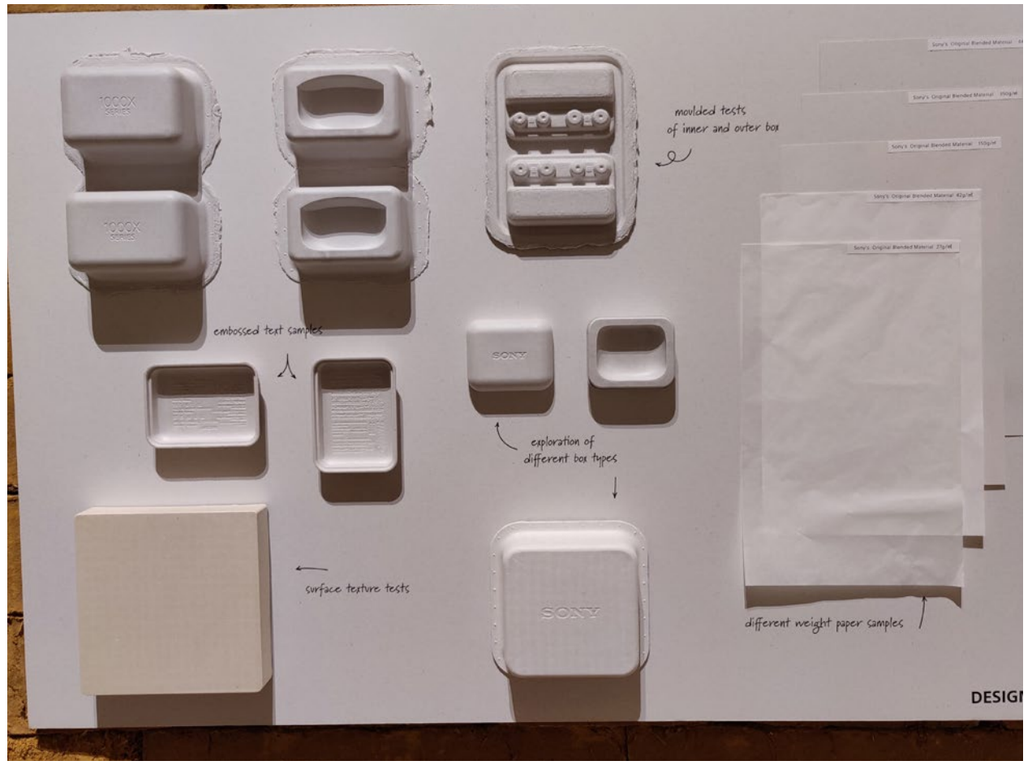
Organic Discovery

One of the display in the exhibition event showcased something closed to what is needed in the material exploration in this Semester 1 Project. The exhibit displayed a natural bonding of organic material such as coconut fiber, sugar beet, coconut water, bacterial cellulose, banana stem and hemp fiber.

This exhibit be can used as an inspiration conceptually and material making process since the design architecture similar branches and personality.

Industry Recognize Exhibit





Sony, one of the top consumer electronic company of the world has decided shift from creating new material to recycling existing material and applying bio-degradable material in their commercial products. In the exhibit, they showcased Sony WF-1000XM4 earbud model's packaging made from recycled paper, bamboo and sugarcane fiber. This is an interesting concept since consumer electronic design doesn't dwell well with sustainable material due to lack of durability and being a fragile material.

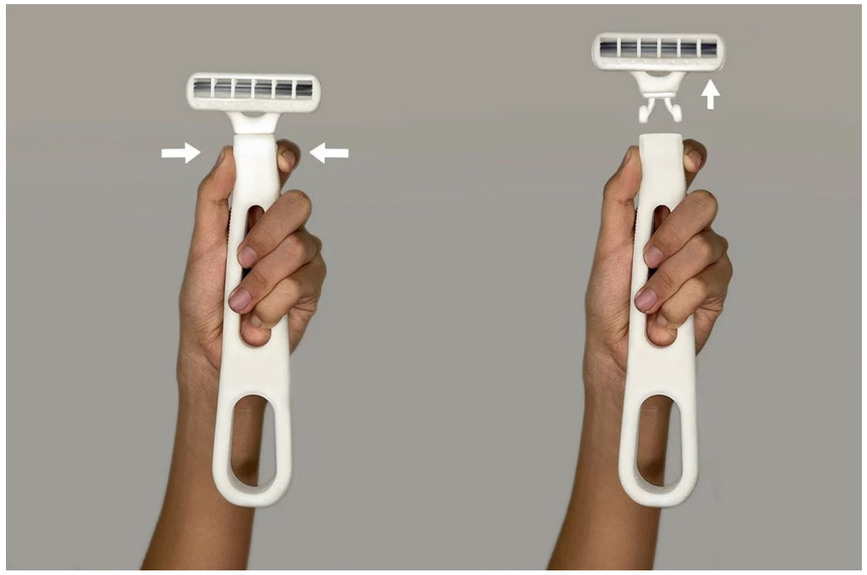
Mushroom Lamps

Mycelium, or the vegetative part of a mushroom, has found itself in the limelight for being a cheap, sustainable, and vegan alternative to suede and leather. If treated correctly, it looks and feels just like leather, offering a cruelty-free and biodegradable alternative that doesn't have as much of a carbon footprint either. The mycelium fibers are bound to scrap strips of willow wood, which provides the base and fodder for the fungus to grow. The result is the absolute antithesis of mass production. Designed in part by nature, each lamp is unique, has its own aesthetic, and is beautiful in its imperfections.

Turning Food waste to tableware

This product has one of the best ways to use organic material but it may not be ethical/ accepted in certain societies/ communities. The bonding agent used in this product are dead animal bones that are burnt to charcoal and rotten vegetables waste. This is one of the perfect example of a product that is durable, not fragile, microwave proof, oven proof and biodegradable which can be converted to one of the finest manure/ fertilizer for the soil.

Educational Aspect



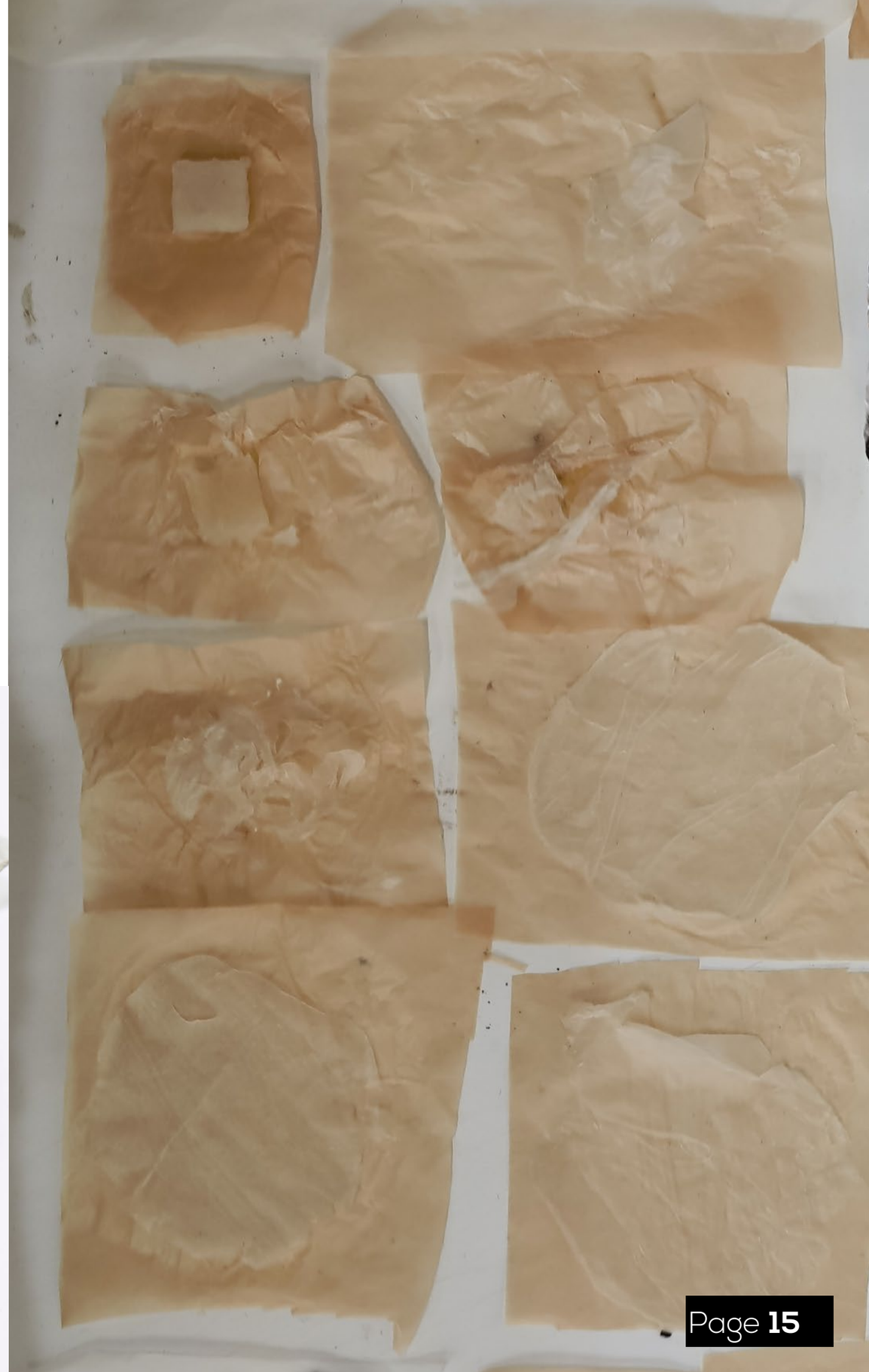
There is another element which may be possible to impact the users interacting with such a material. Promoting the **sustainable** mindset can be the key feature from this material to the user, hence their everyday life choices are based and influenced by visual learning. Such as converting from petrol driven vehicle to an electric car or segregating different types of waste for faster growth of recycling and bio-degrading certain materials to reduce land and sea dumps.

Creativity Phase

Coffee Experiment

Bioplastic Studies

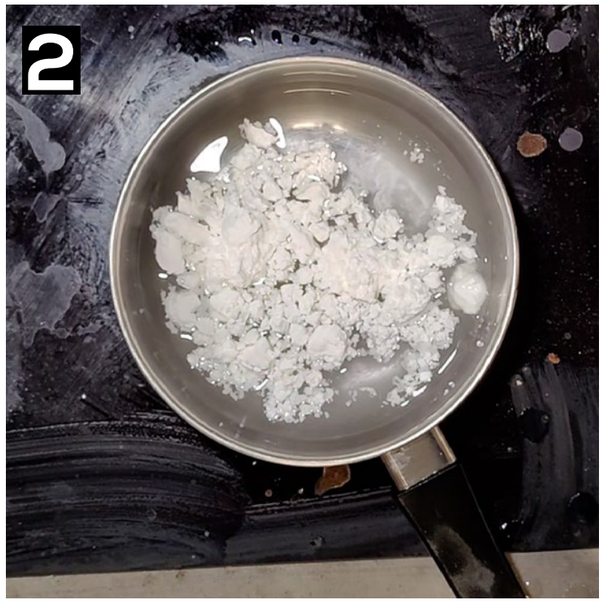
Before the experiment of coffee being converted to a sustainable material there needs to be a bonding agent that is not made from artificial silicon such as adhesive glue. So research on organic bonding starch took in where PLA (Poly-lactic Acid) came into picture, which is usualy found in corn starch, potato starch, flour, etc. The issue with PLA is that "**biodegradable**" but "**degradable**"with the help of certain enzymes generated from bacteria or fungus. Hence I did some research on decaying process and experimented with cornflour to understand how the material works with the right proportions

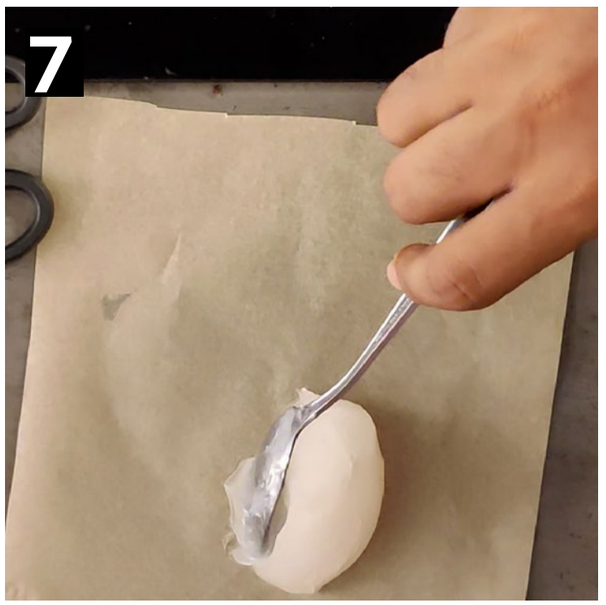


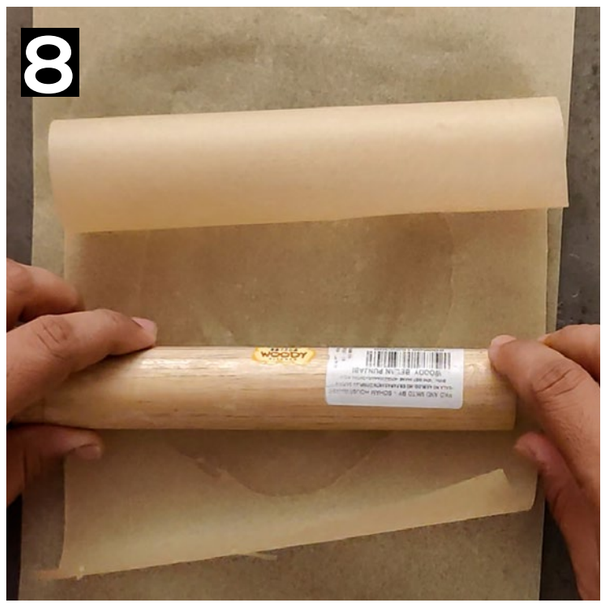
The **Chosen** material for experimentation

Gelatin **Corn Flour** **Glycerin** **Coffee**

Making Process without **Coffee**







Standard **Mixtures** without **Coffee**

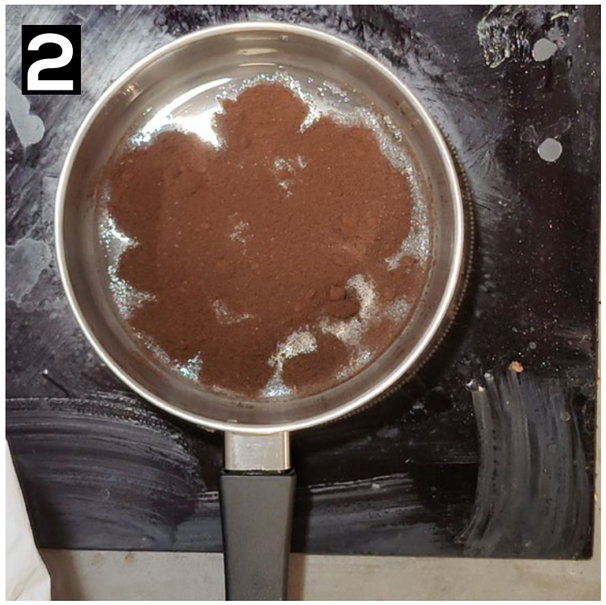
Success Fail

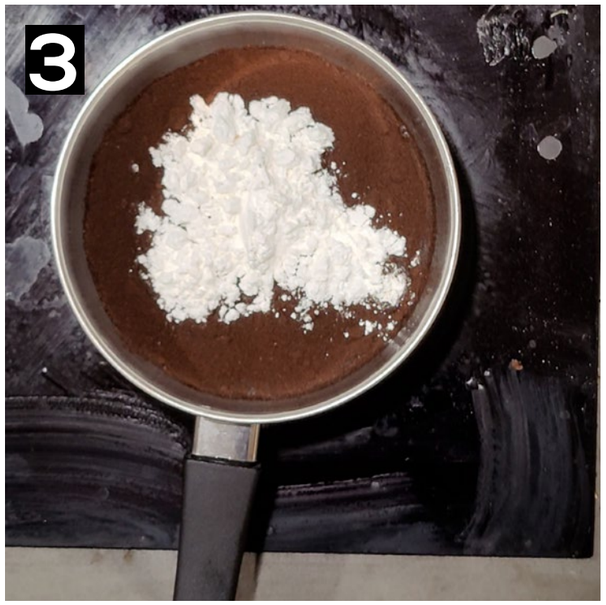
Material	Stability	Strength	Flexibilitiy	Malleability
Corn Flour + Water				
Corn Flour + Water + Glycerin				
Corn Flour + Water + Glycerin + Gelatin				

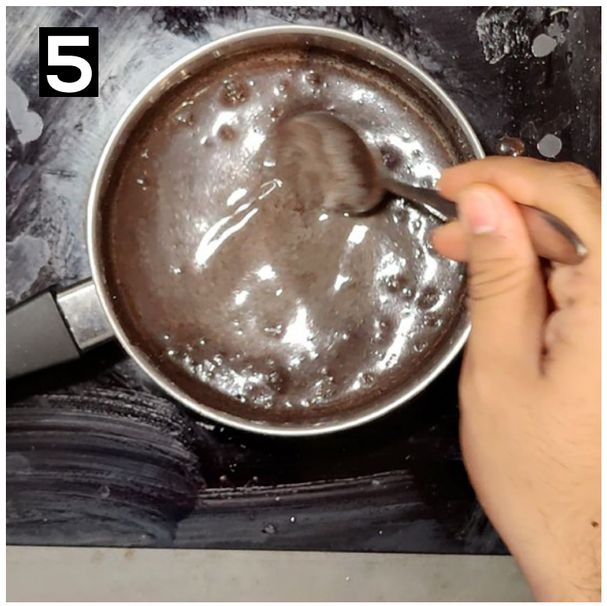
Stable Proportions of **Ingredients**

- 150 gms Corn Flour
- 30 ml Glycerin
- 1 sheet Gelatin
- 125 ml Water

Making Process without **Coffee**







Standard **Mixtures** with **Coffee**

Success Fail

Material	Stability	Strength	Flexibilitiy	Malleability
Corn Flour + Water + Coffee	●	●	●	●
Corn Flour + Water + Glycerin + Coffee	●	●	●	●
Corn Flour + Water + Glycerin + Gelatin + Coffee	●	●	●	●
Corn Flour + Water + Glycerin + Gelatin + Coffee + Grass Seeds	●	●	●	●

Stable Proportions of **Ingredients**

- 150 gms Corn Flour
- 30 ml Glycerin
- 1 sheet Gelatin
- 125 ml Water
- 250 gms Coffee
- 250 gms Grass Seeds

Ingredients Testings

There were different samples made from variants of ingredients inputed in the material. The reason why I had to try these samples were to find out what exactly I need for the material property to have to decide the purpose of the product. There were some samples which had more corn flour, there were some which had more coffee and there were some which had more gelatin sheet.

The ones that had more coffee were brighter in color and brittle as a biscuit, this made the material feel more heavier and ease to break while handling it. The ones that hard more cornflour became hard as a brick and were giving out coffee particles each time the material was in contact with something. The ones that had more gelatin sheets became a semi-liquid form (similar property of a jelly).

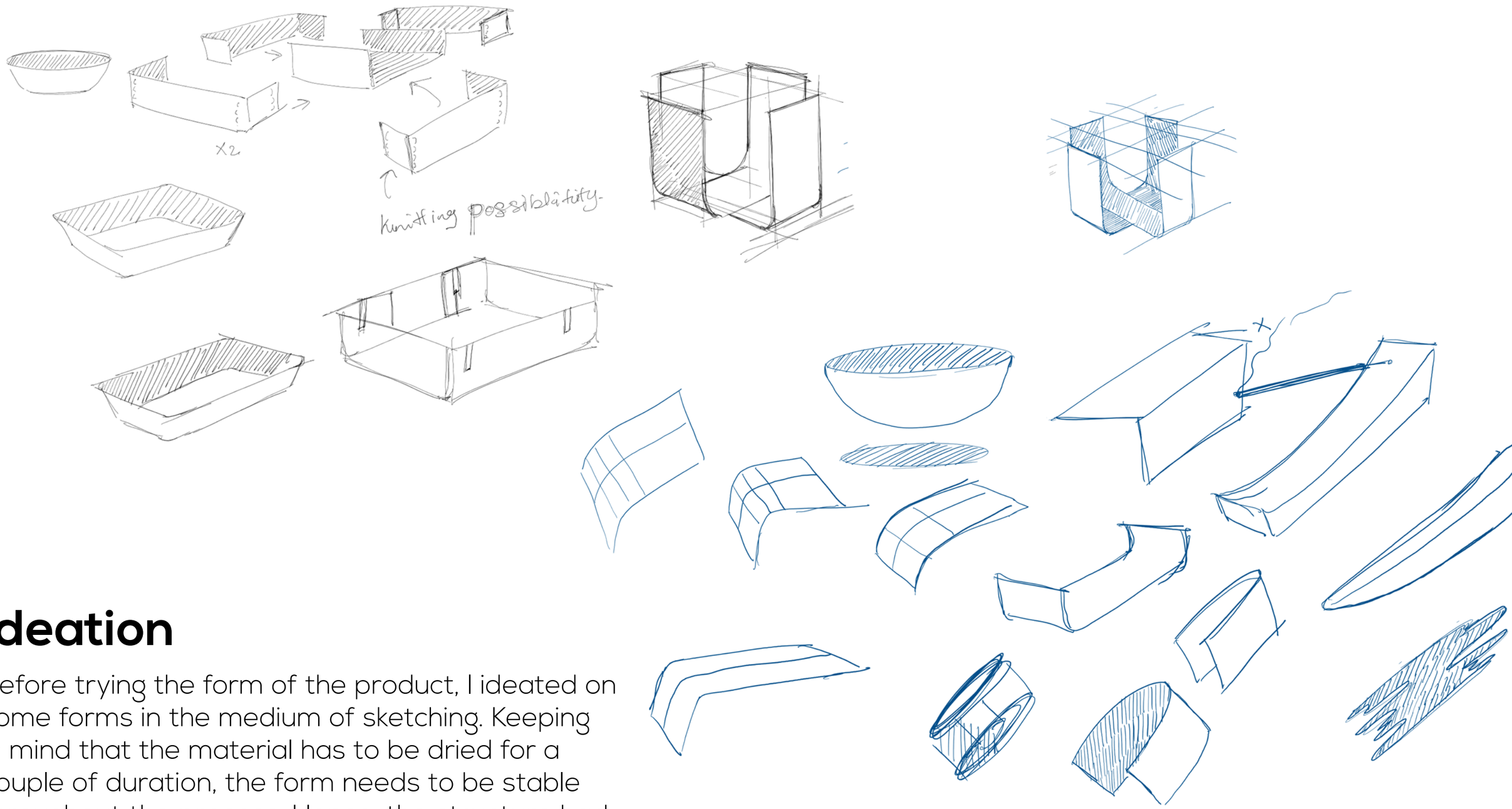
In conclusion, it gave me the idea to balance the ingredient at a fair point where the surface should like the one which had more gelatin sheet,the hardness as the one which had more cornflour.

The Fiber Within

While the experiment was going on for the coffee, I was researching about sustainability and came across a methodology for promoting eco friendly mindset through products. That gave a thought of not just making the material biodegradable but also should leave an effect to the user about thinking sustainable everything. The impact would be like a butterfly effect to user where a small impact would lead to a larger change in the user's life.

Ideation lead to when the user discards the product a life would be form and give the user certain responsibility to take care of it, but at the same time it should in-expensive and also be user-friendly where there isn't complication that it would lead to giving up the process. The first the we notice in the a garden is the grass on the ground which gave a way to enhance the product further. Blending grass seeds with the product with create a form of fiber to the material and would also leave a legacy to the product when discarded in the soil/land dumping.

The fiber of the grass seeds gave a better malleability to the material while making it.



Ideation

Before trying the form of the product, I ideated on some forms in the medium of sketching. Keeping in mind that the material has to be dried for a couple of duration, the form needs to be stable throughout the process. Hence, the structure had been sketched accordingly.

Apart from making uni-body structure, I also considered joinery mechanism with different material such as thread knitting or puzzle bonding. But then came to realize that the project will deviate from its main focus which is broadening my material exploration canvas.

Trail & Error

The next phase of material exploration is to find the shape and form it can take, for basic I tried tableware shapes such as bowl and container.

After balancing the ingredients according to its property required to mold into the shape. As per the observation , despite of drying it in the oven or openly at first the water starts to evaporate and leaves gap in the shape. This hasn't happened to the sample because it was a block of this material, while on the other hand the material thickness has become thinner and the grass seeds in the material absorbs the water which led to cracks and break while the mold is taking its shape. Which lead the structure of the product weak and unfinished. After multiple retries, it came to an understanding that the material had to be re-mixed and dry further to remove the remaining water. Which led to reduce of the quantity of the material in a gradual manner.

Hence, the plan was to make a bit more extra while making the material mixer before drying.

Sample Journey

The beginning of this project I was focused on product's feature, functionality and purpose. The final goal of this process was trying to blend sustainability with consumer electronic design, which felt to be ambitious and far fetched goal because without knowing how the property of the sustainable material will be to match the variants of polymer is pointless to move forward. Hence, this got me to try different variety of material sample and try and reach to the point of where it closely match with polymer at least structural wise. The focus on this project had changed from the product to the material exploration.

In this journey of exploration there many new knowledge that were passed on regarding bio-plastic, poly-lactic acid and organic bonding adhesive. The research came from studying existing sustainable and understanding how they have brought in the material to life in the form of providing functionality. At the beginning of the material exploration phase, I had done some testing on existing bio-plastic (i.e. cornflour with glycerin and gelatin sheet) to understand the based property and see what it was lacking with.

Shape Molding

First try out is a small bowl shape, with multiple re-mixes since I learnt the mistake from the material cracking up an drying.

The observation of this structure led to the side being curled up as it dries due to further drying up. The structure of the product seems to balance the weight of the shape since it was molded in the shape of the bowl.

This gave me a clear idea of how the material works with the drying process and it's malleable properties.

Shape Molding - ii

The second testing I did is a container like shape to see if there will be any deformation. In this process there were two types of container used where one was a sharped edge structure and the second being curved edge (larger fillet).

In this process the observation led to understanding that the sharp edged structure will not work in this material because the strength and weight of the structure would not be supported well which will eventually lead to breaking by itself. As for the curved edge structure, it worked well because there is a continuous contour support holding the weight of the structure through the curved edge. Another observation noted, during the drying process of the curved edge sample the height of the side cannot exceed a certain length since the weight increases with the height. Hence the base of the structure will either topple off to the side or break.

Decaying Process

The plan was to make sure the material is disposed to the soil and the grass seeds will take growth which will be a symbol of sustainable mindset for the user. Due to lack of research on the grass seed growth, they were unable to grow and only fungal growth began. I had contacted a gardener from my home town to give me advice for the on the growth of the seeds, which suggested to make sure the temperature of the environment would need to be between 24C to 32C, the season they can grow is during the spring and summer with a sunlight required for at least 6-8 hours. Since I'm doing the project in Farnham located in the United Kingdom during the winter season, there wasn't any growth of grass. But for future development, I shall verify and test this process to proceed further.

Clarity

With the help of trying different variants of mixers, forms and structure there a clear understanding on how the material can be used for further development to design different types of products and purposes.

Due to insufficient time and research, the goal of blending this sustainable material with consumer electronic product couldn't be achieved at the moment. But the process of exploring the material gave me a direction to work ahead for future development.

Development Phase

Structural Refinement

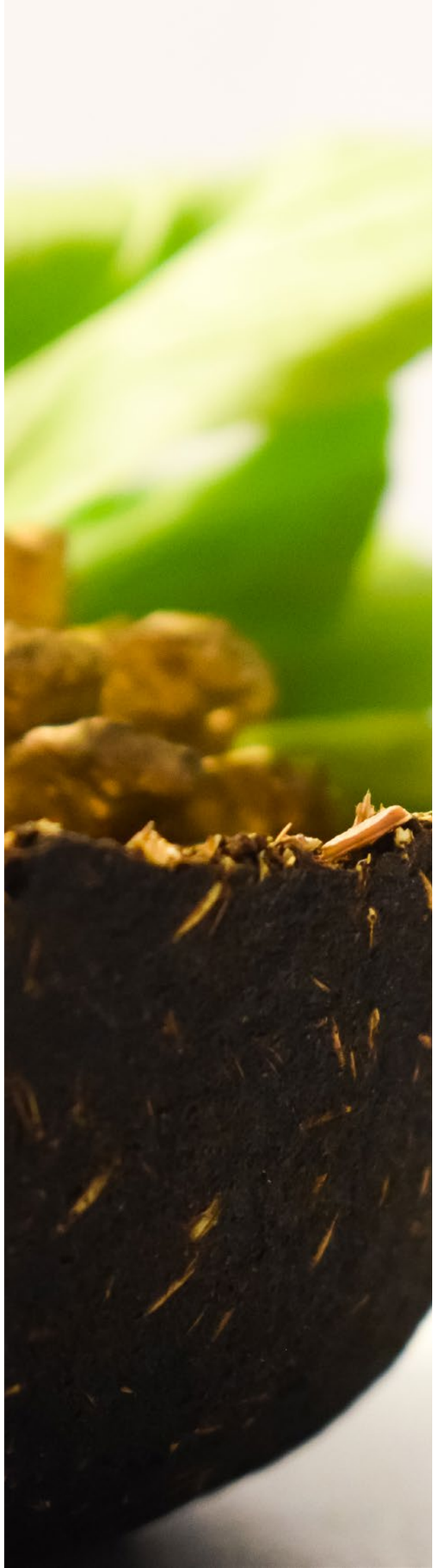
Shape Modification

After testing the shape of the bowl, I decided to cut the excess extra material length to avoid folds and curls. This will help the form to balance out the weight of shape evenly proportional. The material showcases the key ingredients through visuals(i.e. coffee color and grass seeds) and smell (i.e. coffee smell), hence it conveys the natural/sustainability essence when the user sees this at one glance.

A “Bigger“ Risk

The next step is to make a larger bowl structure out of the explored coffee material. Considering how the material will tend to break off when there is uneven distribution of weight towards the side of the structure, it is a risk to take to find out if this mechanism would work in a larger scale. Hence, the thickness of the material had to be control evenly so that there would constant weight all over the material which was a task because making thing with hands requires skills and practice but with machine work it will be faster and constant without human errors.

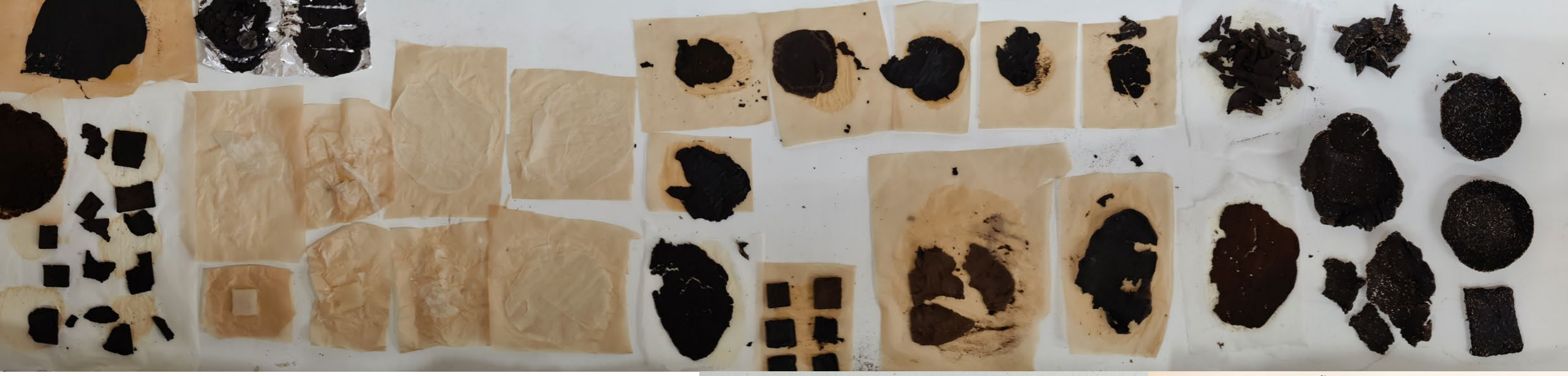
Product Shots



Product Shots

Pricing as per current lifestyle

Direct Cost		Indirect Cost		Profit		
Grass Seed	£ 1	Rent	£ 9779	40% Margin	£ 4	
Glycerin	£ 1	Internet	£ 120			
Cornflour	£ 0.5	Entertainment & Travel	£ 300			
		Miscellaneous	£ 180			
		/				
		Work days per year	180 Days			
		/				
		Work hours per day	10 Hrs			
		x				
		Hours to make one product	1 Hr			
						Wholesale Price
	£ 2.5	+	£ 6.25	+	£ 4	=	£ 12.75



The Coda

In this journey of this project, there were many difficult encounters that were faced. There were times where doubts were rising regarding understanding the property of the organic material (i.e. Coffee waste material) for it's stability and structure. It sure did take a lot of trial and errors to understand the personality of the material and design it's functionality accordingly.

The main goal is try to make this organic material similar to the features of plastic, which it is no where near it. Polymer is an innovation with a large drawback to bring down the eco-system of the planet, it shall take many research and experiment to replace such an innovation through the concept of sustainability. As for the coffee waste material, there can minor steps taken for replacing certain utility where plastic is unnecessary being used.

This project for sure doesn't ends here, it shall develop further to unlock it's full potential.

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