UPCYCLING & SUSTAINABLE BASED THINKING IN PRODUCT DESIGN

Open educational resource developed by:

cre thi dev
creative thinking development

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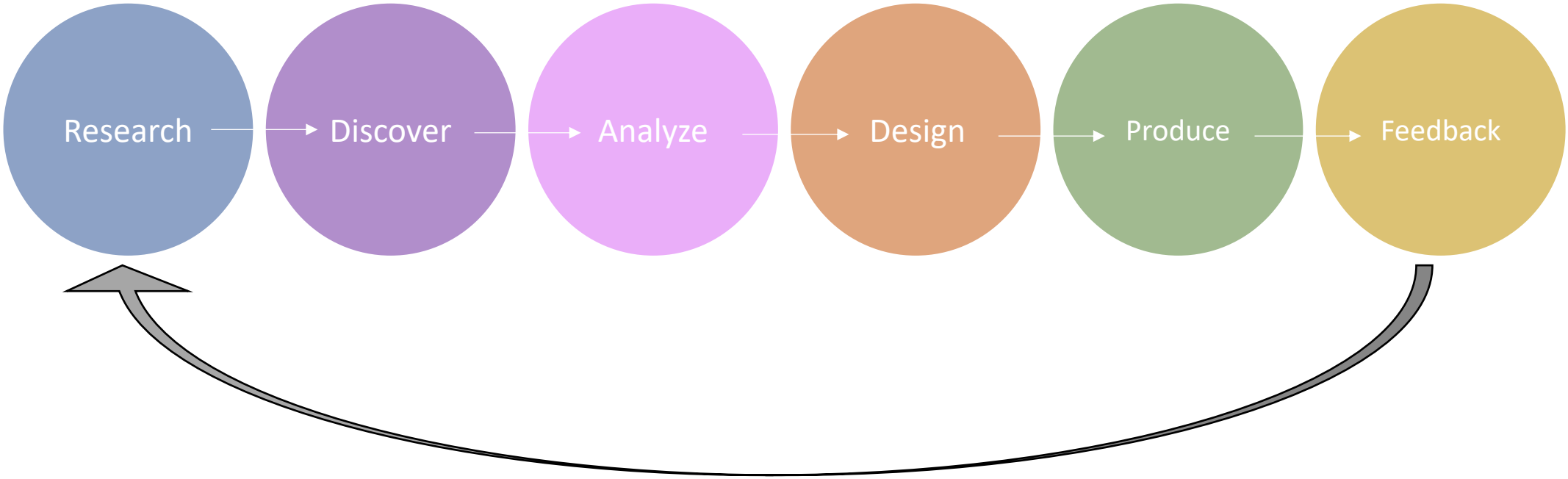
Introduction

Research is a very important process for the design of a product. Having the knowledge of what are the needs and being able to depict this [knowledge] following a sustainable thinking, is more probable to thrive as an act nowadays. Since the textile industry is one the most harmful industries towards the environment and the the people as well, the research and development of sustainable ideas and products is of vital importance.



Another strong element in the actions taken for sustainable product design is the term of upcycling, since it prolongs the life cycle of a product, therefore it reduces its disposal and in the long term its impact on the environment. On the other hand, the upcycling of a product can regenerate it into a new life cycle as a fresh produced product which might have acquired the purchase – hence the production – of a new one.

Keywords

Sustainability, upcycling, research, R&D, innovation, design, potential, fog- catcher

Goals

The aim of this resource is to present the different ways of managing elements that are proven harmful to the environment. Eliminating the harm is not a knowledge that this educational resource aims to provide, but it will show activities that will prolong the life of a textile, and which will be implemented either in the pre-production or post-production stage.

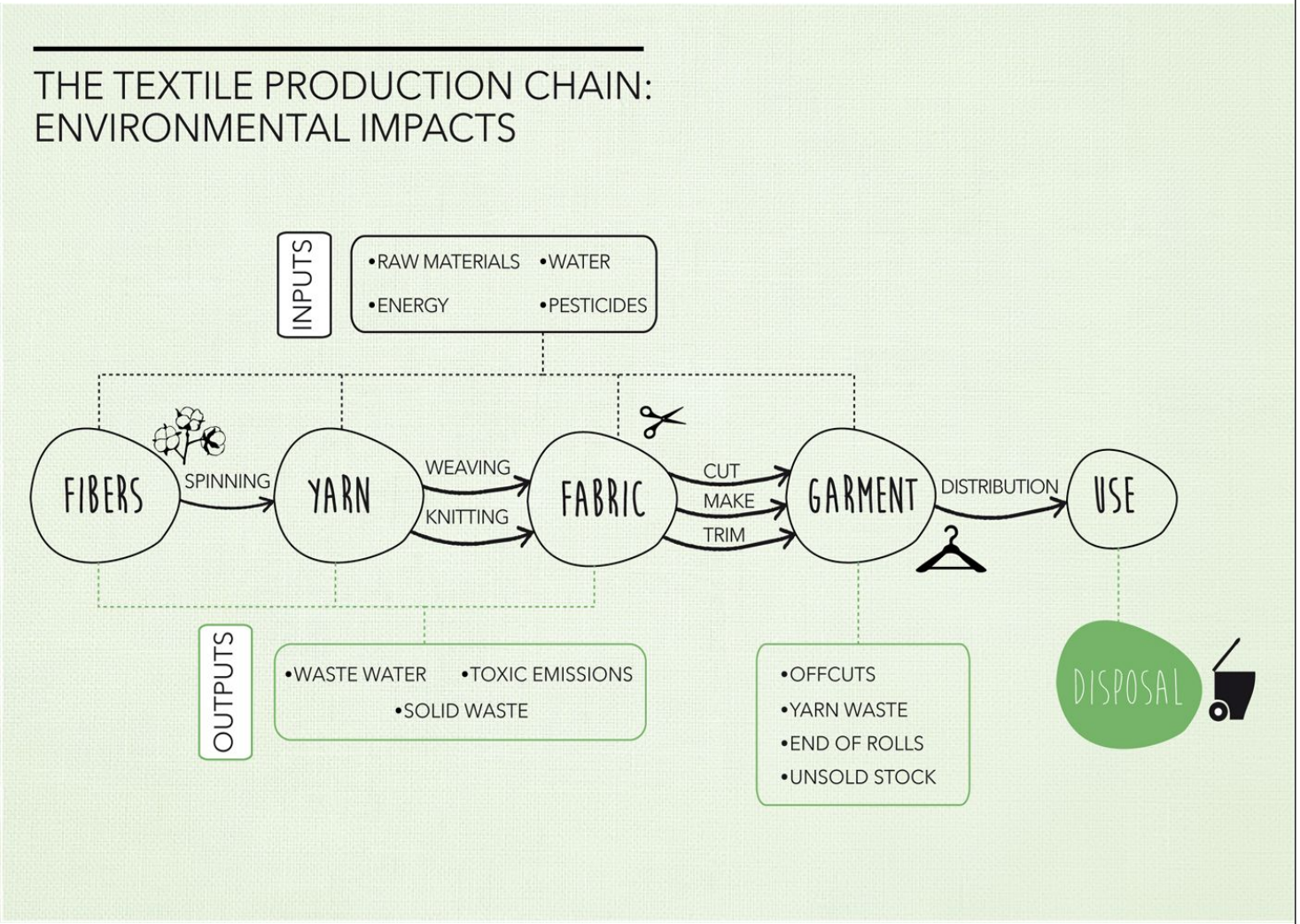
Moreover, the upcycling methods of a garment and the intrigue of innovative thinking through the paradigms is an addition to the aims. Nowadays, a sustainable based thinking is vital and it should be applied incessantly.

Finally, in order to understand further and broad the minds of users, it is important to find reproduceable examples in nature, which will sharpen the innovative thinking and R&D.

Learning outcomes

1. The impact of textile recycling
2. Different ways of environmental disposal decrease
    a. Reuse, remanufacturing, upcycling, recycling
3. What is upcycling?
4. The importance of sustainable based research
5. Sustainable based thinking project example
6. A creative paradigm as a result of the above terms researched and curated by students of higher education institute

1. Environmental Impact



Images: : https://www.cooperhewitt.org/2016/11/08/infographic-environmental-impacts-of-the-textile-industry/

The making of a garment requires the manufacturing or the supplying of its pieces which will be put together and complete the production.

However, these requirements have equivalent outputs which are harmful and toxic towards the environment.

The making of a garment brings up amounts of waste coming from its pieces, as well as unsold products.

Finally, the disposal of the garment at the end of its lifecycle, impacts also the environment.

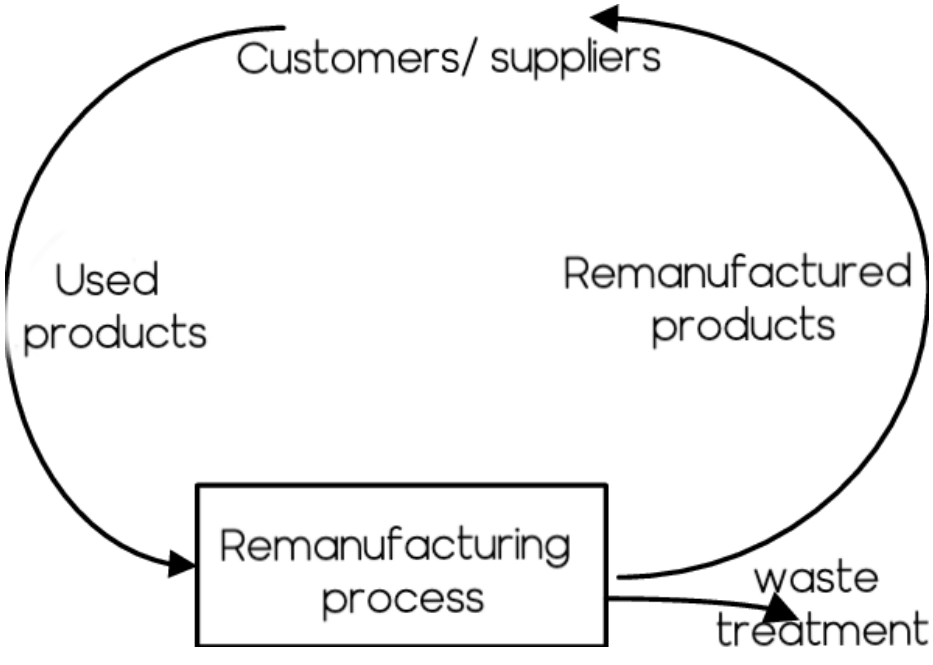
The textile industry employs only 2% of recycled feedstock from other industries (typically PET), to which as few as 1% of closed-loop recycling can be added. 12% of fibers from fashion textiles are recycled into other, lower value applications, while 76% is landfilled or incinerated. In the same industry there are also scraps produced and wastes that can hardly be re-introduced in the garments value chain, either for lack of demand, or for post-consumer loss of mechanical properties that makes the material unsuitable for reuse. These leftovers are often used to create bio-composites for accessories or felted into new materials for interiors, typically used for sound absorption or insulation. A different approach privileges exploiting the inherent aesthetic value of the waste materials by suggesting applications where the recycled material content is clearly identifiable and characterizing feature of the final product.[1]

1. Milašius, R., Mikučionienė, D., Raluca, A., Papakonstantinou, S. andScalia, D., 2019. TextileStrategyForInnovativeHigherEducation. 1st ed. [ebook] Availableat: <http://www.texstra.eu/outputs/>

2. Decrease of environmental disposal

Nowadays there are even more and more solutions appearing, as to how the industries and the consumers can contribute in the effort of environmental disposal. A sustainability based thinking must come from both sides of the coin, and from all of their affiliates. It is important that both producers and consumers, have become fully aware of the concerning impact of the textile industry on the environment, hence they will counterpart in the actions that must be taken for developing ideas based on a sustainable thinking and process.

In this thinking there are two different stages where sustainable thinking can take place. One is the pre-production stage, where research takes place, and is a task that the producer has to compete. The second stage is comes after the consumption of the product, where either the user or the manufacturer take place into the product's lowest-environmental-impact disposal.



Common methods of low-environmental-impact disposal are:

1.Reuse (both)
2.Recycling (manufacturer and consumer)
3.Remanufacturing (manufacturer)
4.Upcycling (both)

2.1 ***Textile reuse*** refers to various means for prolonging the practical service life of textile products by transferring them to new owners[2], with or without prior modification (e.g. mending). This can for example be done through renting, trading, swapping, borrowing and inheriting, facilitated by, for example, second hand shops, flea markets, garage sales, online marketplaces, charities and clothing libraries. In the academic literature, various forms of reuse have been conceptualised in terms such as collaborative consumption, product-service systems, commercial sharing systems and access-based consumption).

2.2 ***Textile recycling***, on the other hand, most often refers to the reprocessing of pre- or post-consumer textile waste for use in new textile or non-textile products. In this paper, we adopt a more generous notion of textile recycling, also including the recycling of non-textile materials and products (such as polyethylene terephthalate (PET) bottles) into textile products

Images: : https://www.ecologicaltextiles.nl/contents/en-uk/p14497_Yarn_Nm_20-2_recycled_cotton_oatmeal.html

2. L.M. Fortuna, V. Diyamandoglu Optimization of greenhouse gas emissions in second-hand consumer product recovery through reuse platforms Waste Manag., 66 (2017), pp. 178-189.

2.3 ***Textile upcycling*** (often also downcycling) or ***textile remanufacturing*** can be achieved
by combining various mechanical, chemical and thermal processes. Other classifications of recycling routes is if
the recycled material is of lower value (or quality) than the original product, this is termed downcycling.

Today, existing textile recycling routes are in most cases downcycling. In contrast, if a product from recycled material is of higher value (or quality) than the original product, it is termed upcycling.[3]

3. Sandin, G. and Peters, G., 2018. Environmental impact of textile reuse and recycling – A review. Journal of Cleaner Production, 184, pp.353-365..

3. How much challenging is the recycling of advanced textiles?

The complexity of materials used for a smart/ advanced textile, states them as a complex product for recycling or upcycling. As a first thought, a smart textile is being designed and produced for specific purposes, and because of its utilities, a further use after its original one, is either hard to imagine or create or very easy one.

Therefore:

1. implementation of eco-design in the development of a smart textile must be tested
2. Environmental conscious decision making in smart textile design must serve as a model
3. Environmentally aware material choices reduce environmental impacts of smart textiles
4. Knowledge about life-cycle wide environmental impacts of smart textiles is essential

Because smart textiles consist of small electronic devices that are seamlessly embed in the actual textile, recycling old e-textiles will be difficult because valuable materials are dispersed in large amounts of heterogeneous textile waste. Moreover, the electronic components can act as contaminants in the recycling of textile materials .

4. Upcycling

Upcycling is defined the activity to increase the symbolic value and create long live products. It is the wider branch that contains the reuse and remanufacturing phase.

In the context of TEXSTRA project, as a good practice of textile upcycling is stated the paradigm of:

Trash-2-Cash: utilising zero-value waste textiles and fibers with design-driven technologies to create high quality products (Project):

Trash-2-Cash was an EU funded research project which aimed to create new regenerated fibers from pre-consumer and post-consumer waste. It was also pioneering a whole new way of developing materials. One resource that's becoming more abundant is waste. The idea of recycling textile waste has been popular for decades, but current mechanical methods give poor quality fabrics suitable only for industrial applications like insulation, and upcycling of pre-consumer textile waste into products is impossible to scale. Trash-2-Cash proposed a new model where paper and textile waste is recycled chemically - resulting in fabrics that are the same quality as new materials, to make products that are industrially replicable and infinitely recyclable[4].

4. Milašius, R., Mikučionienė, D., Raluca, A., Papakonstantinou, S. and Scalia, D., 2019. Textile Strategy For Innovative Higher Education. 1st ed. [ebook] Available at: <http://www.texstra.eu/outputs/>.

5. How important is a sustainable based research

With a sustainable based approach during the pre-production phase, people move from the current linear take, make and dispose system to a system that restores resources and regenerates material resources. Creating a more circular economy than linear, the where elements interact intelligently into prolonging life and maximise resource. As the core of sustainable thinking research, is defined the re-imagination of industrial arrangements and business models and corporating in them methods that will ”close-the-loop”. One approach is the development of products that will serve more than one purposes in favor of the environment and the user[5].

Sustainability is an issue that is starting to gain importance and will influence significantly the development of long lasting textile products. The solution to sustainability is the development of products that will help in the decrease of waste emission and will offer a need that will amortise the production. Taking as an example the natural resources that are being used for the fibers and yarns, biochemistry brings another option on the table by combining nature’s creatures and their abilities and the manufacturing of textiles into one product.

5.. Koehler, Andreas & Hilty, Lorenz & Bakker, C.A.. (2011). Prospective Impacts of Electronic Textiles on Recycling and Disposal. Journal of Industrial Ecology. 15. 496 - 511. 10.1111/j.1530-9290.2011.00358.x.

6. The “Fog catcher” project for water consumption

Video: : https://www.youtube.com/watch?v=683iTtlxwOs

6.1 How it works

Video: :https://www.youtube.com/watch?v=2GRgL4JEL0g&feature=emb_title

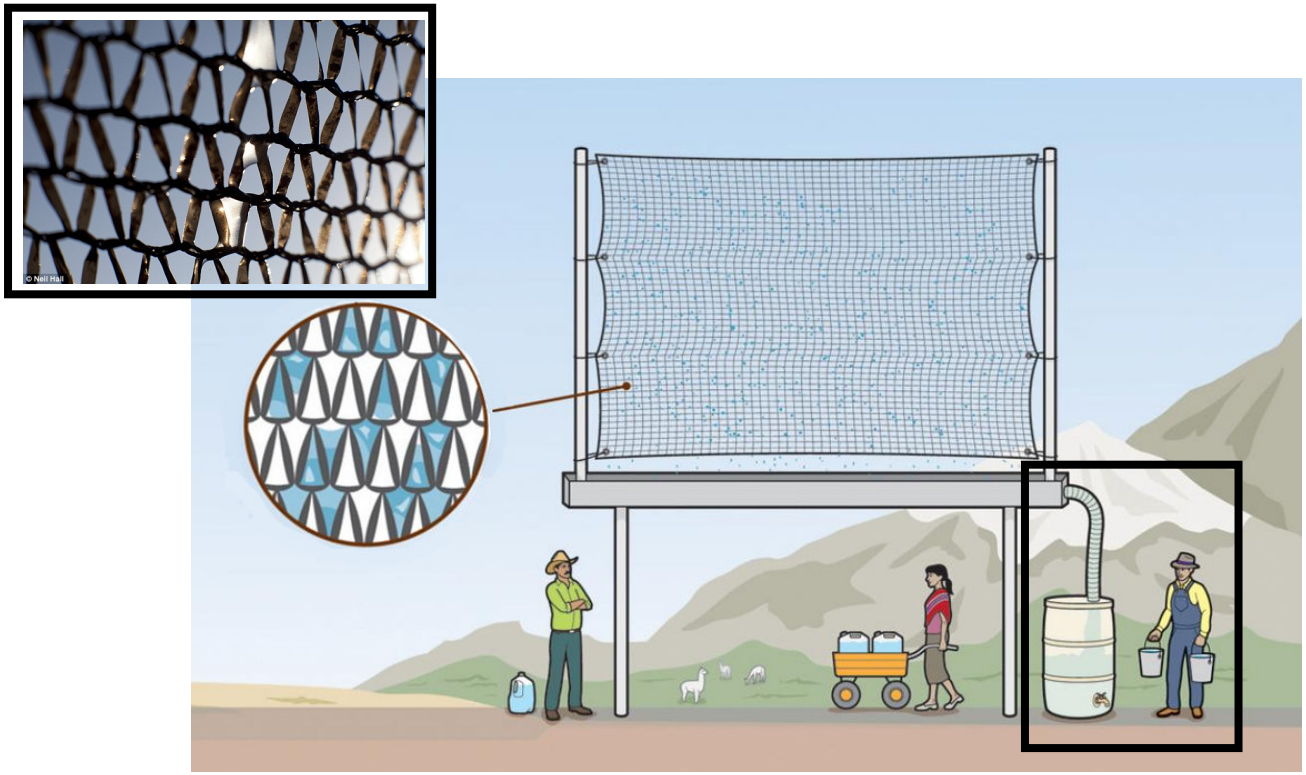
6.2 Where it comes from

Video: :https://www.youtube.com/watch?v=TmyfqjXOf7M&feature=emb_title

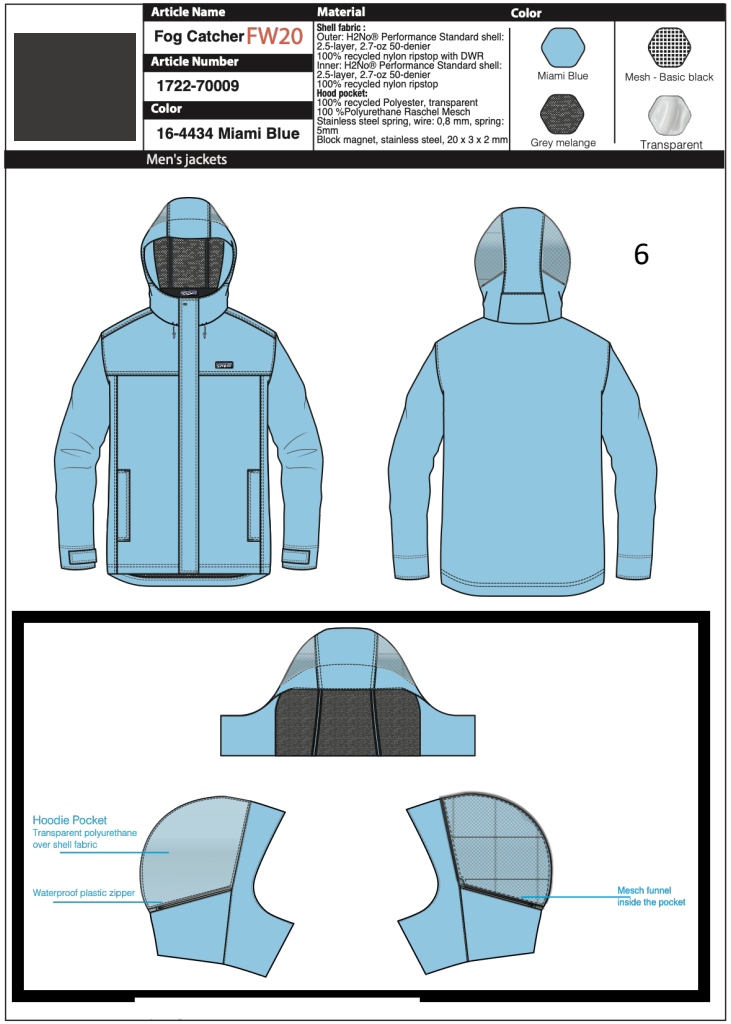
6.3 A creative paradigm

As a result of research in the product design stage based on the mesh panels.

The below paradigm was created by a group of students during their master studies in Textile management at the University of Borås



Images: : Product development oficial presentation, Adrami C., Bilali S., Dreker D., Leinatam K., Tucholke K., Schreiber R., (2019)



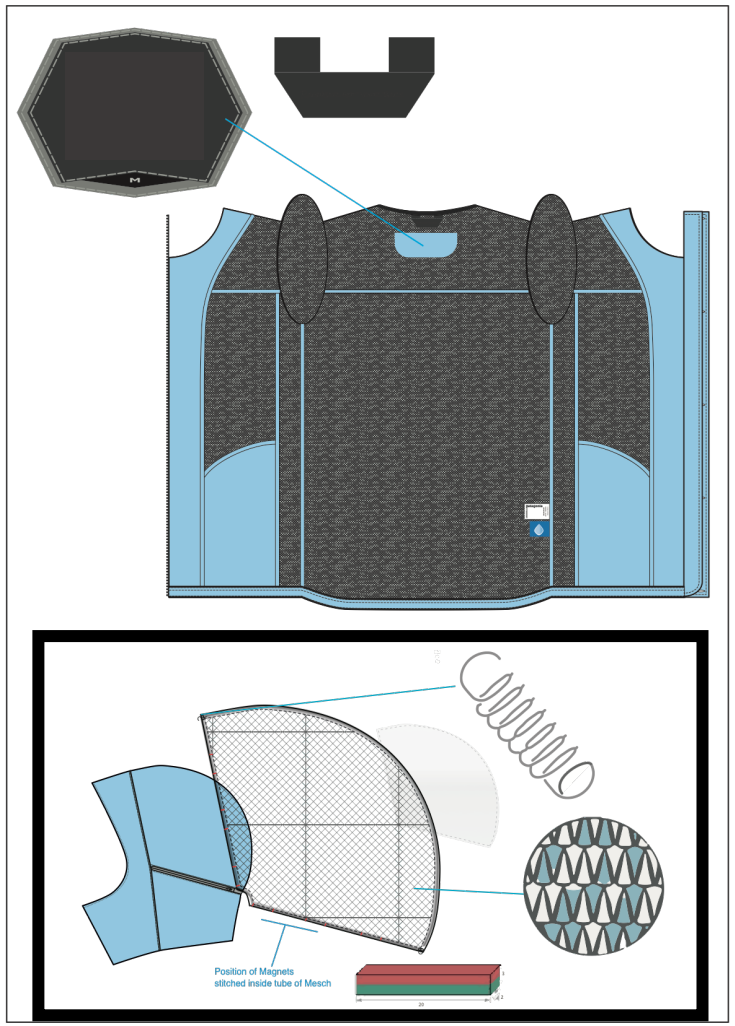
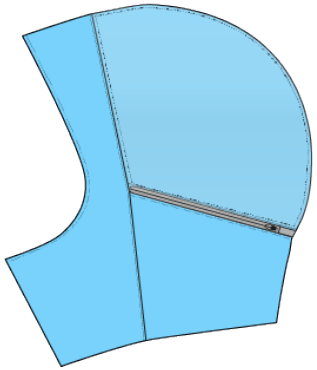


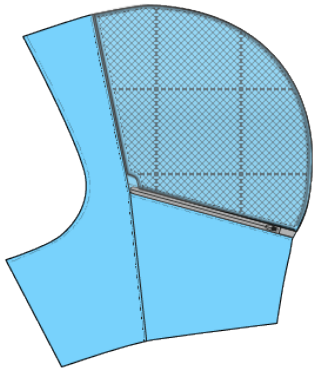
Image: Product development oficial presentation, Adrami C., Bilali S., Dreker D., Leinatam K., Tucholke K., Schreiber R., (2019)

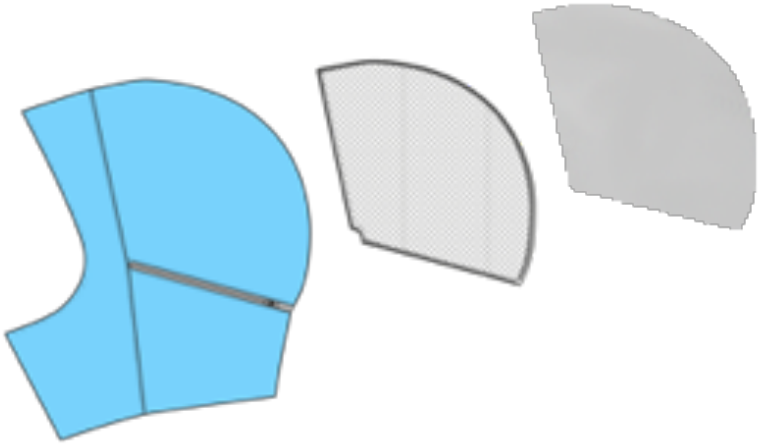
The product is designed according to the needs of
an outdoors adventurer, taking into consideration the
easiness and sustainable add up of water in order to secure the basic need.

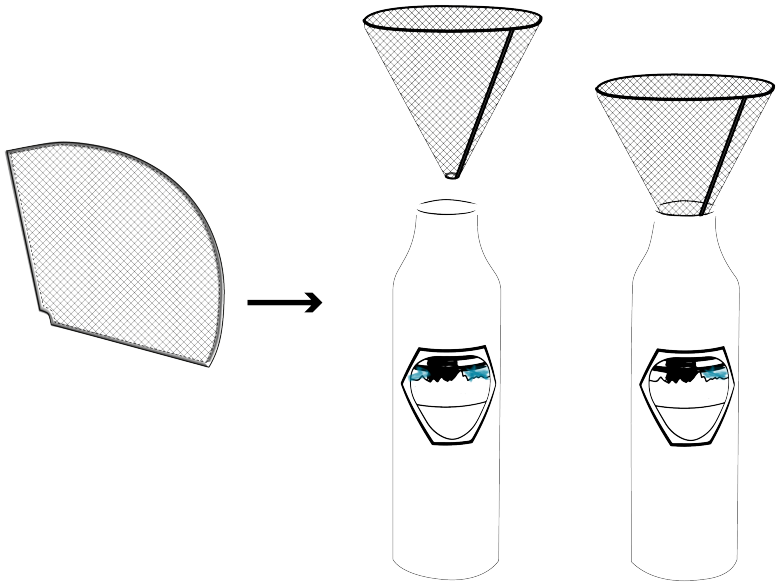
The minimum usage of plastic bottles is the prior thought.

6. Garment developed by all, designed by Tucholke K.









Based on the best satisfaction of consumer and on sustainable and lifelong ethics, the product offers water consumption without the need
of purchasing a new product and giving a long lasting product use cycle.

Images: : Product development oficial presentation, Adrami C., Bilali S., Dreker D., Leinatam K., Tucholke K., Schreiber R., (2019)

7. Conclusion

There are different ways which have been developed and a lot more that are being developed in order for the textile sector to follow ways for a sustainable based thinking in product design and a sustainable disposal in end of a product's lifecycle.

Textiles are already established as a negative environmental impact since the production phase. Smart textiles on the other hand are also added in the list and even more. The after effects of these products are also food for thoughts in order to balance the widely increasing demand for Smart textiles and the decrease of the pollution to the environment.

Visit http://destexproject.eu/ to see the rest of the intellectual outputs of the project

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