Matteo Orsini's

Product Design

portfolio

About me

Over the years, I have engaged in a variety of experiences as a **design practitioner**, **researcher**, and **educator**.
My key skills are the following:

Basic & Applied Research: Scientific research to study states-of-the-art, investigate user needs, and competitors' solutions, following relevant parameters.

Industrial & User-Centered: Design of solutions that are tailored to available production processes and to users' needs and characteristics.

Prototyping: Realization of digital and physical prototypes to assess solutions' viability at various stages of the R&D process.

The various experiences required me to work with an **open** and **collaborative** spirit in highly **interdisciplinary** teams, where I often served as a **facilitator** among diverse professionals, translating experts' indications into practical design features.

In recent years, I have also become familiar with **international environments** through experiences such as the international Master's program, my "**Visiting PhD**" period (during which I conducted research for 6 months at **TU Delft**), and the organization of **TEDx** Events.
During my PhD, I have also presented research contributions at international sectoral **conferences** (Mexico and France) and **hackatons** (the Netherlands and Italy), and taught for three semesters in a **Master's program** on the topic of Pharmaceutical Packaging as a **teaching assistant**.

When I design, I follow the **Design Thinking Framework**, developed by Tim Brown in 2009, as it allows me to both formulate problems through appropriate exploratory research and reiterate design phases when outputs do not meet both my client's and my own criteria.

In this portfolio, I gathered my most pertinent **Product Design projects**, with some being more advanced than others in terms of **Technology Readiness Levels** (TRLs).

Product Design

Graphic Design

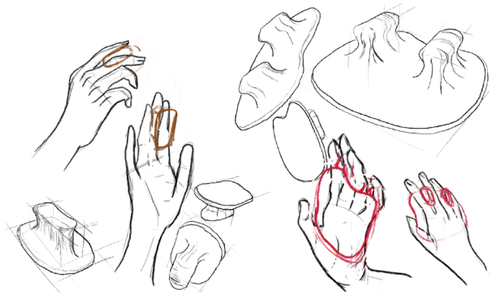
UI Design

Data Management

Brushcob

TRL–7

Set of Bio–Based Skin Brushes



Designer(s) M. Orsini, I. Ferracci
Year 2022

*This project was awarded with a **Honorable Mention** at the contest Cumulus Green 2022*

Keywords **Ergonomic | Bio–Based | Textures**

Rationale

Both the **agri–food** industry and the **cosmetic** industries of them are highly **polluting** and generate significant amounts of **waste**. While agri–food products are only **partially consumed** (unedible elements), the other one creates goods that often contain **microplastics**, dangerous for the environment and the organisms.

Methodology

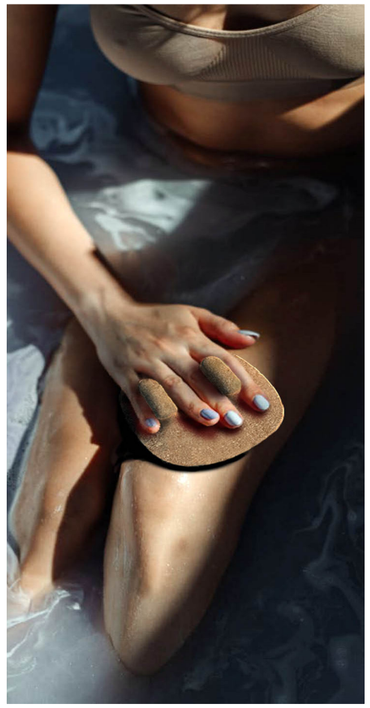
We developed a **bio–based material** upcycling a common waste of the agri–food industrial process, the **corn cob**.
This exact waste was also selected because of its **mechanical properties**, which guarantee the performances of the product.
After experimenting to find the right balance between **ingredients** and **textures**, we shaped it into **usable tools**.
To do so, we also had to design and realize **3D printed molds** into which we forced the material to give it its shape.

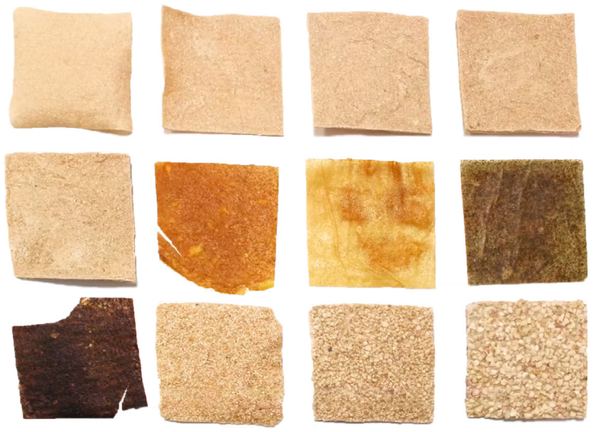
Solution

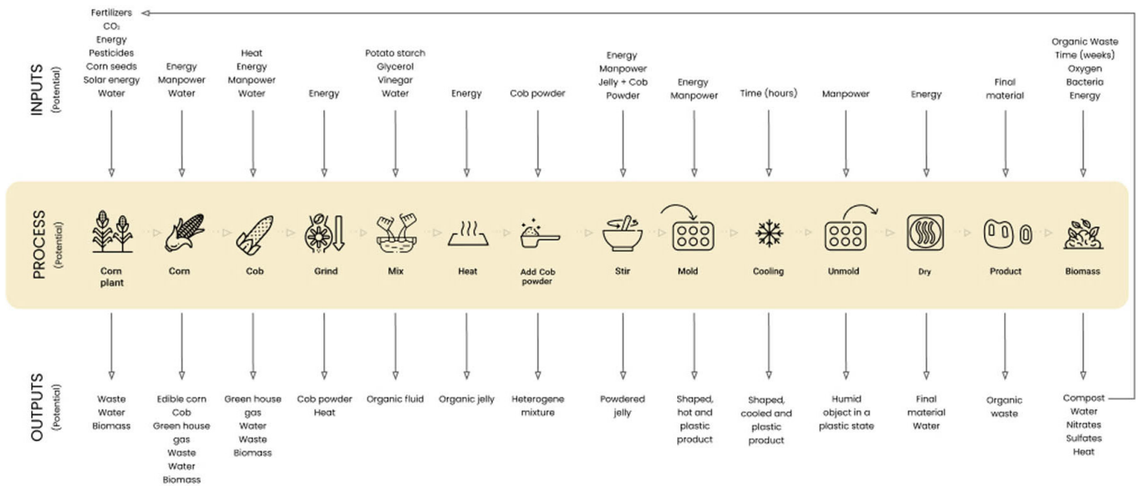
Brushcob is a set of three **scrub brushes** for the skincare, designed following the **hand ergonomics**. The abrasive nature of the cob is combined with the softening properties of the glycerin and the potato starch, leaving the skin soft and smooth after the usage. Wetting the brush is enough to activate the softening capability of the material.

However, The corn cob's hardness imposes the use of **advanced shredding machines** to achieve precisely dimensioned granes and establish routines of continuous production.

https://cumulusgreen.org/brushcob/







The Potential Usability Module

TRL–6

Pre–Prototype Usability Evaluation Method for Smart Home–Use Medical Devices

Designer(s) M. Orsini
Year 2026 (Industrial PhD Thesis)

Keywords **Usability | User Safety | Project Management | Systemic Thinking**

Rationale

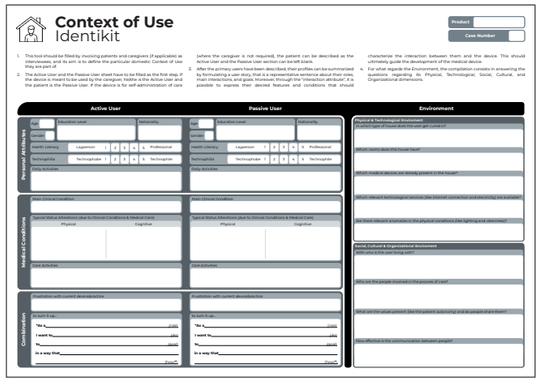
Smart Medical Device **manufacturers** tend to invest more resources on the technological aspects and **overlook devices usability** of their devices. This is because usability tests are **notoriously costly** (due to the production of functional prorotypes and the test themselves) and are **considered less critical** than ensuring the proper functioning of the product. However, literature shows that **device usability issues** are among the most frequent causes of **market recalls** of medical devices.
This is particularly relevant in the field of **Home Care**, where **users** are frequently **non–expert** and **impaired** and **devices** integrate advanced functions that require appropriate levels of **expertise** and **dexterity**.

Methodology

The entire process that brought to the definition of The Potential Usability Module and its tools is based on the **Design Thinking** Framework. After investigating current medical devices **R&D processes**, the Home Care **Context of Use** (ISO 9241–11:2018), and the laws of **User–Product Interaction**, two versions of The Potential Usability Module were designed and evaluated (the first version through expert reviews and the second through a workshop).

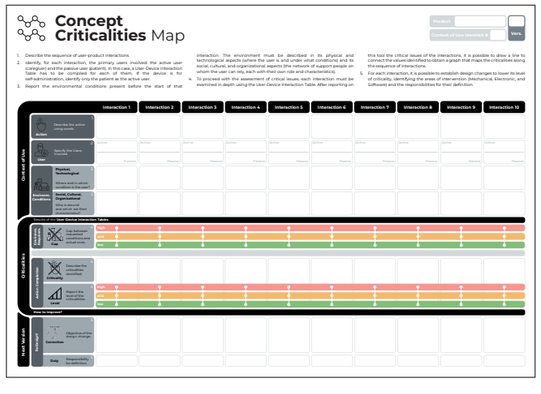
Solution

The Potential Usability Module is a toolkit to conduct a **pre–prototype usability assessment** of a Smart Home–Use Medical Device at early stages of the R&D Process. As the name suggests, it evaluates the potential usability of a device, because it is to be used to assess wheter a product idea is **viable enough** to proceed with the realization of a functional, testable prototype. It is composed of **three tools**: the Context of Use Identikit, the Concept Criticalities Map, and the User–Device Interaction Table. However, the second version still presents **room for improvements**, and developing a tird was left to future research.



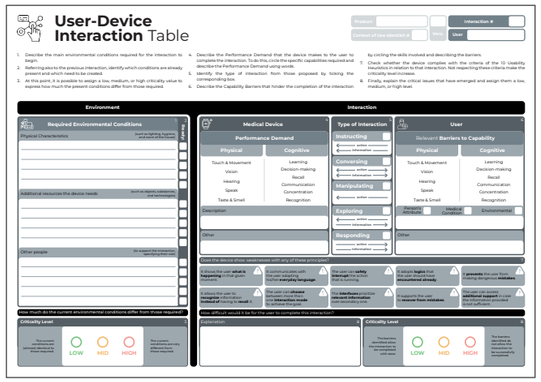
Context of Use Identikit

It allows the R&D team to collect and organize **data** about the **Context of Use** in which the solution will be deployed, which would guide the entire R&D process. Meaningful characteristics regard Users, Goals, Tasks, Resources, and Environment.



Concept Criticalities Map

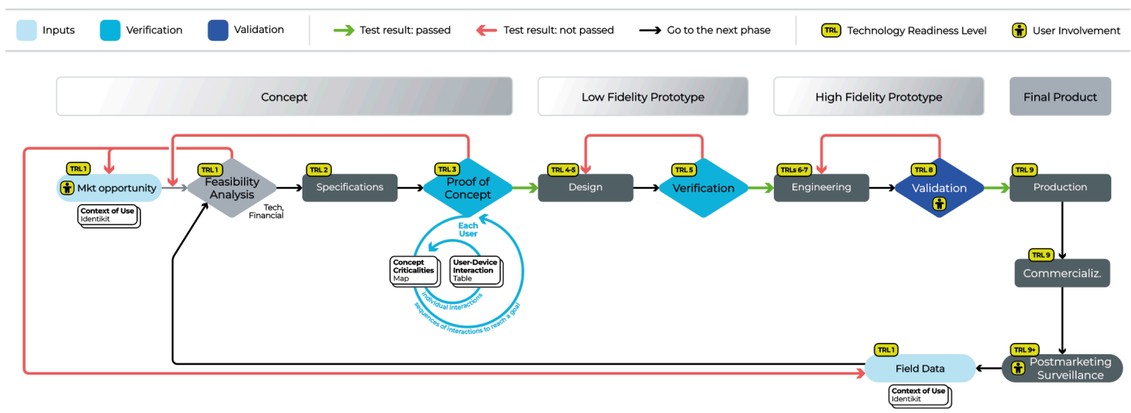
It allows to **map criticalities** that emerge in every interaction, allowing the R&D team to **identify design strategies** to mitigate them. It functions as a dashboard to visualize and correlate the criticalities that emerged into the more detailed analysis conducted with the User–Device Interaction Table.



User–Device Interaction Table

It allows to describe in great detail an interaction, **comparing present conditions against those required** to complete that interaction, in terms of **environmental characteristics** and **user' capabilities**.
It also helps assessing whehther the device helps bridging this gap.

Integration of the 3 tools into the R&D process



Pelagus Seadrone

TRL–2

Acquatic Rescue Drone Support

Designer(s) M. Orsini
Year 2018 (My debut project)

Keywords **Rescue | Safety | Maritime**

Rationale

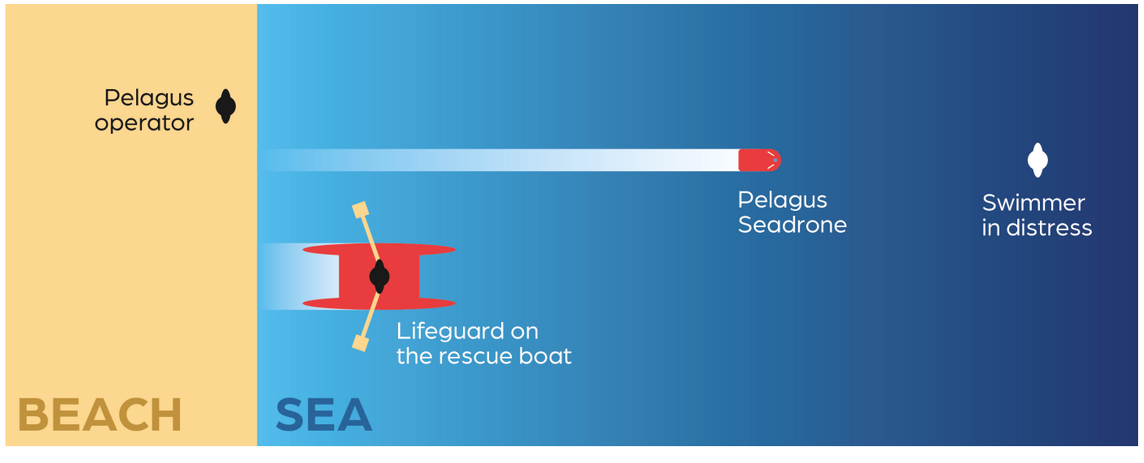
Under current practices for rescuing swimmers at sea in Italy, the lifeguard is responsible for the operation and relies solely on a rescue boat.
The problem with this situation is that the boat is usually slow and propelled solely by the lifeguard's physical effort.
This makes it difficult to ensure that the lifeguard reaches the swimmer in distress before it is too late, especially in the presence of strong waves and currents.

Methodology

The concept for this drone was developed by incorporating the features that enable its key functionalities.
However, further studies must be conducted to build a working prototype, including a buoyancy test to precisely determine the design and materials, as well as the development of radio-control software and electronic circuitry to operate the various components, such as the motors, the microphones, and the speaker.

Solution

The Pelagus Seadrone serves as a **means of support** for rescuing swimmers in distress. It is radiocommanded, and it precedes the arrival of the traditional rescue boat, which will reach the person in need soon after. Thanks to its speed, it serves as an **early means of rescue** by allowing the swimmer to rest on this floating support. The drone is equipped with a camera, allowing the operator to better interact with the surrounding environment. The drone is also equipped with a speaker that allows the operator to talk to the swimmer via a microphone installed on the remote control. This feature can be useful for calming the swimmer and telling him that the rescue is arriving. Finally, a perimetral bumper prevents the drone from physically harming the user.



Metahinge TRL-4

Metamaterial Hinge

Designer(s) M. Orsini
Year 2021

Keywords **Advanced 3D Printing | Mechanics | Experimental**

Rationale

This project is the result of an exploration of metamaterials design opportunities.
Metamaterials are artificial structures whose mechanical properties are defined by their typically repetitive cell patterns, independently of the material used (as long as it has a desired deformation behavior).

Methodology

For this project, two main types of cells have been used: Shear Cells and Rigid Cells. Shear Cells represent flexible points in the system, while Rigid Cells are the rigid points. By combining these two types of cells, it is possible to create complex assemblies that integrate their mechanical characteristics to produce the behavior of a macroscopic object.

Solution

Metahinge is a hinge realized in a metamaterial that enables the movement of a swing chair.
Compared to traditional hinges, it does not require lubrication.
The prototype was made with 3D-printed TPU, but a final product could be made from a much more durable material and using more convenient production processes, such as injection moulding.