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“How are current designers changing existing conventions of materials purpose and use within design by creating alternative solutions.”

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Summary of topic.

Currently some designers are trying to push the limits of materiality. Understanding the diverse properties of materials have allowed them to experiment to change traditional norms to create more effective alternatives. This is crucial for designers to explore now as the world is trying to find solutions for different sociological and environmental issues, which need to be answered.

Introduction:

Designers are constantly innovating and developing the ways in which different materials are being used. They are doing this to create products which are more efficient or by making something unique to products that are currently being produced. A huge factor revolving around this advancement is through the development of environmental change. The consumption of different products consumers are using on a daily basis have made a great impact on the state of the environment. Creatives are aiming to alter this by making small improvements to products to positively impact the world, through implementing changes of everyday products. This is being achieved by creating sustainable alternatives and reworking current materials functions. This is a great way to show that there can be positive outlooks on all materials if they are used correctly.

Consumers are beginning to be aware of where and how their products are made and it is making a big impact on the environment showing that these changes to materials are potentially a long-term solution to climate change. Designers are not just trying to provide exposure to issues, but they are trying to improve negative attributes to the environment. These factors may include problems with manufacturing like items having a high carbon footprint, so redesigning and understanding what is necessary in production is key. For some this problem is caused within fashion. Elements of manufacturing fast fashion has created a large carbon footprint around each of the products from elements of the turnaround of manufacturing, shipping and sourcing these products on such a high demand.

Social improvements within design change expands an idea of the products functionality. Each design of a product needs to be working at the highest potential and if it doesn't it may be time to reconsider what could make it better. Making products efficient at a good quality will reduce the consumption of products as product satisfaction would be a lot higher. Also, if quality is good, people will take better care and want to respectfully use the item.

One issue designers will always battle with, is the idea of aesthetics and trend. Consumers want to purchase the newest version of a product or will want to stay up to date. Because of this they need to think about the appearance of a product; if it is to make something with a timeless aesthetic or create an item which is sustainable.

The technological advancements within creating products is something that is developing quickly. The idea of robots used to be something of the past but they are now becoming more current through elements like drones and smart cars.

CHAPTER 1: Issues Regarding Materials Functions

Currently people are unaware of the indications that things need to change by way of the types of materials used on a daily basis. A lot of materials in mass production are creating a negative effect on the environment. Some elements we use to create things are running out because of the rate we are burning them in production (e.g. noble gases). Man-made materials like plastic are also damaging our planet due to the carelessness of how people utilise and dispose of them. Designers and other companies are implicating new alternatives to these materials which could become replacements to these 'harmful' products.

The reason that a lot of materials we are using now are harmful to the environment is that they have a long lifecycle meaning it takes a lengthy amount of time for them to decompose, for example, plastic, tin and leather. Some individual consumers are not throwing the rubbish away correctly, as they have little understanding of what can and can't be recycled, which shouldn't be an issue nowadays. Even if people have the correct understanding that not all plastics can be recycled, they still get it wrong, this is because a lot of the time items are contaminated with things like food or grease so they must go to landfill anyway.

The media have recently been combatting the issue of climate change and the consumption of products and have been trying to explain what the individual person can do to help, for example BBC Wales have published an article 'Recycling in Wales: Reduction in black bin bag waste' (Cashmore, 2019) highlighting issues of the amount of waste in Wales; making the public aware of alternatives that positively

help the issues around single use items. Nature documentaries have also made a big impression showing people the environmental impact their rubbish is making. For example, Blue Planet (Our Blue Planet, 2017) show horrific images of animals suffering due to the waste we make. It is why its apparent that plastic pollution is one of the largest, negative impacts to the ocean.

The development of improving products are being limited by the element of mass production. Production has had a negative effect on the environment, as factories emit many dangerous gases. In production gases like CO₂, methane and nitrous oxide (NASA's Jet Propulsion Laboratory, 2019) are emitted, which impacts on the environmental greenhouse effect. The environmental state of human activities currently releases over 30 billion tons of CO₂ into the atmosphere every year. (United States Environmental Protection Agency, 2017).

At this time people are trying to stop the production of harmful materials, and there is great impression that this change is currently trying to happen. Environmental activists like Greta Thunberg (TEDx Stockholm, 2019) are influencing young people to make their own voices heard through concepts such as climate strikes and, for harmful materials and gases to be cut down and stopped. The resource UN Environment's Global Resources Outlook 2019 have examined the trends of natural resource consumption and that the extraction and processing of materials total to half of the greenhouse gases produced since 1970. (UN Environment Programme, 2019).



Fig 7: Cubbits (Unknown)
Kaleidoscopic

Designers are currently trying to adapt the purposes of materials to make sure they have been used to their full potential, before they are binned or wasted. Designers, such as Sophie Rowley (Hitti, 2019) and Barber and Osgerby, (Pownall, 2019) have been creating new products revolving around the usage of waste: producing materials that

give a second function after they are not wanted; extending the materials lifecycle; and there has been experimental production which combines wasted man-made materials together with natural alternatives which are less harmful to the environment. Although, there is a lot of stigma around these products, as they are very new alternatives that may not perform well when the aim is for them to be produced in the mass market.

Cubitts are a glasses company that create bespoke designs. They have collaborated with other brands to create a range of glasses frames with unique material properties, to make products that can be sustainable alternatives. They have included frames which range from using corn starch, sheep wool and old CDS. They pride themselves on making the products traditionally and by hand. Because of them being hand-made each pair of glasses are made to order and could take six weeks to make. (Frearaon, 2019).

Smile Plastics is a business Cubitts collaborated with. The Welsh company create panels from different types of recycled materials that can later be 100% recycled.

Their product is designed to be flexible in purpose, it can be used in an interior setting or be used as a material to make glasses. This brand's aim is to "transforms waste materials into unique decorative panels for the architecture and design industry." (Smile Plastics, 2019) They used three of their materials to collaborate with Cubitts to make the frames: the first from reused food packaging and drinks bottles which you can see in figure seven; the second compound of materials has created a marbled style design made from yogurt pots and the final from chopping boards and packaging which created a cloud effect of blue and white. One thing that is significant about the materials they create is that the ratios of the materials they use are easily accessible on their website so the consumer can look up exactly what is in the product. This is a great thing to know about their products, as the consumer can trust what they are buying and there are no hidden ingredients involved. (Frearaon, 2019).

Designers are trying to create products in a more ethical way to what there has been in the past, this is because consumers care a lot more about where their items are coming from and who are making them. Some factories have created environments which have terrible working conditions but through the development of technology they are trying to limit the number of working employees. With technology advancing this could mean introducing equipment such as robots to the assembly line which could potentially replace people. A good example of this would be DHL. They use two different types of 'Rethink Robotic Cobots' to pack products alongside paid employees and in November 2018, DHL announced a £233 million investment to introduce more robots into their warehouses. (Love Money, 2019). This has changed the efficiency and process in which products are made on an assembly line. The only

negative drawback from this new process is that a lot of money has to be invested into the business to change the way in which they currently work. The initial cost of these machines and the upkeep is huge, and if one component was to break it could shut down the whole production line.

Products which are manufactured in large quantities have generally been produced quickly and cheaply. This is normally to meet demand and to have a quick turnover in products, like the manufacturing of plastic, textiles and metals. With new material alternatives being produced factories are having to understand if their products are still going to be needed after this change or whether they should rethink the materials they produce. If they do not consider this change it would be at a greater risk either way.

Plastic is one of the most questioned materials we use. Different types of Polyethylene plastics are one of the most common types of plastics used on a day to day basis. Examples of this are polyethylene terephthalate (PET) which is mainly found in food packaging and bottles, and Low-Density Polyethylene (LDPE) used to make plastic bags. They are recyclable and easily manufactured, which is probably one of the factors why it is such a common material. Polystyrene (PS) and Polyvinyl Chloride (PVC) used for piping and insulation are more questionable types of plastics as they can be the cause of serious health risks and environmental pollution issues. The issue with plastics lies within the materials which are classified as 'single-use plastics', where the product will only have one function and after that it is thrown away. This generates lots of problems mainly due to the environmental issues this creates. The manufacturing of plastic is very harmful to the atmosphere

producing a lot of carbon dioxide. It can take thousands of years for plastic to completely decompose, depending on if the plastic has been exposed to high temperatures. Plastics materiality means that it cannot tolerate high temperatures leading to, once again, that it will release more gases which cause a negative effect on the environment.

The manufacture of single-use products and the function of plastic is one of the key negative impacting materials companies produce. As a material, plastics have some great advantages when you compare it to other materials. Plastic is highly durable meaning it can last a lot longer than others (this can be a negative also). It is malleable and lightweight meaning it can be formed into many different things easily and it can look very effective. It is smooth and bendable, so it doesn't have to be handled carefully like something that can crumble, or a material like glass where it is harsh and easily breakable.

The environmental issues regarding plastic are becoming endless. Mainly due to the carelessness of people not knowing the issues around what it takes to dispose of the material. Every year at least 300 million tonnes of plastic (Ritschel, 2018) is produced and most of it is created as single-use items, at this rate with the expanding population there is no means of stopping it. Once plastic gets into the natural environment it begins to break down, and it is very difficult to get rid of. It disturbs the natural order of the ecosystem making plastic a part of the soil and food. Environmentally it has affected a lot of natural environments and the well-being of animals, as it doesn't decay for 100s of years. That is why people have discovered fish with plastic in their digestion systems and birds with plastic tangled around them.

A study by University of Plymouth and Plymouth Marine Laboratory has found this that three percent of larval fish had eaten microplastics in 2017. (Parker, 2019) This evidence supports this idea that plastic is affecting the world and everything in the ecosystem.

People generally go about discarding plastic by recycling it so it can be reused in manufacturing, but a lot of the plastic is still wasted due to the degrading and the contamination of the plastic. A solution to this is using biodegradable plastics. A lot of different types of them are being produced now which is a material that could be a good alternative to single-use items but, there is still a lot of questions about how effective these products are. The manufacture of this alternative material in contrast to plastic is a lot better for the environment as it uses less energy, which means that it has a lower carbon footprint. These types of products are decomposable but they rely on the individual to dispose of them correctly otherwise, if a consumer just bins it the product would never decompose. The biodegrading will only occur if it is exposed to heat, light and oxygen correctly so there would have to be an alternative way to bin the plastic to help it decompose correctly. (Greenwash 101, 2016).

Bioplastics are made from renewable materials like corn starch or vegetable oil. They are very diverse materials as they can be combined with other materials to give them different properties. For this they are often mixed with BIO-FLEX, co-Polyester and PLA to make them different. The attraction of most bioplastics is that they can be compostable, and it is a much easier and safer alternative to plastic once it has been used.



Fig 1: Plantbottle (2012) *Unknown*

PlantBottle (The Coca-Cola Company, 2012) is a packaging company that is now working to produce Coca-Cola's plastic bottles. It claims to be the first to manufacture fully decomposable PET plastic bottles. The product

though is produced with soya-based bioplastics rather than sugarcane. Their website explains a lot about the production and sourcing of these bottles, as there are still a lot of questions to be resolved about if these kinds of products can replace traditional PET plastic bottles. (The Coca-Cola Company, 2012). It highlights factors about sourcing and harvesting the materials they use. Harvesting takes up a high usage of water, energy, fertilizers, pesticides and land which would affect the world highly if we were to change over to bioplastics on a large scale. These types of materials would also highly impact the production of food. This is because it would be taking up the land, and the only solution to this reality would be to cut into the natural environments like forests which right now is a whole issue in itself. Coca-Cola has made sure that the production of their bottles is helping improve social-economic factors. They work closely with the government of Brazil where the product is produced, to help improve the biodiversity that connects with good farming practices and sound public policy. (The Coca-Cola Company, 2012).



Fig 2: Kensler, M. (2016) A look at how cradle to cradle concepts might work within human production systems

Michael Braungart and William McDonough have co-written the design manifesto based upon the idea of Cradle to Cradle. Their book, *Cradle to Cradle: Re-making the way we make things* identifies their need for a circular lifecycle when it comes to the manufacture of products. (Braungart and McDonough, 2019) It presents ideas that are trying to create beneficial changes of safe materials, water and energy in the circular economies and combats the issue of waste. The framework included in figure 2 shows they have put forward a way of trying to eliminate waste and make sure we use the materials until they are worn out. When creating products using natural resources the lifecycle is simple - once it has been used it can be put in an environment where it can decompose, and it can be used again as compost. The nutrients remaining for the product will help grow the new material allowing the cycle to keep turning.

With materials that cannot be composted they should be recycled so the products can go back into the cycle. So that materials can be reused many times the materials must be high quality, so they can work to the best of their ability. This is important when it comes to plastics. Plastics are graded from one to seven categorising on the type of plastic for people to understand whether it can or cannot be recycled. Numbers three, six and seven are different kinds of plastics that are unable to be recycled, so being aware of which products as a consumer people buy is important so that you mindful of what happens afterwards.

The interpretation of Cradle to Cradle is a 'support strategy' approach for people and has seen to be hugely successful in the Netherlands and their method to this is through educating businesses. The Ministry for the Environment were creating a procurement strategy back in 2008 to help Dutch companies in the understanding of natural gases. Over forty percent of natural gases are created from people being uneducated in the negative effects being made in production. With the exposure of Cradle to Cradle people are able to maximise production to be most effective. (Braungart and McDonough, 2019).

In contrast to Cradle to Cradle being a continuous lifecycle for materials, the framework Cradle to Grave works a lot differently. It focuses on the impact of having to throw away materials and making sure people do that correctly. Companies should begin to take responsibility of where their goods go after they have been used, maybe through recycling or salvaging parts of products which could be used to make a new product through the concept of upcycling.

Referenced in the Cradle to Cradle: Re-making the way we make things is the case study of Orangebox, an office design company based within Wales. (Braungart and McDonough, 2009, p. 9). Orangebox are very aware of the production of their goods and want to make sure they create as little impact on the environment as they can. The company have invested their resources to create Orangebox Remade, where they fully restore products to be considered as good as new. Beyond that they highlight these products being as good as the new products matching them with the same warranty. This is a great marketing strategy as they have the confidence to show that these products are just as good. Orangebox aims to expand a materials lifecycle in the same way in which Braungart and McDonough explores in Cradle to Cradle. They are making sure that each element of the design is made the most of by offering a service to ensure that their process of manufacturing supports the circular economy. The referenced chair (Remanufactured Orangebox Task Chair G64R) is the first of their products to be reused. 98% of the materials used are recyclable. Because of this they are able to cut down the production of these products with elements like process, cost and manufacturing being affected. Once manufactured a reused chair only uses 40% the amount of CO₂ a brand-new chair would and saves 75% of the water it would consume. (Orangebox Limited, 2019). These chairs are made with CMHR foam, cast aluminium and plastic, all elements which can be put back into production and be reformed to create new products. Other policies which Orangebox use to help combat this issue is the element of a zero to landfill policy, being part of the Furniture Industry Sustainability Program (FISP).

CHAPTER 2: Tactile Functionality

Creating a product which will be placed in an interior or exterior space, the understanding of the tactility is key to a piece. The meaning of tactile is connecting to something through touch. So, the interaction someone has to a space or an object will be affected by this. A good example is to reference back to plastic bottles. The design of a plastic bottle is key to the desire of purchasing that bottle over any other. When PlantBottle created their bottle, they explored the handleability of it, through the concept of tactile functionality. The bumps and groves of the bottles enforce how someone must hold it, as seen back in figure one. It makes the consumer want to touch it and want to explore the experience of holding it. It shows that the idea of something that is smooth is seen as being desirable and will urge the consumer to explore the objects; which means that having an item which is pointy could be seen as sharp and dangerous, so consumers are most likely not going to touch it.

A lot of change is happening currently to understand customer needs for a product, to how make them desirable and using natural materials that have sustainable elements is one way that they are doing this. The idea of tactile functionality in natural materials is something soft and visually very appealing to viewers. This could be because people can feel at ease in a natural environment. New experimental ways of design are being created using uncommonly used natural products; things like sunflower seeds and corn husks (Solanki, 2018 p. 94) are now used to make new hard materials such as panelling. Like Thomas Vailly. (Hitti, 2019) designers are truly questioning the limits to these new functioning materials. The main kind of questions designers are having to ask themselves are: what is the limits of this new

material? Is it self-sustainable? Is the product bettering the design process?

Understanding these natural products are key to making them successful.

With recent environmental issues of forest fires and deforestation we need to be able to improve the ways we are producing these materials. With using wood for example, it has made a very big impact on the environment. It is key for most habitats, and people don't think of the implications that this could have on everything. (Union of Concerned scientists, 2016) Producing materials using natural materials will put a great consequence on space for agriculture and natural habitats, if the demand for them is high. More space will have to be sourced for production and growing so this will create question about if the product is sustainable.



Fig 3: Ty Syml (unknown) *Silo Light*

Using natural materials and fibres are one way to improve the waste issue with unwanted products. Tÿ Syml is a company that use both biodegradable products and also reused products. This process is rather unique in the way that the lamps are made, as instead of the lamps being manufactured, they are grown in 3D print moulds. Their lamp shades are created from a mixture of Myceluim and a different

type of material what they called substrate. Mycelium is a compound of threadlike cells made from the vegetative part of fungi which is contained in mushrooms. It is used as a binder to keep the two materials together as it grows and combines substrate to it. This process takes about five to ten days. The substrates are also natural materials that are recycled like wood chips, sawdust and brewers spent grain (BSG). They are used because they mix well with the other components. (Tý Syml, 2019). Mycelium has been designed to be an alternative to plastic polyester as it contains similar properties, for example, it has good thermal properties which ensures the lamp shade does not overheat meaning it would have fire resistant properties. (Lefteri, 2014, P.84) Although, the materiality of these lamp shades are very different, they look to have an almost paper-like quality as shown in figure three.



Fig 4: TACTILITY FACTORY (2015) TACTILITY-FACTORY-CON123-3

Ruth Morrow and Patricia Belford have explored there work in a feminist contexts by combining their understanding of their two fields, of textiles and architecture. This is fundamental to how materials have been shaped due to their functions and materiality. The

two women worked together to create Tactility Factory; a brand which created the collection "Infused Concrete Collections" (2015) which embeds textiles into concrete to create wall features. In figure 4 you can see the effect it gives when the two materials are combined. They decided to work with concrete due to the low-tech

materiality of it and idea that it can be seen as controversial. The aesthetic of concrete is harsh and dull, this material is mainly seen as something rather negative as it creates these large unattractive buildings. Concrete buildings have a lot of negative stigma around them, which is why concrete may be compared to this. High rise block towers in recent years have been linked to unhappiness, criminal activity, substance abuse and the overall safety of them. (Belford and Morrow, 2012) An example of this bad design works hand in hand with the fire of Grenfell Tower in June 2017. Concrete is the complete opposite to fabric and different kinds of textiles. Fabrics and textiles are generally seen as something bright and exciting so combining harsh materials and the malleable materials work well through different ways of experimentation. They have created three different successful combinations of fabrics, which has added to this collection; linen, velvet and the concept of “stitched materials”. They have all been designed with working together unique concrete recipes, to be able to work as an interior piece.

Tactility Factory draws inspiration from the work of Sherry Ahrentzen when they have been developing their designs. Sherry Ahrentzen has analysed feminist architecture and explores the understanding of a person’s behaviour and thoughts within architecture. Her aim was to ‘look for the invisible among the visible’ (Belford and Morrow, 2012, p. 408) in architecture. The psychological meaning between the two materials used in the designs are significant throughout feminist architecture. The idea of objects and material that could be masculine or feminine is rather common due to people believing in stereotypical attributes. Men are perceived as strong and hard, which concrete is also seen as, and fabric is seen as soft which is the same as women. Tactility Factory love exploring the two -contrasting feelings within the

materials. They feel that the fabric creates a personal experience between the viewer and the wall feature, making the materials seem as a positive and negative to your own personal feelings. This shows that the objective of Tactility Factory is to enhance people's experience of these wall designs by increasing levels of tactility which is caused by the manipulation of the materials.

Although Tactility Factory's whole ethos of design is created through the touch and the experience of their products the way in which they create the work is very digitally orientated. All their designs have been created digitally which seems very impersonal and contradicted the aims in which they want their products to be viewed. When creating a sensory experience around touch I would expect that the development and process of the products would also be very hands on.

The idea of sensory products implies that a consumer would have an experience, or an emotion caused by the product. Through experiences which revolve around touch designers would want you to feel that you deserve to hold or touch something in a space. Juhani Pallasmaa's research and work supports this by exploring the relationship between senses and architecture. His writing implies that the only way in which we can connect to the world around us is through touch.

The boundary line between the self and the world is identified by our senses. Our contact with the world takes place through the skin of the self by means of specialized parts of our enveloping membrane. All the senses, including vision, are extensions of the tactile sense; the senses are specialisations of

skin tissue, and all sensory experiences are modes of touching and thus related to tactility.

(Belford and Morrow, 2012, p. 410).

Juhani Pallasmaa's writing is an influence on Tactility Factory's work as he has helped them understand the clear connection and importance of including all the senses in their designs.

Juhani Pallasmaa's writing has concentrated on the connection we have with building. He has demonstrated this by implying we have a clear connection to parts of buildings. For example, in his book *The Eyes of the Skin: Architecture and the Senses* he says, 'The door handle is the handshake of the building.' (Pallasmaa, 2012, p. 62) This is a beautiful analogy that the handle is what welcomes you into the building allowing the participant into its interior. This quote allows the meaning of many possibilities of what lies on the other side of the door.

Maggie Orth's work revolves around innovative designs which is the idea of creating a product or design that will resolve a greater cause. Her work in textiles design is experimental and most importantly fun for her and the viewer. Maggie Orth creates experimental electronic art which is designed for both interiors and fashion. Her work is heavily influenced by weaves and soft textiles. In the past, she explored concepts of double weaves which has led her on to experimental pieces exploring touch. A running theme throughout her work when she explored touch has been using pom-poms, and during her work in 2006 she explored creating fluffy sensory objects. In some of these pieces she created soft switches and dimmers out of pom-poms - the



Fig 5: Orth, M. (2006) *four different designs*

reference image shows some of her designed light switches, examples of these products are in figure 5. (Orth, 2009) Using her knowledge at the time of combining electrical items and textiles she wanted to create a product to sell which would contradict its normal design to create something which could cause a playful interaction.

Through research she found out that people do not want to buy this kind of product and so it didn't go into production. Even though the

product presented a warm and comfortable element to the design using traditional textiles people didn't want to see this. When Maggie Orth set out to create this product, she just wanted to create a fun electrical element which would enhance the perception of childlike play and joy, similar to when you were small you would play with switches in environments such as hardware stores. (Orth, 2009).

She also found out that once her research was completed Innovative Art was looking at more environmental issues. Although referenced on her website she uses reused and reclaimed fabrics, in some of her designs the lifecycle of these products would always be to landfill. Also, the production of the products ethically wasn't very good. She had planned to manufacture 50,000 of these light switches in China meaning that they would be cheap to make but at the same time would be made in a bad

working environment. (TEDx Talks, 2013) If they were made there the carbon footprint of each product would be a lot higher than something that was made locally.

Through Orth's research, she aimed to understand material's properties to be able to create soft products, which contradict traditional hi-tech aesthetics that consumers want in their homes; but within her other pieces, which is textiles they fit in well, to develop new ways to recreate existing material functions. The work of Bradley Quinn in his book *Textiles Futures* show the experimentation of electronic textiles have changed the idea of wearable surfaces. (Quinn, B. 2010, p. 7) Sensory designs have allowed people to interact with their surroundings in ways they may have not been able to before. This is a development idea of having smart garments. These products are aiming to be created to sense things around you through the senses of smell and sight. This maybe a new market helping the impaired as one day they would be able to alarm warnings to the wearer of approaching obstructions. (Quinn, B. 2010, p. 12) What Quinn is saying is the future of designs is sensory fashion. This would be a new unique market to focus on and it would develop communication across many visual mediums. Quinn demonstrates that these products would help people, for example, it could help the visually impaired convey messages and warnings through different elements to the wearer. Currently, this is happening through tactile fabric manipulation in aims to put braille on clothing. Work by Cinthia Di Ciancia is doing this by adding studs to garments, but from more experimentation this could be developed further to create all types of wearable messaging.



Fig 6: SÓNAR (2017) *The clash of textures is a common mark, as it is the way visually impaired people enjoys design.*

Conclusion:

This research aimed to explore what current designers are doing to push the boundaries of materials functionality and it has shown that they are currently trying to push the limits of materials. This has been demonstrated through designers completely understanding how the properties of different materials can work together to be most effective. By infusing the relationships between hard and soft materials has been a hugely effective way of design by working materials function to the fullest. This shows that experimentation within design is key to the development in the progression and use of materials. Without playing with materials and making mistakes when creating a product, you will not create something successful. Although, companies do not advertise their failed ideas and processes all designers and companies have to go through these processes.

Through looking at all these pieces of work by designers, the aim for a lot of products is to add back the elements of products becoming personal to either the designer or consumer. They have challenged production to create a product which is once again personal to the user, so that the objects will be considered as special. Having alternatives to single use items is a great way of challenging this. It has allowed people to work in this fast-changing world and having developing products which are sustainable alternatives. Products that have a function for a busy lifestyle, that it is not always everyone's way of life forever, and in that respect creating bioplastics may not be the best long-term solution. Through the changing movements which were referenced earlier from young people like Greta Thunberg (TEDx Stockholm,

2019) who want to stop the production of all single-use items and create a new demand for these new sustainable alternatives materials.

The development within technology has allowed ideas in design to also progress. These has helped develop factors of sensory design. Having sensory materials which reacts with examples like wiring and lighting has allowed elements of futurist textile design. The work of Bradley Quinn in his book Textiles Futures show the experimentation of electronic textiles have changed the idea of wearable surfaces. The manufacturing and sourcing of materials has improved through Robots and 3D printers being used in unique ways have allowed new techniques of working, which in turn has optimised designs.

With consumers being more aware of environmental issues, the functionality of materials is currently changing. They want to be able to buy materials that are sustainable to the environment and items that are good quality in contrast to things which are harmfully affecting the environment. Recreating material through reusing, reclaiming and recycling materials is important to the designers which have been discussed, as doing this helps the environment. With current issues with wasted materials getting into natural environments instead of being disposed correctly, these recycling of materials could potentially stop this. More development in creating effective alternatives needs to be done with well valued supporting research, in order for people to improve their understanding of the values of materials. Consumers must understand the better products to buy and implicate it into their lives.

Changing the convention of materials has some great benefits to positively effect different issues we have in the world. With the evidence and experimentation these designers have collected it will hopefully influence more designers and manufactures to rethink how they use materials. But there is still a lot of work that needs to be done to enforce these processes on a global scale. Looking forward, researchers will be able to implicate the experimentation to be able to replace single use plastics which have been created. This could be achieved by the education of consumers for them to understand that this is a crucial development change which ought to happen. Understanding and exposure is key to any product which is trying to become main stream as that is how people learn about them, to be able to seek alternative designs can resolve issues.

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