

# CREATIVE ENQUIRY: RESEARCH PRACTICES

PDF submission for Creative Enquiry research module AD313

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# c o n t e n t s :

intro

cradle-to-cradle

localisation

emotional durability

form

development

lifecycle assessment

Oxford Dictionary definition of Sustainability -

“Avoidance of the depletion of natural resources in order to maintain an ecological balance.”



I began this project with a passion for designing desirable products, yet was uncertain of how I could ensure that high-end consumer technology products could be classified as sustainable product design.

In a world where sustainability is the growing fashion in consumer items, I wanted to learn more about sustainable design and specifically how it can be approached to produce more environmentally friendly products.

I began researching sustainable design theorists and their approach, each answered the problems of mass consumer waste with a different solution.

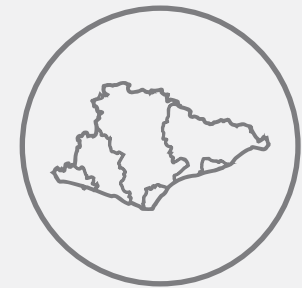
# sustainable speakers

This project presents a series of three Bluetooth speakers titled: 'Waste', 'Place', and 'People' - each designed to critically explore digital manufacture and sustainable product design.

The 'People Speaker' builds on the concept of emotionally durable design by exploring the value of 'sentimentality' in sustainable design. This design incorporates the patina of a recycled artist's desk to embody the sentimentality of a creative space into a consumer object.

The Place speaker critically explores material locality and the circular economy in the context of sustainable design. This project utilises Stewart Walker's model 'Sustainable by Design' by incorporating ideas of local vernacular, local jobs, and circular systems of production.

The Waste speaker explores the 'Cradle-to-Cradle' model of production by utilising material waste to produce high value goods from materials otherwise destined for landfill. The outcome is an example of how waste plastics can be repeatedly reprocessed to produce new products. Collectively, these projects present alternative methods and materials for the manufacture of everyday products.

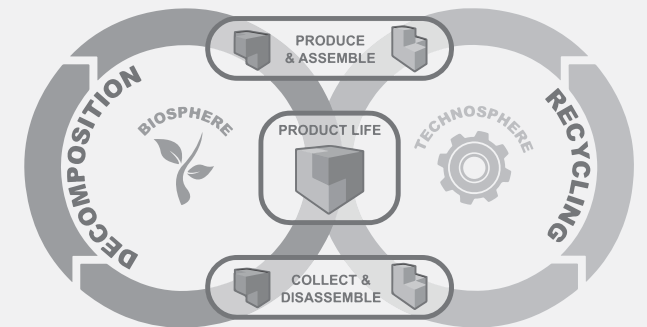


cradle-to-cradle



I began this project with a desire to explore William McDonough and Michael Braungart's theories of creating 'Cradle-to-Cradle' objects. This means using material that can either be reused in industry after its use, or could biodegrade and provide nourishment back to nature.

Their book, '*Cradle-to-Cradle: Re-Making the Way We Make Things*' was hugely inspirational to me, however I was unsure how these theories could be brought to life physically. I was unsure how successful these would be in modern day manufacturing infrastructure, but was determined to explore the exciting possibilities.





# material investigation



Waste Plastic Bags (LDPE)

# h e a t i n g

I began experimentation by melting the waste plastic. Discovering its ability to be reformed when hot meant that I could flatten the material using an industrial press.





Stages of melting plastic bags (LDPE) at 190° in industrial oven.



Making samples, adding pressure to melted plastic (LDPE)

Converting everyday household waste into an infinitely usable raw material for industry



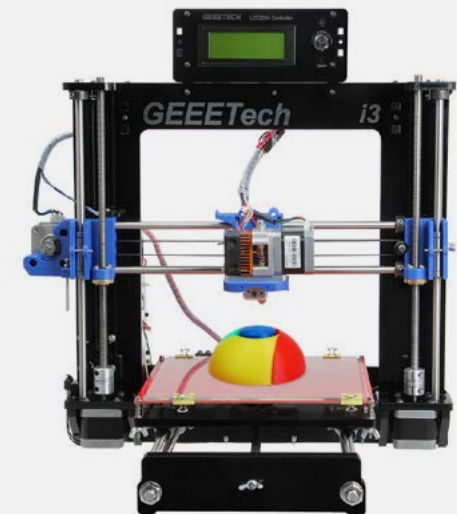
# alternate processes



Filabot is a machine built for industry, where it can take waste plastic material and convert it into filament for 3D Printing. This would provide an easy conversion from a waste material, making it the perfect material for rapid prototyping. This would also give me the opportunity to explore the possibility of creating complex 3D structures from the waste plastic.

I enquired with the Polymers department at the University, to attempt to gain funding to buy the machine. However, the 3D printer that we have access to is restricted to only printing in certain plastics, meaning that it would not work with the waste plastic filament.

This is a process I look forward to working with in the future, as it will allow me to experiment with the material on a much faster time-scale without having to melt and add pressure manually.



# overheating

While creating sample pieces, I experimented leaving the plastic in the oven for much longer to see if this had any effect on its strength / aesthetic.

Here is an example of over heating the material to the point where it has burned and lost its colour. I have found that it also loses much of its elasticity and becomes brittle where burnt.

I did not desire either of these characteristics in a Cradle-to-Cradle product therefore discontinued the overheating process, however this brittleness could be applied to other projects later on.

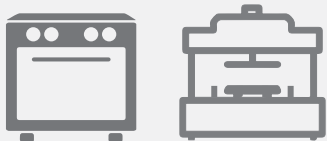


# melting and applying pressure

After many sessions experimenting with the material, I discovered its optimum melting temperature to be around 190°C. To begin with, the original plastic bags only need to be in the oven for around 5 minutes, before taking them out and applying pressure using the industrial press.

This process is repeated, each time adding more plastic bags onto the tray to be melted into the material. As the block of plastic starts to thicken, the melting process will take longer. Once the material is dense, and reaches a thickness of 10mm - the plastic can take up to half an hour to melt properly.

It is essential that the material melts fully before applying pressure, or air bubbles can be stuck inside the material which may sacrifice strength.





It was a struggle to get the material to flatten to a desired thickness at first. However after a while I managed to develop a process that was reliable in producing equally flat material each time. This involved using 10mm acrylic offcuts, and placing them around the molten material in the press. This secured the material to have a flat surface which would later reduce time on the CNC machine.



# r e p e a t

Thanks to LDPE being a thermoplastic, this material can be constantly reprocessed into new shapes. To create an interesting aesthetic I experimented in cutting different shapes from different samples and then reprocessing them.

This gave me a range of colourful samples, while also proving the 'Cradle-to-Cradle' potentials of the material.

I was curious as to why the material had not been used previously if it was so successful in its ability to be reused after use. After a product has come to the end of its lifecycle, it could be melted down and reformed either by an injection moulding machine or by a cnc-milling machine.

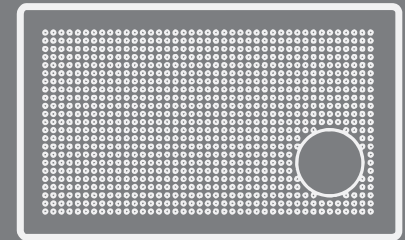
developing process



non-usable waste



usable material



product

re-process



## Raw Material to Form

I wanted to develop a product that could be comparable to everyday consumer technology products, and not something that could be interpreted as a cheap or as a waste material.

Looking at inspirational product designers, specifically Dieter Rams and his Braun products gave me initial inspiration to build on.

I enjoyed his goal of simplifying complex objects, to make them user friendly and help make everyday life more enjoyable. I took inspiration from this and worked on designing a series of CAD drawings that could be sent to industrial machines that could start to mill shapes from my materials.

I chose to create bluetooth speakers as these are complex objects, yet are used everyday by people all over the world. I had experience over the summer designing casing for electrical products and therefore knew that I could build on my experience in designing these objects.

Constructing forms that could be disassembled easily, gives easy access to the electronics in the product, meaning that if a part breaks then it can be repaired or replaced without having to destroy the product altogether (as in most smartphones and technology products found today).

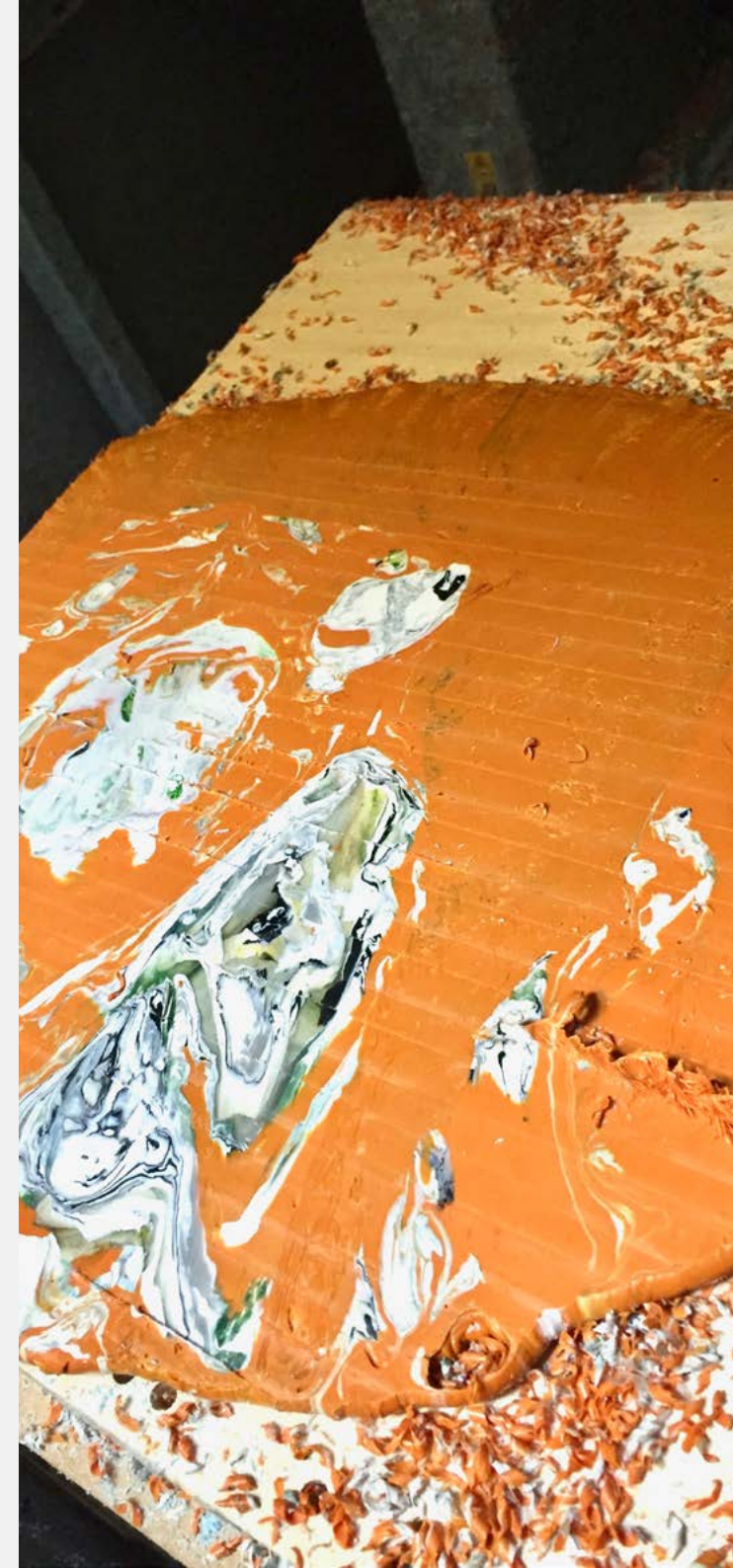
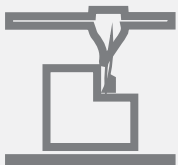


Melted and Pressed LDPE material - ready to be processed into product.

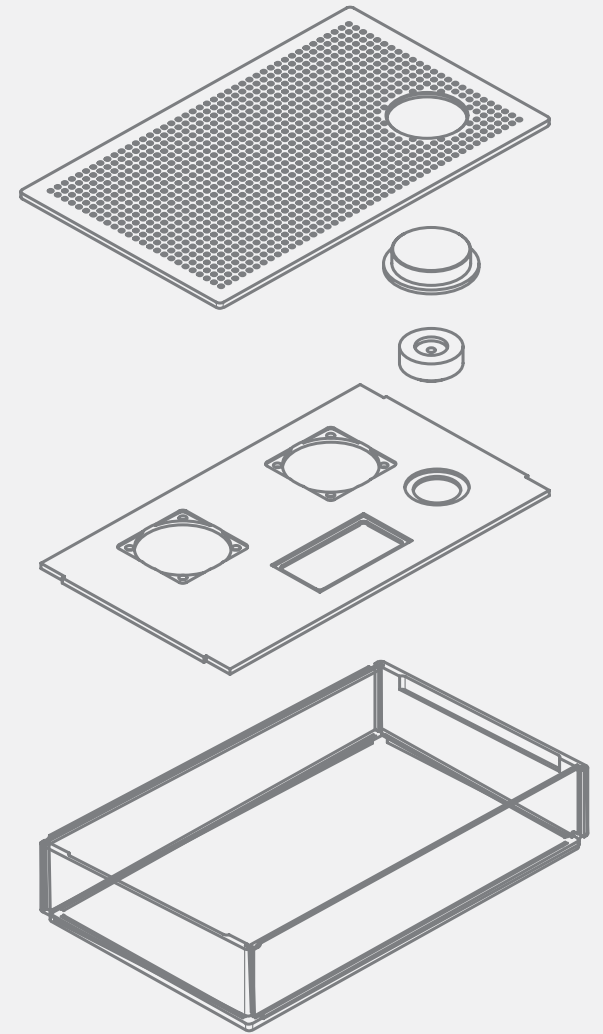
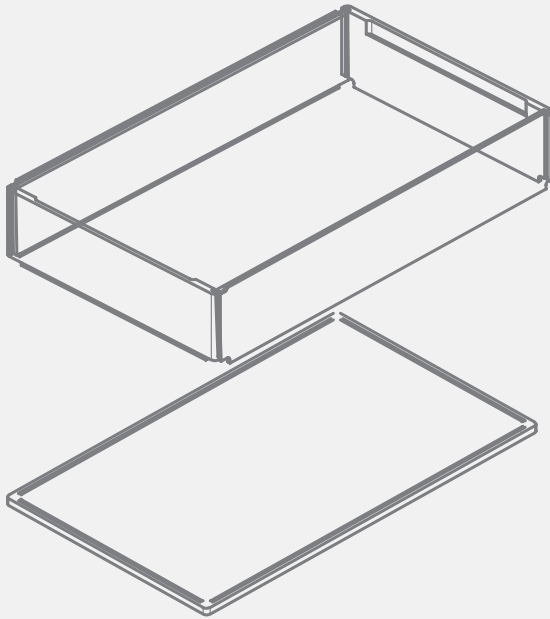
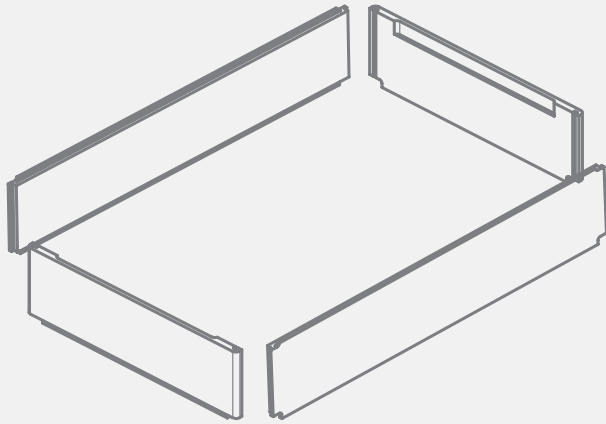
This first prototype took a long time to complete as I was not fully aware of how the material would interact with the intensity of a CNC machine. Some layers would need to be surfaced to gain a flat enough side to mill from. This surfacing meant a build-up in heat and could lead to warping - which could make some areas thicker than others. This took a lot of time, as it meant that I could spend hours on a panel and then have to restart the process if it started to warp.

Thankfully, due to the material being a thermoplastic, it meant that if the material were to fail, then I could remelt it into a block and then start to machine again.

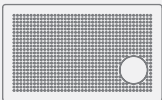
I solved this problem by only taking 0.4mm off the surface at each time, and then leaving the material to cool. Although this method of production meant that I had to spend more time on the machine, it used a lot less energy to produce and greatly reduced the chance of warping.



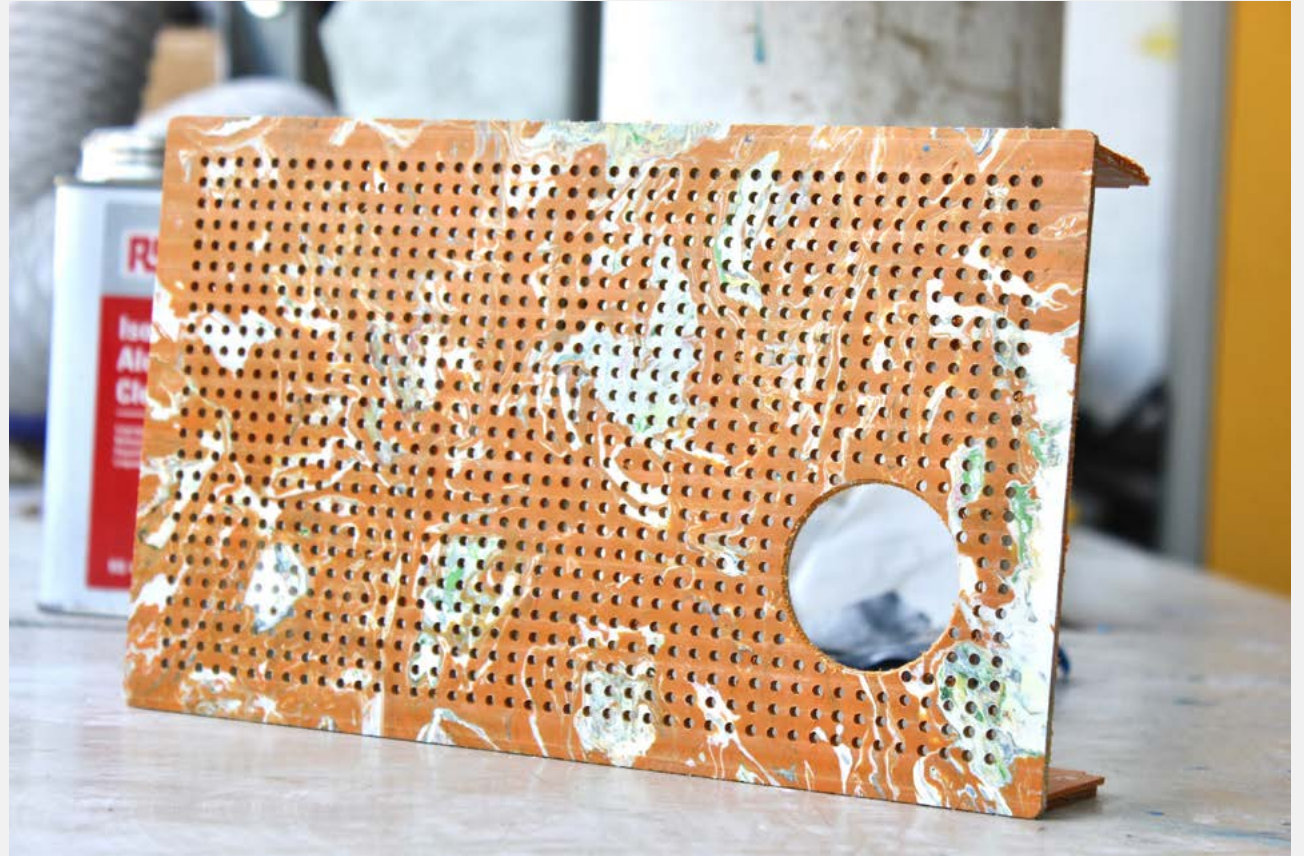
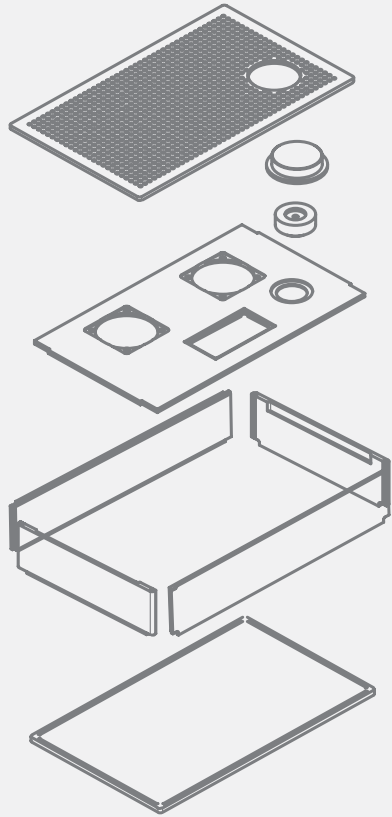
Designing flat-pack components that interact - inspired by IKEA



At this point I could apply the digital CAD drawing to the surfaced material. This was the least risky part as the material had much less chance of warping - giving me an accurate physical representation of the digital file. This is important, as all the components were designed to fit together in 2mm slots, meaning that any warping could stop the final piece attaching together securely.









Melting down offcuts from cnc-milling, to form new sheets of raw material (LDPE)

# offcuts

After cutting the object from the material, you are not just left with the finished piece and waste.

The offcuts from the cnc-milling come out as 'snake skin-like' shavings. This can be very quickly remelted in the industrial ovens, and have an interesting swirled aesthetic once it is compressed.

The finished object can be reprocessed very easily. Also after its use, it could be chopped into small pieces and then remelted or it could just be melted from its original shape.





Sample Speaker grill made from previous offcut pieces of LDPE.

All of the offcuts from milling the base panel were remelted down into a thick block which were then milled into the volume control. This proved the 'Cradle-To-Cradle' nature of the material, showing that all waste could be reused easily. This also added an interesting aesthetic to the speakers, visualising the nature of the recycling process.





Assembling final prototype Waste Speaker

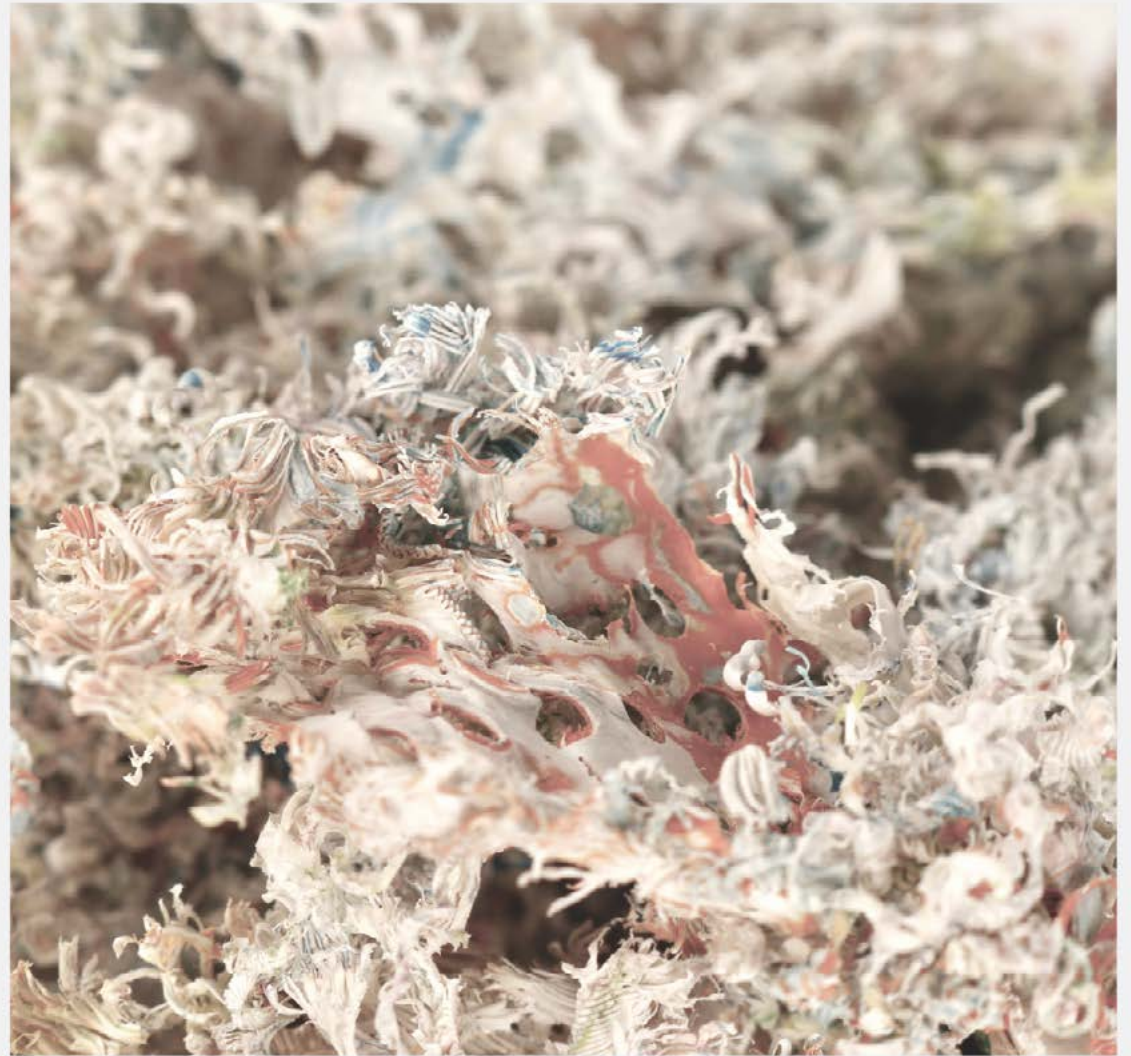


# publication

To present my research projects to the public I wanted create well-edited magazines that explained the processes and sustainable outcomes of each of the objects.

For the 'Waste Speakers', I used a photo of the offcut reusable material from cnc-milling. This material is key to the whole project as it means there is zero-waste through production.

I wanted to replicate the form of the speaker through the graphics, so I continued using a minimal but detailed aesthetic throughout.



## WASTE

Making everyday objects that produce zero waste, made from 100% recycled plastic bags

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2017



# critical reflection

At 4mm, the material can be very flexible when not having a large surface area. In my samples I had made large sheets, which were structurally sound, however when I introduced complex joins to the design, the material began to weaken.

Specifically at the back of the Speaker box, the material has become particularly weak. When designing my second prototype I invested time in redesigning the joins to work with thicker sheets of plastic. Increasing the thickness of each component by just 2mm would strengthen the overall form.

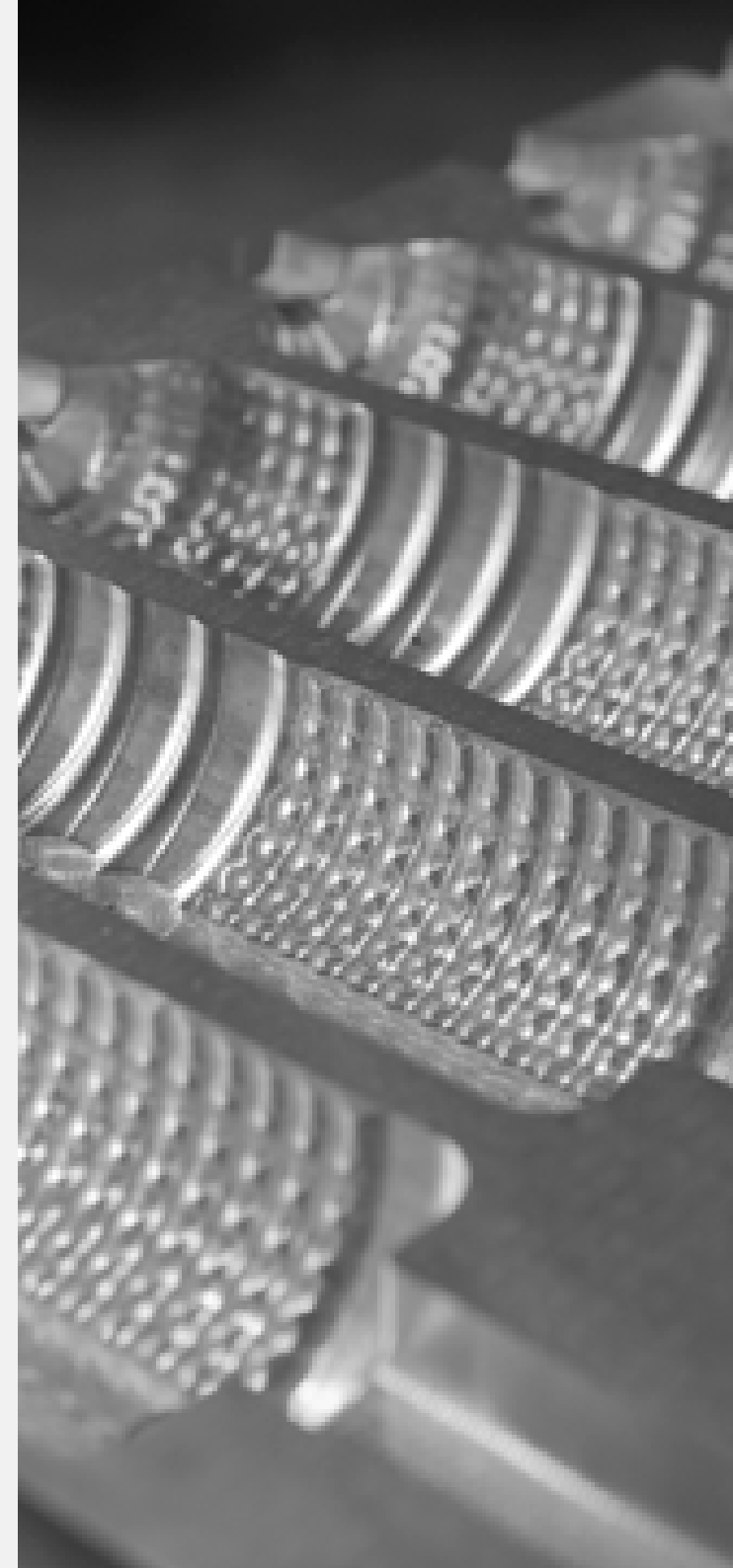
To improve this design I would avoid creating large open joins, and instead create more frequent holes where the material can lock together to form a stronger bond.



As this was my first trial working with waste plastic to create a flat-pack object, there is still much improvement to be made on the process. Ideally, I would not use a CNC-milling machine to cut from large blocks, and would instead use injection moulds to create the components in a solid form.

Although this process would be economically and environmentally costly to begin with - using milled aluminium moulds - it would save a great deal of energy and time when producing the products in batch. This would also avoid the problem of me having to assemble the material in flatpack. As there is much less chance of the material heating up and warping, it would mean I could reduce the amount of separate components from 9 to just 4 - overall speeding up production time and reducing complexity in manufacture.

Although the CNC-milling machine can be accurate and give great detail, it takes a long time to produce one component from waste plastic, and is not reliable due to material warping. I would also spend time reworking the design to make the wall thickness increase from 4mm to at least 6mm, this will strengthen the structure overall.

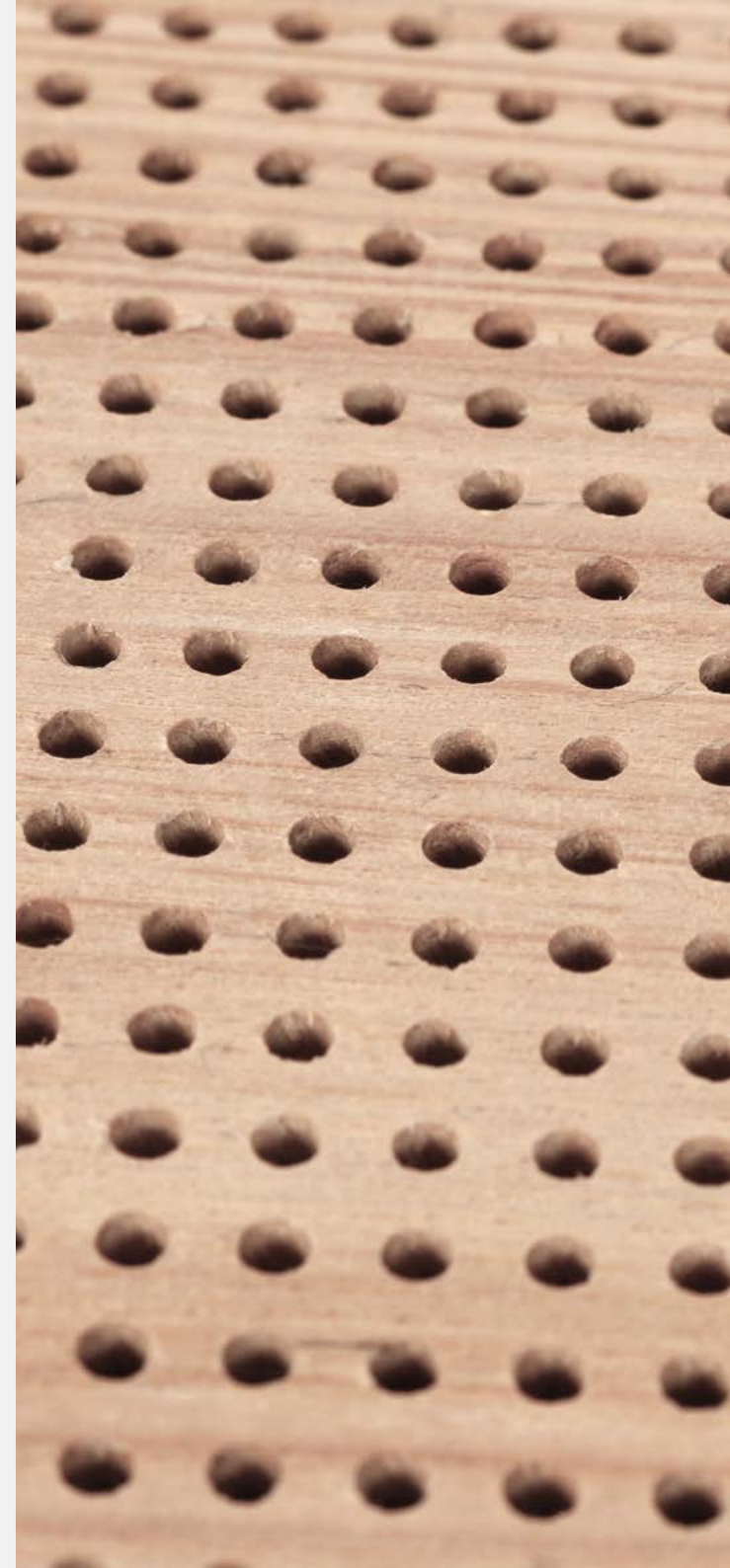


place



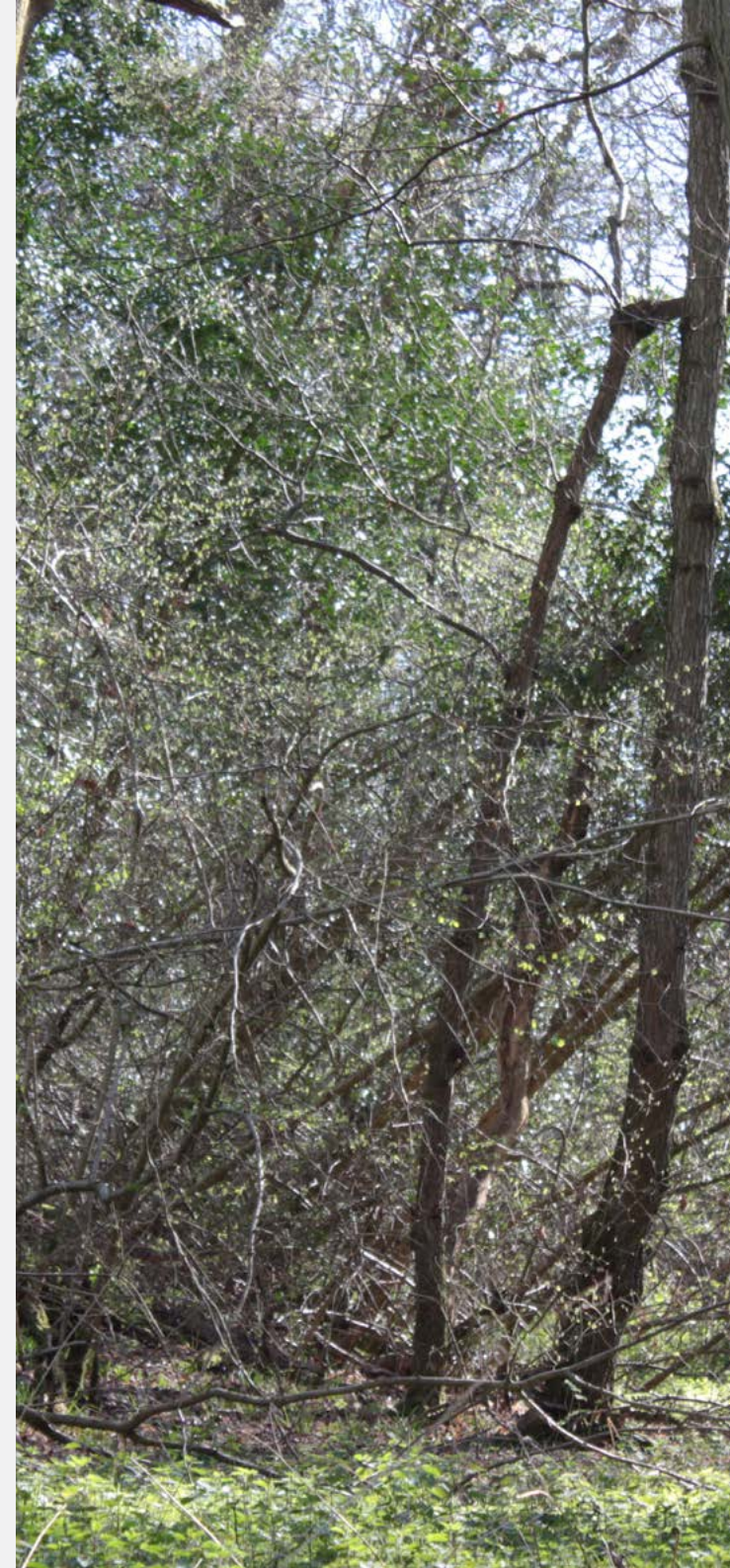
The Place project is an exploration into material locality and the circular economy in the context of sustainable design. I used Stewart Walker's book 'Sustainable by Design' to generate a series of rules to follow throughout the project. These rules included; Designing products that incorporate ideas of local vernacular, create local jobs, and generate circular systems of production and recycling.

Walker suggests that if communities designed and built their own products, they would have a better understanding of how to utilise materials after they have been finished with - avoiding landfill.



key information extracted from  
stuart walker's  
*'sustainable by design'*

- Local Economy, Local Employment, Locally Relevant and Appropriate
- Utilisation of Local Materials
- Employ Local, Skilled, Productive Workers
- Add Community Wealth
- Sense of Personal Worth and Contribution for Employees
- Creation of an aesthetically vibrant and evolving material culture
- Emphasis on Local Repair, Reuse and Recycling
- Mixing Local Making Techniques with Mass-Production
- Sustain a Vigorous Market Economy, while being Environmentally and Socially Responsible



implementing walker's  
rules to create a  
community-specific product

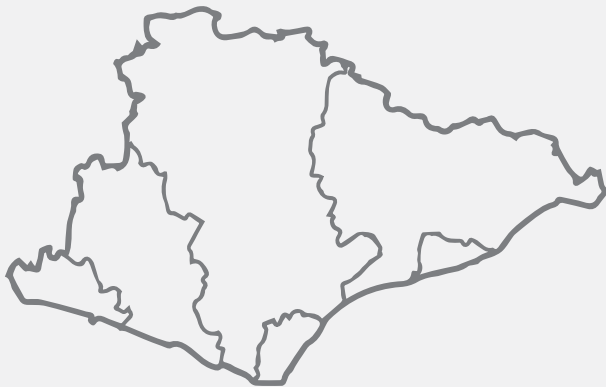


within brighton



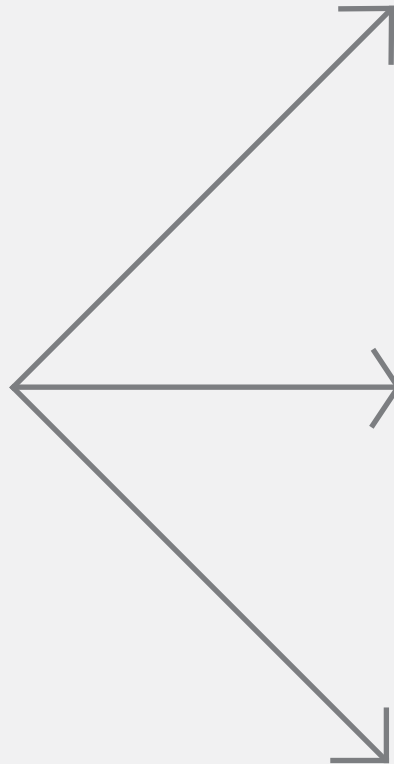
# east sussex

- lewes
- brighton
- newhaven
- hastings



What materials are traditionally found and used in construction and manufacturing within Brighton and East Sussex?

mining local materials-



stone

sandstone  
limestone  
chalk

timber

→ oak  
→ ash  
→ elm

clay



# a s h

Chalara dieback of Ash, is a disease of ash trees caused by a fungus. Once a tree is infected by the disease, it is usually fatal.

The first recognised outbreak of Chalara in the UK was in 2012, and has continued to grow ever since. The disease has potential to cause significant damage to the UK population of Ash trees - with some experts estimating around 12 million Ash trees expected to die.

Although the fungus kills the tree, it does not effect it's uses as a timber - other than a possible stained aesthetic.

As we are likely to expect a huge yield of Ash timber in the near future, I wanted to show the uses of this material when designing premium products. I have suggested an outcome of the material to avoid using the material as fire wood or chipboard.



Turned Nest of Bowls - Made with Chalara Infected Ash, Robin Wood, 2013



Discoloured Ash Wood, BBC News, 2012

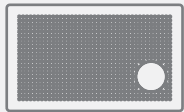
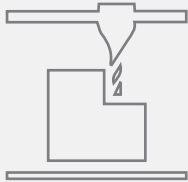
# cuckfield woods -

15 miles outside of brighton

Using local Ash timber from a well-managed woodland in East Sussex, ensures that the Speakers have a low Carbon Footprint. The Place Speakers represent a vernacular aesthetic, made by local manufacturers from wood that has grown just 15 miles away. These are designed specifically to benefit growth of a local economy.



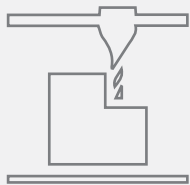
from material to product-



- Measure the material
- Cut the block using a band saw
- Plane the material to the correct thickness
- Attach the block to the platform on the milling machine with tape or screws
- Program the machine to start cutting material and wait until the job has been completed



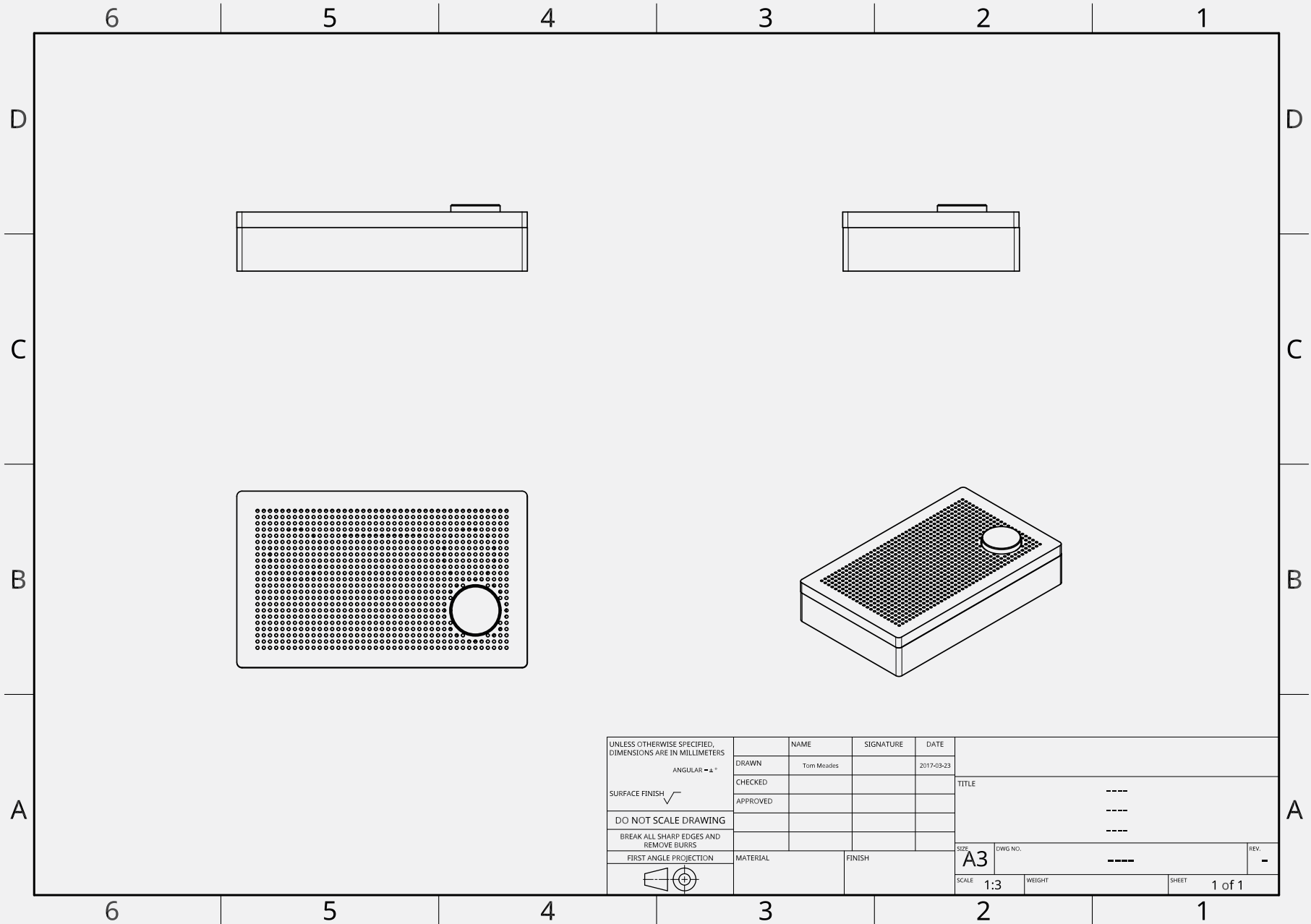
- Once finished, remove from the machine and sand off any rough surfaces
- Apply wax to the surfaces of each component, wait to dry and then rub back to get the desired shine
- Connect the electronic pieces and attach to the shelf
- Turn on, and connect your phone, laptop or tablet to the bluetooth device, and enjoy!



- My first prototype of the speaker achieved the desired aesthetic however was not ready to start functioning.
- The volume control was not yet designed, and I had not deciphered a way to connect the electronics onto the wooden material.
- Using these wing nuts would have made the back of the speakers seem very unattractive and would ruin the minimal aesthetic which I was aiming for. Therefore I had to spend time developing a new way to join the wood without being so obvious.





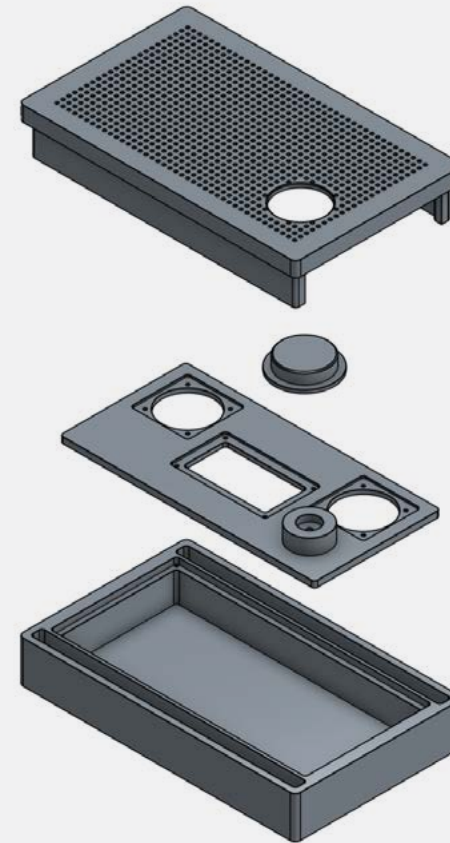
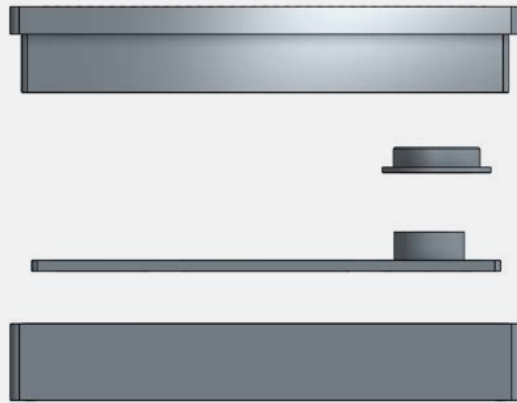


UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN MILLIMETERS  ANGULAR $\pm 1^\circ$  SURFACE FINISH $\sqrt{\quad}$  DO NOT SCALE DRAWING  BREAK ALL SHARP EDGES AND REMOVE BURRS  FIRST ANGLE PROJECTION	DRAWN	NAME	SIGNATURE	DATE	TITLE			
	CHECKED	Tom Meades		2017-03-23				---
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	MATERIAL	FINISH		SIZE	DWG NO.	REV.		
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Drawing using Onshape software - developing Place Speaker components

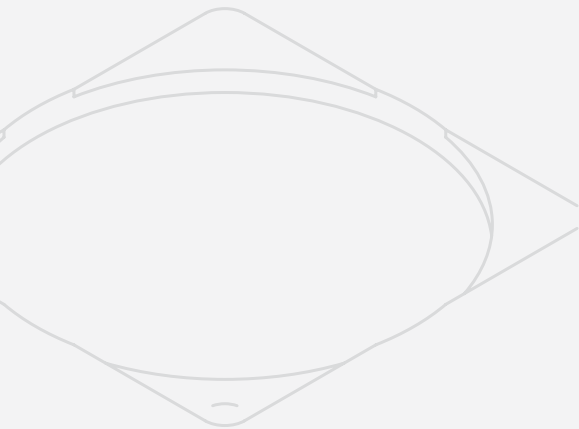
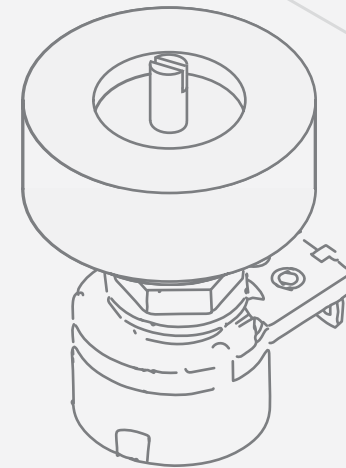
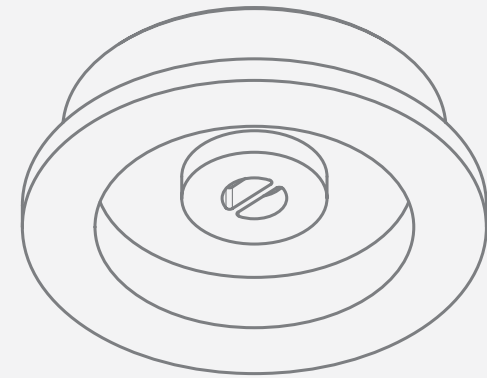


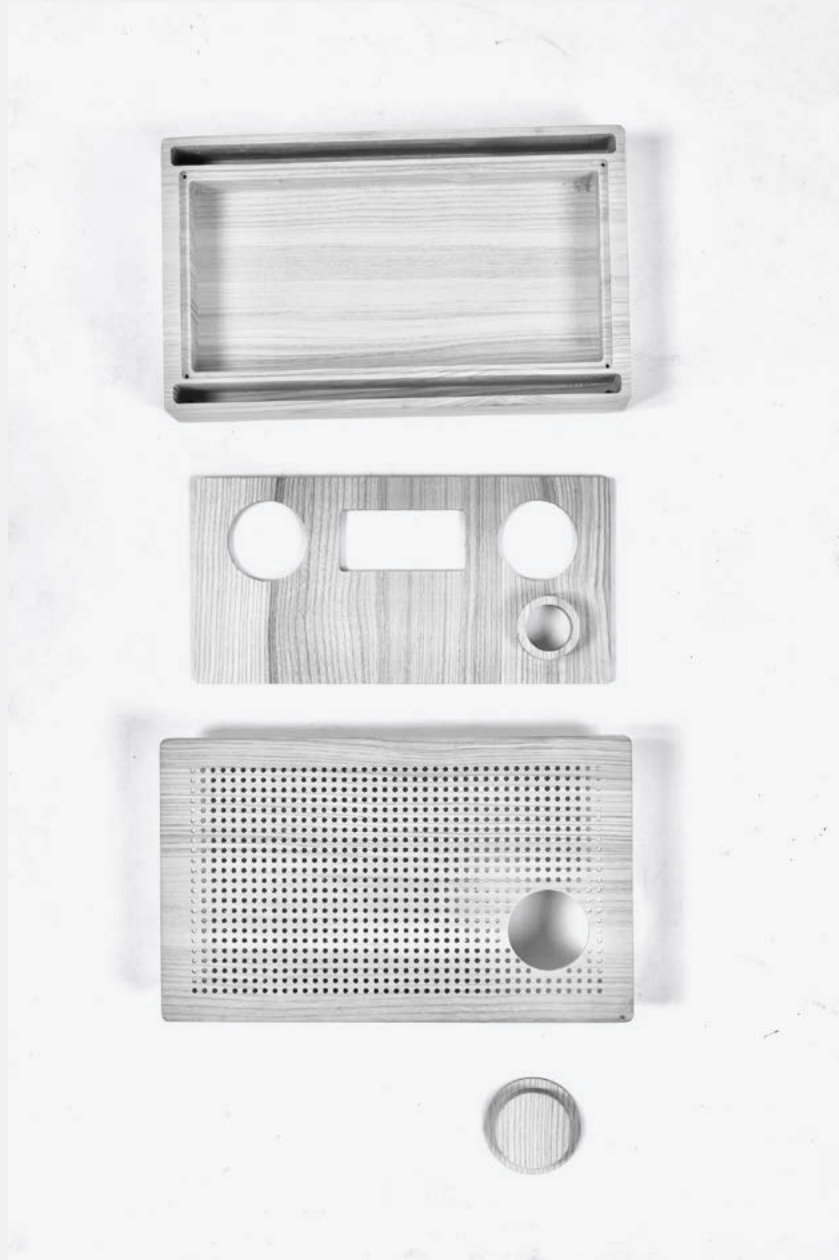
3D Development - Designing moving components that interact with each other, that can be assembled or disassembled easily, while also maintaining structure.



Attaching the electronics onto the wooden shelf.

I designed a hole in the shelf where the potentiometer can screw underneath and reveal the control out of the surface. This component is then ready to interact with the wooden volume control, which fits tightly and is secured in place. This allows the user to adjust the volume without having to see any of the electronic components.





Place Speaker components, made from locally sourced Ash





# publication

To present my research projects to the public, I wanted to create well-edited magazines that explained the processes and sustainable outcomes of each of the objects.

For the Place Speakers, I used a photo from Cuckfield Woods. These were taken on a research trip, to learn more about the home of the Ash material.

I wanted to replicate the form of the speaker through the graphics, so I persisted with using a minimal but detailed aesthetic throughout. I maintained a Helvetica Light font, and kept the colour scheme within a colour group of greys, I then made them slightly transparent to allow the colours of the natural woodland appear through.

This effect worked well, as it meant that I could keep within the rules of Ram's aesthetics, whilst telling the story of the speakers' history.



## PLACE

Exploring local vernacular, local jobs, and circular systems of production to provide alternative suggestions to everyday consumer items.

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2017

# critical reflection

Making the Place Speakers involved making many different prototypes from a range of local woods.

I experimented using local Pine from a Wood Recycling store in Brighton. Although this was cheap and supportive of using waste materials, it was not suitable for this process due to its tendency to bow when there is a change in moisture. It is also quite brittle, meaning that the joins can easily snap when under pressure.

I then went on to work with Ash. This was much stronger and allowed me to take more risks with making thinner structures that could maintain strong under pressure. This project concluded with making a working product which could be easily mass produced and would be able to support local economies as it set out to originally. However, I would need to source a local electronics company to complete the circuitry for me and design it professionally so that I could ensure it would not break easily.

Also, to improve this product I would work to adapt the volume component. Although it is satisfying to control the volume using local wooden components, the structure is currently not strong enough to withstand heavy-use. These problems could be solved by having more time on the project to develop more prototypes, and get feedback from a greater range of people.

Taking this project forward in the future I will be working alongside local technology company ControlFreq, to develop a range of products that incorporate some of Walker's ideology - using local materials and processes to create well-refined products specific to Brighton.

people





This project began as an exploration into the work of Jonathan Chapman. I had read his book 'Emotionally Durable Design' over the summer, and was inspired to create an object that encapsulated some of his theories.

Emotionally Durable Design is where an object is designed to grow with the user over time, avoiding it going into a waste stream.



“If a designer wants people to become attached to his/her product ... s/he should facilitate ways to form associations between the product and people, places or events (memories), or s/he should design an object that evokes enjoyment.”

- Jonathan Chapman, Emotionally Durable Design



Exploring the sentimental relationship between people and objects, Illustration Studios, The University of Brighton



Life in the Artist's studio, Illustration Studios, The University of Brighton



Capturing the atmosphere of the environment within an object

I began exploring local studios within the University - specifically the Illustration rooms.

Here, I found a selection of unused studio desks, that had been heavily used and gathered years of paint spills and markings. I found this material very interesting, as it presented a series of memories for the users, who may have been studying at the University years ago.





Studio Desks, Sourced from the Illustration Studios, The University of Brighton



Sentimental material sourced from Illustration Studios, The University of Brighton





I found this material so interesting that I used it as interior decoration within my home. Although it is effective for me, I believed that it would be far more interesting to ex-students from the Illustration course. Their memories of time at University could be reignited by the layers of paint spills and marks made on the surface of the tables.



Putting these memory-evoking qualities into a product would eradicate the propensity to 'throw away' of the item as waste after new versions appear - just as someone would not throw out their grandfathers watch to replace it with a newer model.. Hence forming a long lasting sentimental relationship between consumer and product.

After this, I arranged to meet up with George Hardie - a world renowned illustrator and professor of Illustration at The University of Brighton for over 20 years.

Here I discussed with him the history of the studios and what it was like studying and working in this environment. I probed his knowledge of the desk spaces, and asked whether he recognised the material.

I filmed a short interview to show the conversation, and decided to transcribe it and show it in my final magazine publication alongside the 'People Speaker' piece at exhibition.





Short piece of interview with George -

When asked if George had any memorable moments working in the studios, he told me about a time where funding was supplied to the University to attempt to get Art students to come in - rather than working from home. They invested the money in buying sofas for each of the studios, trying to create a more sociable relaxed atmosphere - George expressed the significance of conversation between Art students. He claimed that this was the most important way for students to grow, and far more important than the work itself.

I then spent time in the Illustration studios - trying to understand the atmosphere of where the students work today. I was curious to see how the speakers would aesthetically interact with the space the material was sourced from.

This inspired to me work deeper into the environment. I spent time discussing with George Hardie how we could generate a catalogue of sentimental products formed using materials found within the studio. If I had more time to work with this project I would enjoy generating a range of products that could all be specific to ex-Brighton students.

# process



Processing the People Speakers, involving a similar method to the Place project. The CNC-machine is programmed using CAD software, and then the form is cut from the material.



Processing the People Speakers, involving a similar method to the Place project. The CNC-machine is programmed using CAD software, and then the form is cut from the material.



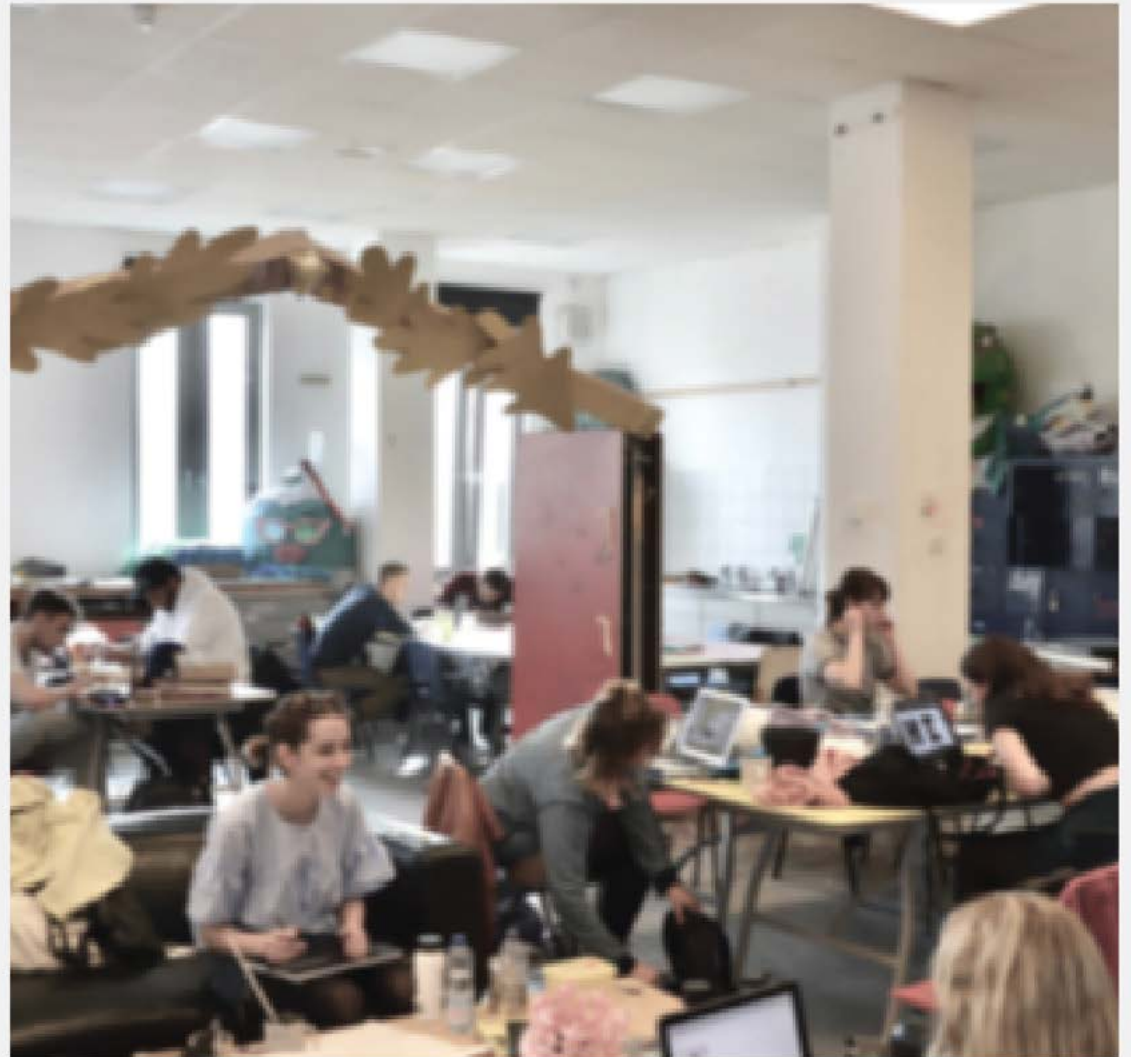


# publication

To present my research projects to the public I wanted to create a well-edited magazines that explained the processes and sustainable outcomes of each of the objects.

For the People Speakers, I used a photo from the Illustration Studios based at The University of Brighton.

I aimed to capture the working atmosphere of the artist's studio with this photo. This personal space is vital for the sentimental importance of the speaker itself.



## PEOPLE

Crafting the concept of emotional durability through design and exploring the value of sentimentality in sustainability

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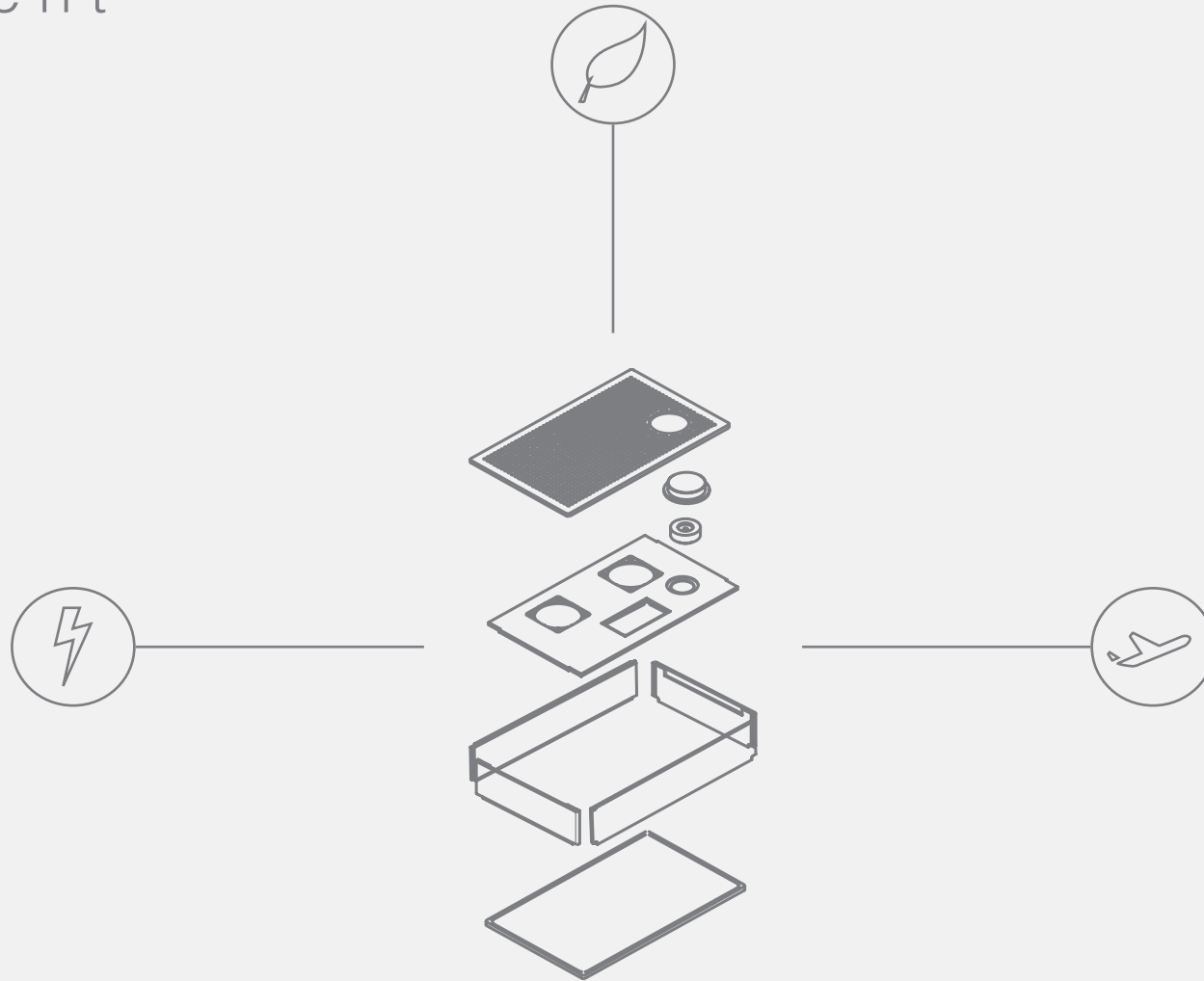
# critical reflection

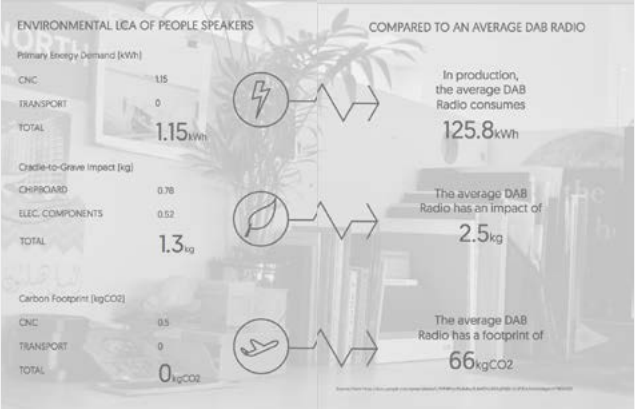
Developing the People Speakers involved gathering today theories, materials and processes to try and produce a product that was a clear representation of Emotionally Durable Design. Whilst the material is very interesting aesthetically, it is only recognisable as sentimental after the story about it's history is told. This makes it difficult to be appreciated in comparison to the other speakers, as these are obvious representations of their sustainable theories.

The issues I have had with this object is connecting it to it's original users in it's previous life as a studio desk. However, after meeting George and learning some of the history about the studios and how the students may have interacted with the objects - I was able to create a narrative about the Speaker's past, and learn the importance of the studio space to its users.

To develop the People Speaker, I would like to pursue designing and making a range of products that are representative of a certain community or group of people - so that these are then indefinitely important objects to their users. I would also like to compare aesthetics of sentimental objects between their owners. For example, how might an accountants speaker compare to an artists? This would create an interesting range of products that are all sustainable and built to be used forever, yet all completely specific to their user. Each would highlight the individuality of each person.

environmental  
lifecycle  
assessment



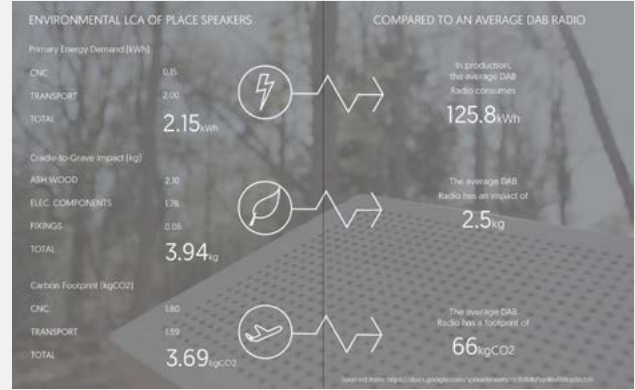
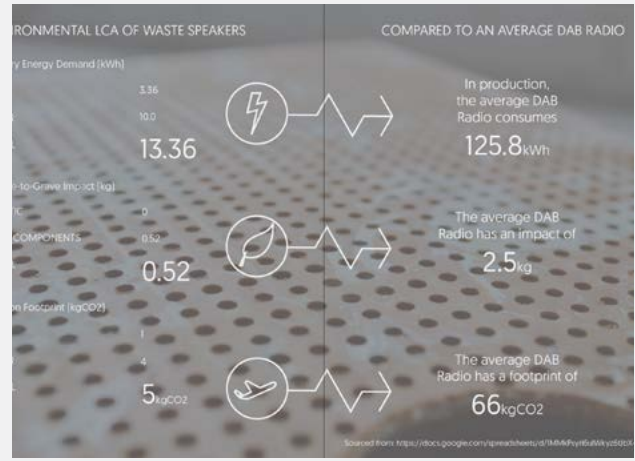


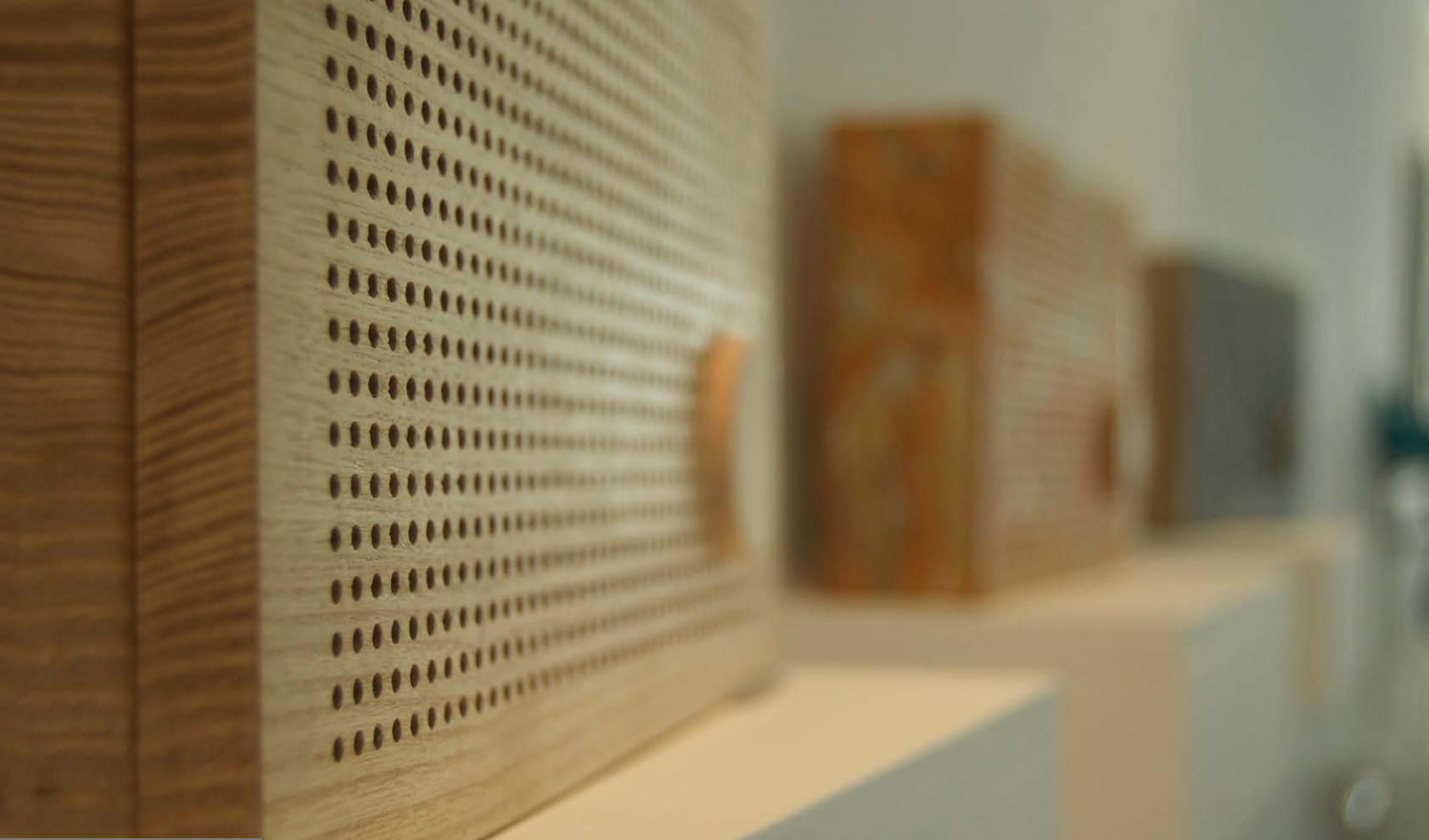
I felt that it would be important to measure each of the speaker's energy consumption, carbon footprint and cradle-to-grave impact. This information could then be provided to manufacturers to prove the economic and environmental advantages of using certain methods to produce high-value goods.

I chose to use the same assessment criteria as Sustainable Consultancy Thinkstep. This way I could ensure that all of my results can be compared against other everyday consumer items.

Environmental life-cycle assessment (LCA) is a collection of data that aims to measure the input and output of material, energy and waste flows associated with the objects over their entire life cycle - determining the environmental impact.

This pushes my project to be more critical on itself, and questions how each component can be improved on the next prototype.





All three speakers setup in exhibition, The University of Brighton Degree Show 2017

# promotion

I created a website and social media page as a way of making the project more professional, while also being able to test a response from the outside world.

I wanted to use the platform to showcase myself as a Sustainable 3D Designer, making high-quality one-off pieces that could influence the development of a future mass produced product. Although not selling any objects directly from my site, I have marketed myself as a freelance designer and opened the possibility to job opportunities.

So far the Speakers have been published by a range of different design-based social media accounts, including @MaterialDriven, @Student.Design and @99PercentLifestyle. I have also had interest from local Brighton social media outlet BN1 Magazine. The Waste Speakers featured in Material Driven's week of waste plastic.

This platform has helped me communicate to professionals already working in the Sustainable Design field. I have been in regular contact with Smile Plastics (a leading design and materials studio based in London, specialising in working with waste plastics), this has been a great insight into life after University, whilst also providing advice on where to take the materials next.

# MEADES DESIGN



SPEAKERS

GLAZED

VR+DEMENTIA

PEOPLE

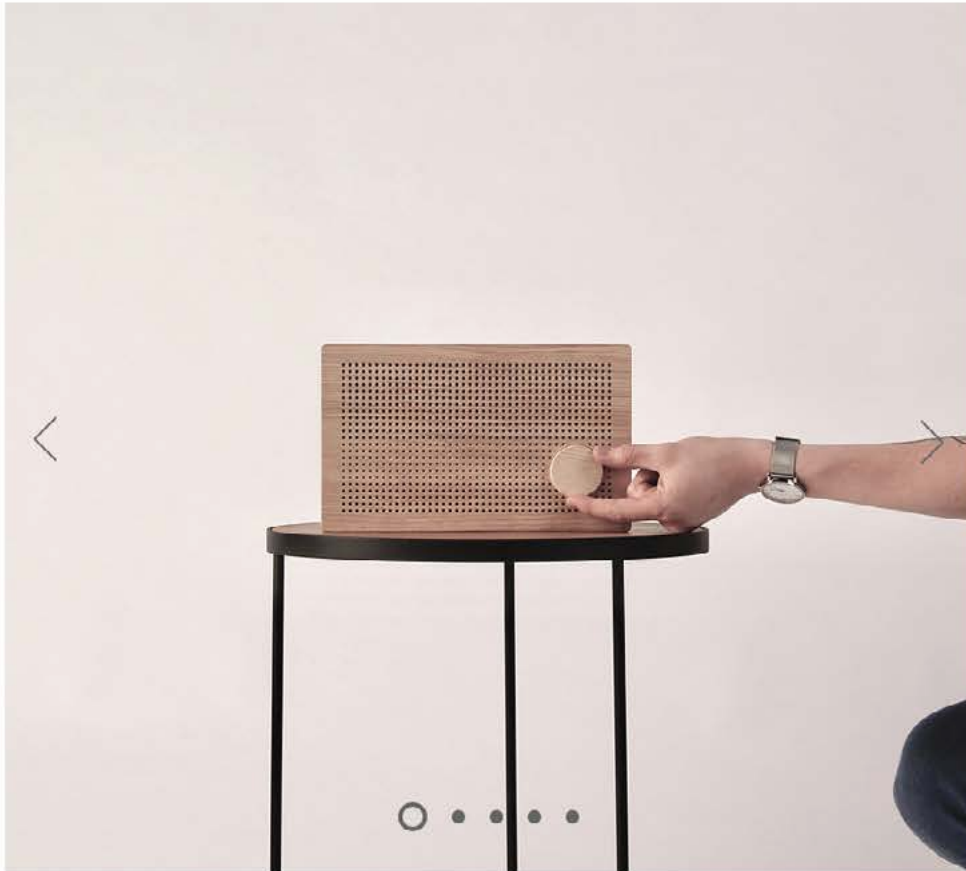
PLACE

WASTE





# PLACE SPEAKERS



I have developed a range of speakers that each expresses a vision of sustainable design.

The Place Speakers represent a shift towards a local economy, where products are made from local materials, manufactured locally and should represent local design aesthetic.

These speakers represent Sussex - from using locally felled Ash, to finishing the objects with Bees wax made just 16 miles away. The minimal design and branding of the objects allow their natural features to stand out - reminding the user of where their products have come from.



28 posts    207 followers    333 following

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PLACE SPEAKERS



PEOPLE SPEAKERS



WASTE SPEAKERS

PLACE SPEAKERS

This project presents a series of three Bluetooth speakers titled: 'People', 'Place', and 'Waste' - each designed to critically explore digital manufacture and sustainable product design.

The Place speaker critically explores material locality and the circular economy in the context of sustainable design. This project utilises Stewart Walker's model - 'Sustainable by Design' - by incorporating ideas of local vernacular, local jobs, and circular systems of production.

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PEOPLE SPEAKERS

This project presents a series of three Bluetooth speakers titled: 'People', 'Place', and 'Waste' - each designed to critically explore digital manufacture and sustainable product design.

The People speaker builds on the concept of emotionally durable design by exploring the value of 'sentimentality' in sustainable design. This design incorporates the patina of a recycled artist's desk to embody the sentimentality of a creative space into a consumer object.

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WASTE SPEAKERS

This project presents a series of three Bluetooth speakers titled: 'People', 'Place', and 'Waste' - each designed to critically explore digital manufacture and sustainable product design.

The Waste speaker explores the Cradle to Cradle model of production by utilising material waste to produce a high value goods from materials otherwise destined for landfill. The outcome is an example of how waste plastics can be repeatedly reprocessed to produce new products.

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