

Card toolkit with innovative sustainability strategies



Open educational resource developed by:



Co-funded by the
Erasmus+ Programme
of the European Union



Introduction



This OER wants to provide a methodology to put into practice a design process that has a result a sustainable and innovative result into the application of an advanced textile in a product.

When designing products, it's important to follow a well-organized design process that allows to consider aspects that involve the user, the market, production, functionality and also the impact that this product has.

When applying advanced textiles this design process can become even more complex, because these innovative materials tend to have a more complex structure that can provoke a higher environmental impact. These materials are in general much younger, so there are less examples that tell us how to work with them, and they have properties that are much more unknown than the traditional materials ones. These facts make necessary to follow a structure that allows experimentation, without forgetting that the result needs to be a competitive product that fulfills the needs of the user and the market.

This structure is divided in four different stages similar to the ones expressed in the Design Council's Double Diamond (1). In this case, instead of their “discover, define, develop and deliver” we propose “analyze, propose, conceptualize and rationalize”, in order to adapt them better to the particularities of the advanced textile application.

Keywords

Product design, advanced textiles, sustainability, innovation, design process.

1. <https://www.designcouncil.org.uk/news-opinion/what-framework-innovation-design-councils-evolved-double-diamond>

Goals



This open educational resource has a primary goal to offer an easy-to-follow methodology to apply advanced textiles in products taking into account sustainability aspects.

To design a product can be a complicated and long process that can involve many people from different profiles, and even more if you are applying innovative materials. That's why it's important to divide it in different stages with clear outcomes that can be shared, understood and approved by the different actors involved.

When applying an innovative material, it's important to make a deep research stage, and also to test and prototype to minimize risks, so the importance of a good organization in the design process is critical.

The secondary goal is to normalize the introduction of ecodesign strategies in the design process, in order to make these tools part of the standard toolbox of designers. Advanced textiles are materials with a big complexity and amazing properties, but this fact sometimes involves a bigger environmental impact in comparison with traditional textiles. The fact that sustainability is one of the most important competitive factors makes essential to find a good application for them.

Learning outcomes



Knowledge

- A good understanding of the stages of a design process, with a focus into the application of advanced textiles under sustainability criteria
- To learn some of the most common ecodesign strategies, that can be applied in a wide variety of projects in order to improve their environmental impact.

Skills

- Use concepts, procedures and methods to put into practice a well-organized design process with a successful result.
- Have the ability to decide which sustainable design strategies are more coherent with the project they are developing, and to find the best application for them
- Have the skills to test and prototype the project in its different stages in order to assure it is moving forward in a correct way
- Develop the necessary level of empathy with the users to be able to develop a product that fulfills their needs.
- To be able to analyze a complex reality that involves suppliers, users, and materials identifying the critical aspects that need to be solved.

Competences

- To learn how to transfer doing and thinking from one discipline to another to foster cross-disciplinary cooperation
- To develop a good level of communication with people from different profiles in order to reach a good result in the design process.

1. The design process



When designing it's critical to follow a clear methodology with organized resources and results. A correct methodology also improves the communication and the collaboration between the different stakeholders of the project, and has some benefits that are specially important when applying an innovative material like advanced textiles:

It Sets Clear Expectations

A well organized design process allows you to establish realistic project deliverables and deadlines together. Any participant in it will know exactly what to expect and when to expect it.

It Puts Clients at Ease

Not everyone the effort that involves to transform a good idea into a great final product. With a clear and concise design process in place, you can show them where the energy is going during each design phase of their project.

It Decreases Risk of Failure

All aspects of a product's design need consideration and a good design process accounts for everything. Sure, you can create a great-looking product with visual design alone, but if there's no thought behind its usability, the technical aspects or no research behind it, the risk that the product will fail increases exponentially.

2. How to organize this activity



The team

A correct innovative design process is generally the result of the negotiation and the collaboration between different points of view. To try to get the most from it it's positive to try to combine the work of different disciplines.

Make a team that has between 3 and 5 members mixing as much as possible technical profiles such as engineers, creative ones such as designers, business profiles like marketing experts or market researchers and the ones from the social sciences such as anthropologists.

With the combination of these four profiles you can respond the every important point of view that the product will need. Of course this is not always possible, like for example in a class where all the students have the same profile. If this is the case try at least to include the other points of view in the discussion thinking like they would do.



The materials

To develop this activity properly you'll only need a room with enough space, big enough tables to work in groups of 3-5 people and the needed material to write and draw, including paper, pencils, post-its, markers, etc.

You can print a set of the ecodesign cards included in this document for each group or use the digital version of the document for the participants to check them.

The timings and the structure of the activity

As it was explained before this design process follows four stages. The whole activity can be as long as wanted, but we suggest a minimum of half an hour and a maximum of one hour for each phase. A small break between stages is recommended, and the activity can be done in only one session or in different days. If this is the case a small 5min review of the result of the stage before will be necessary before starting the next one.



3. The activity

Introduction

- Explain the product that is going to be redesigned with all the information you can: user, market, main components, etc.
- Make the groups (between 3 and 5 members)
- Explain the dynamics of the session



3.1 Analyze

In the first stage of the design process, you need to use discussion between the group members as the main tool. After a brief debate with your team members, you need to answer these questions:

- What are the functional needs that this product has to cover?
- Are there other emotional needs that this product is fulfilling?
- How is this product produced in general? By who?
- What is the business model behind it? How do they make money with it?
- What is the system behind it along its complete life cycle, from material suppliers, factories or workshops, user, stores, distribution and transports, and its most common end of life. This system can be described connecting words with arrows and it should include actors and processes.
- What steps does the user experience follow?



3.2 Propose

After understanding well the product you need to design it's time to introduce strategies to improve its environmental impact. These strategies often will involve changes in the way this product is used or sold, try to consider critically if the user and the company that produces it will be able to absorb these changes.

Use the ecodesign strategy cards of the next pages to evaluate which different approaches will work to solve the project. They are divided between the different stages of the life cycle they impact in. This stages are: Pre-production phase, Material selection, Manufacturing, Distribution, Use, End of life phase.

Not every strategy will work for any project, it's the duty of the team to discuss if their introduction is useful for the project or not. Many of these cards can be combined, and some others can even be contradictory between them (example: "anti-obsolescence" and "compostable"). Use debate which ones are the ones that will make the project better.

A. Strategies for the pre-production phase



Pre-production strategies

Anti-obsolescence

Something that lasts is something that takes a long time to become waste. Obsolescence is not only a question of loss of functionality, like when a product is broken and cannot be repaired, but also aesthetic obsolescence, like when something is not trendy any more or looks old.



Pre-production strategies

Dematerialization

Using less material reduces the impact of the material extraction stage, needs less material to be transformed in production and distributed, and produces less waste.

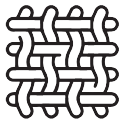


Pre-production strategies

Modularity

When something can easily be divided in parts you can recycle the different components in an easier way, you can replace what is broken to make the product last longer, and allows a better transport, as it can be distributed disassembled.

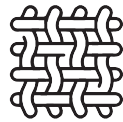
B. Strategies for the material selection phase



Material selection strategies

Biodegradability

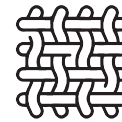
Biodegradability is the capacity for biological degradation of organic materials by living organisms down to the base substances such as water, carbon dioxide, basic elements and biomass. Choose a material that makes it possible.



Material selection strategies

Lightweight

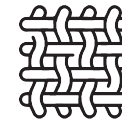
Lightweight materials are in general easier to transform and provoke lower impacts in distribution.



Material selection strategies

Locally produced

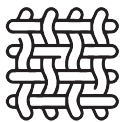
A material that is obtained locally reduces drastically the carbon footprint of its transport to the production center, and also benefits economically the area where you are working in.



Material selection strategies

Low-embodied-energy materials

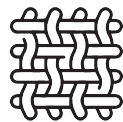
Consider the energy needed to obtain or transform your material, and try to promote one that needs a low amount of it.



Material selection strategies

Reclaimed and recycled materials

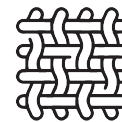
Introduce a material that comes from another life, in general it will help to reduce the level of waste in landfill and will have a lower carbon footprint.



Material selection strategies

Recyclable

Use a material that can reintroduced easily in the production chain thanks to a consolidated recycling process



Material selection strategies

Avoidance of lack, paint and other surface treatments

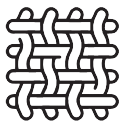
Try to introduce a material that doesn't need a layer of protection or decoration, because it's beautiful and strong by itself.



Material selection strategies

Renewable sources

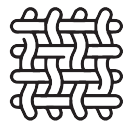
Use a material that comes from a source that will recover in a fast way, because it means that nature will regenerate it quickly.



Material selection strategies

Single or mono-material

A product with a single material will usually be recovered completely, as no parts need to be separated.



Material selection strategies

Materials with certified labels

Promote the use of a material that comes from a reliable certified source like GRS, FSC or others, because this certification will assure you are choosing an option with a better impact.

C. Strategies for the manufacturing phase



Manufacturing strategies

Low energy manufacturing/ production/construction techniques/assembly

Use production processes that don't need a big amount of energy and/or temperature because this will reduce the environmental impact of production.



Manufacturing strategies

Reduction of production waste

Develop a design that doesn't generate production waste.

D. Strategies for the use phase



Use strategies

Encourage recycling

Develop a design that explains in an intuitive way how the products need to be recycled, presenting the different materials in an obvious way, including recycling instructions and showing how to dismantle it.



Use strategies

Improved user functionality

When something is functional the user will try to make it last as much as possible, so it will take more time to become waste.



Use strategies

Improved ergonomics

When something has a comfortable use, the user will try to make it last as much as possible, so it will take more time to become waste.



Use strategies

Hire rather than ownership

Develop a product that can have a shared use, as will cover the needs of more users with less products.



Use strategies

Customization

When something can be adapted to the specific needs or taste of a user this product will create a connection with him/her. These connections make the user more attached to their products and this makes them take care of them.



Use strategies

Ease of repair

If your design helps to make the product repaired with less effort, it's much more probable that the user decides to do it, making the product to last longer, and producing less waste (components instead of products)

E. Strategies for the distribution phase



Distribution strategies

Design for assembly

If something comes disassembled it tends to occupy less volume, and this makes the transport much more efficient.



Distribution strategies

Tools for education & communication of sustainable issues

Use the packaging as a tool to explain the environmental characteristics about the product and the packaging itself. It will help the user to understand what he/she is buying and how to behave with it.



Distribution strategies

Packaging reduction

Use as less packaging as possible, because it will reduce the amount of material obtained from the environment, and also the weight and the size of what you are transporting, and also the amount of waste created.



F. Strategies for the end of life phase



End of life
strategies

Ease of disassembly

Products need to be dismantled in order to recover the value that the different materials have. A good design must make easy the materials and components recovery.



End of life
strategies

Compatibility of materials for disposal

A good strategy when using different materials in a single product is to combine materials that will be managed as a waste together.



End of life
strategies

Materials labelling

Include information that helps to identify the different materials that a product has. It will help the waste management company to recover the value that they have.



End of life
strategies

Product take-back

Design a recovery system that brings back old products to your company/factory/workshop again. When introducing the extended produced responsibility, the percentage of materials and components that are recovered increases at a very high level.



3.3 Conceptualize

Represent the idea you have using your graphic skills: from sketching to concept maps. Remember to apply the chosen strategies in the product, with coherency for the user and the whole system analyzed in the Analyze stage.

It's not necessary to achieve a completely realistic result, but it's important to represent the idea in a way that helps its explanation and understanding.

You can make some test sketches, but it is important that the final result is on a single page to facilitate the explanation of the product.



3.4 Rationalize

Develop a speech that helps to explain your idea and its benefits. Put the main effort into defending these aspects:

- The benefits that this idea has for the user (based in the functional and emotional needs that appeared in the first stage)
- The improvements that it has in terms of environmental impact
- How the different materials are applied, especially the advanced textiles, and the way how they impact in the stages of the life cycle
- The system needed to put this idea in the market.



3.5 Presentation

Explain your idea to the public and/or the other groups, using the results obtained in the different stages of this design process, and not only the results of the conceptualization and the rationalization.

A good design and material implementation is always based in a solid research and ideation, so the first two stages of the design process are equally important to understand where the ideas come from.



Conclusions



This OER provides a standard and organized methodology for design processes that can be followed easily. Besides that, it provides a set of sustainable design strategies specially determined to work in the design of products that integrate advanced textiles, in order to achieve a result that implements them in the most sustainable way.

This methodology is specially adapted to work in small teams, but it can be used in different scenarios with small changes.

The set of cards included can also be useful for almost any kind of project, as they include some of the most common ecodesign strategies. They introduce recommendations about how to implement this kind of advanced materials, after noticing that many of them include multiple components that can provoke a bigger environmental impact. They must cover innovative functions, and this fact tends to make them more complex in terms of production processes, materials, etc.

This set of cards requires a strong and clear criteria to be used, as no strategy works for any project. They need to be chosen after a deep discussion and understanding of what needs to be designed, the needs of the person that is going to use it, and the production and supply chain that will make the product real.

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



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Acknowledgement:

DESTEX project (INDUSTRIAL AND CREATIVE DESIGN IN ADVANCED TEXTILE MANUFACTURING; project reference number 2019-1-SE01-KA203-060379) is co-funded by the Erasmus+ programme of the European Union.

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Erasmus+ Programme
of the European Union

