

DESIGN TOOL FOR SUSTAINABILITY

Charlie Wilson, MEng Product Design Engineering, University of Strathclyde, charlie.wilson.2018@uni.strath.ac.uk

SPECIFIC PROBLEM

Environmental issues are becoming increasingly urgent. With more ways of achieving sustainable solutions being developed how can designers stay up to date and find the best methods for their product in a time efficient way?

80% of a product's footprint and its environmental impact are determined during the design phase (European Commission, N.d.). As a result designers have a fantastic opportunity to integrate sustainability into the core of the products they design.



Current toolkits do not help the designer to choose the best tool for their design

The requirements for sustainable design and end-of-life methods are not easily available. Especially for new methods.



ENVIRONMENTAL PROBLEM

All products are designed but until recently sustainable design was not a priority. Though we have known about climate change and the effect human's have on the environment for a long time we have been slow to react. We are at the point where significant changes need to be made (Institute for Public Policy Research, 2019). These could involve innovative business strategies such as dematerialisation, design methods improved emotional durability of products or circular end-of-life methods such as remanufacture however it is likely a combination of all of these approaches will be needed for progress to be made.

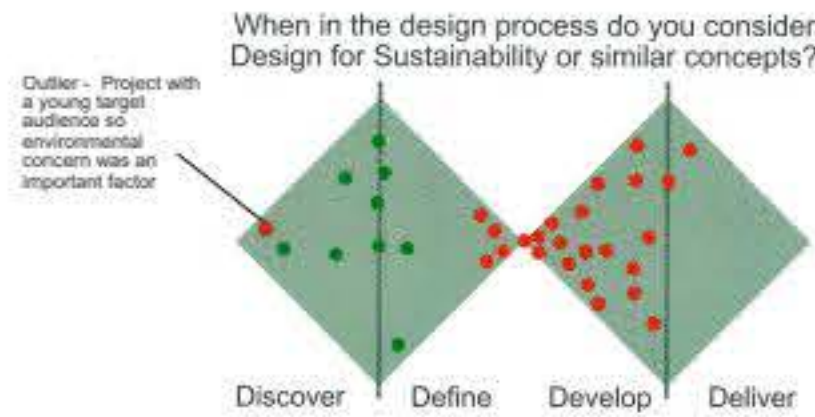
91% of plastic is not recycled leading to 12bn tonnes of plastic waste predicted by 2050

USER RESEARCH

It was decided the tool would initially be aimed at design students. This would allow for sustainable design to be introduced at the beginning of a designer's career. This allows for a wide range of possible solutions to be introduced early on while the knowledge of the tool will allow the designer to continue to expand their comfort area.

As expected environmental outcomes are better in sustainably focused projects. However a notable difference found during user research was that environmentally focused projects consider sustainability significantly earlier in the process. As a result it was determined that the tool should promote introducing sustainability earlier in the design process.

It was also found that the majority of design students selected methods from those they had already been taught and often by experience. This creates a bias towards familiar techniques and away from novel or unfamiliar ones which may be more effective or appropriate. Therefore the tool should also introduce the designer to a wide range of tools.



Sustainability is considered and applied earlier in the design process in projects with an environmental focus than those without.

● = Environmentally focused project
● = Project without specific environmental focus



Users choose tools and methods based on familiarity and ease rather than what is most appropriate

MARKET RESEARCH

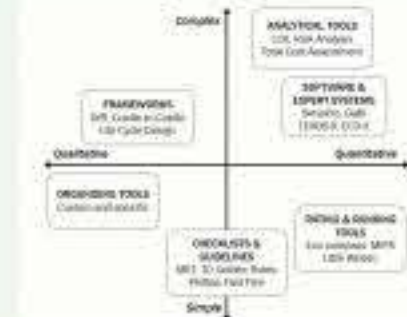
Current Toolkits

Toolkits have been developed in a range of design focused industries. These follow two main themes: A list of possible tools and solutions or open-ended questions to help the designer consider other solutions.

These don't help the designer choose between the solutions they present leading to the designer either using familiar tools or requiring a lot of research or wasted time on inappropriate tools.



Existing Tools



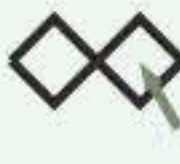
A range of tools have already been developed to promote or aid in design for sustainability. As a result a new tool for design is not needed instead this tool will be a diagnostic tool to guide designers towards the most appropriate solutions. The intention of this is to reduce the entry knowledge and research time for sustainable design while reducing the risk of time wasted on unfamiliar tools and solutions which turn out to not be appropriate.

SOLUTION

Issues to be Solved



Requirements for different end of life processes not easy to find



Sustainability considered later on in the design process even though it is more effective when implemented earlier



Users have a bias towards familiar tools and methods

Start Using the Sustainability Design Tool



Five areas were chosen to tackle these issues. These are general sustainability, life-cycle, end-of-life, tools and business case.

General Sustainability

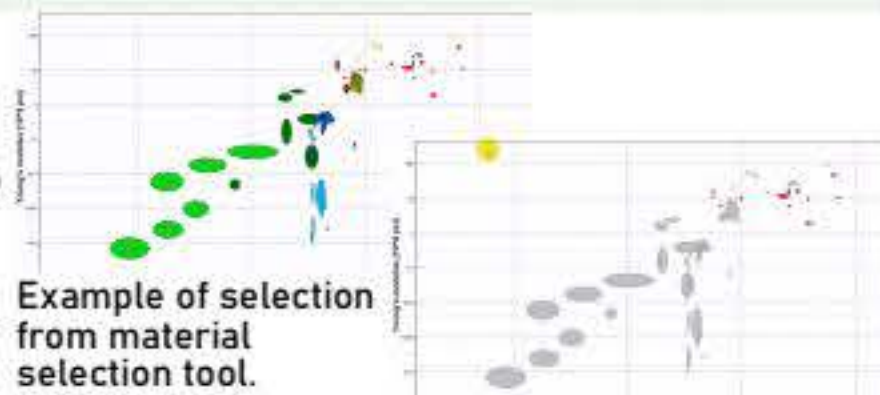
Users identified value in open-ended questions:

- Opportunity for learning
- Expand thought process
- Allow use of designers' existing knowledge

They did note though that these questions could be linked to more information during and after the process. As a result the general sustainability section is set up with open-ended questions but links to other resources, within the tool and areas for further exploration.

Tools

The tools selector was based off material selection software. The existing software effectively reduces the options available to the user while also clearly showing the options. As we want to give designers knowledge of why a certain tool was selected this seemed appropriate.



End-of-Life

The end-of-life section follows a weighting and rating style approach. Each answer is weighted to how important the factor is to a particular end-of-life method. The user can then see which methods are rated most highly and how changing certain factors affects the best end-of-life practice.

Each question also comes with the option for more information to allow the designer to better understand the question or expand their knowledge.

END-OF-LIFE



Life-Cycle



This section has the same headings as an LCA but encourages exploration rather than quantitative analysis. Designers are encouraged to consider

- Materials: where they come from, their implications
- Manufacturing: DFMA, production of materials
- Distribution: Globalisation, packaging
- Use: Emotional durability, engineering durability, energy usage, maintenance
- End-of-Life: Circular design, end-of-life and business case sections of the tool,

Business Case

BUSINESS CASE



The business case section allows users to:

- explore a range of sustainable business practices.
- View business case examples

Many designers view traditional products as the only option so the goal of this section is to expand the possibilities. It also supports designers to think beyond their design to the social and economic impact.

References

European Commission (N.d.) 'EU Science Hub'. The EcoDesign of Energy-Related Products (EDP). Available at: https://ec.europa.eu/science-hub/activities/4/sustainable-product-policy_en (Accessed: 20th April 2023).

Institute for Public Policy Research (2019) 'THIS IS A CRISIS: FACING UP TO THE AGE OF ENVIRONMENTAL BREAKDOWN'. Available at: <https://www.ippr.org/files/2019-02/this-is-a-crisis-and-environment-40-29-summary.pdf> (Accessed: 20th April 2023).



NEW MODELS
Engineering Academics Network
Annual Congress 2023

