

## BITTERSWEET SHIRTS: Combining AI, digital printing & hand-making approaches to inform guidelines for circular, local & long-life textile/clothing design processes

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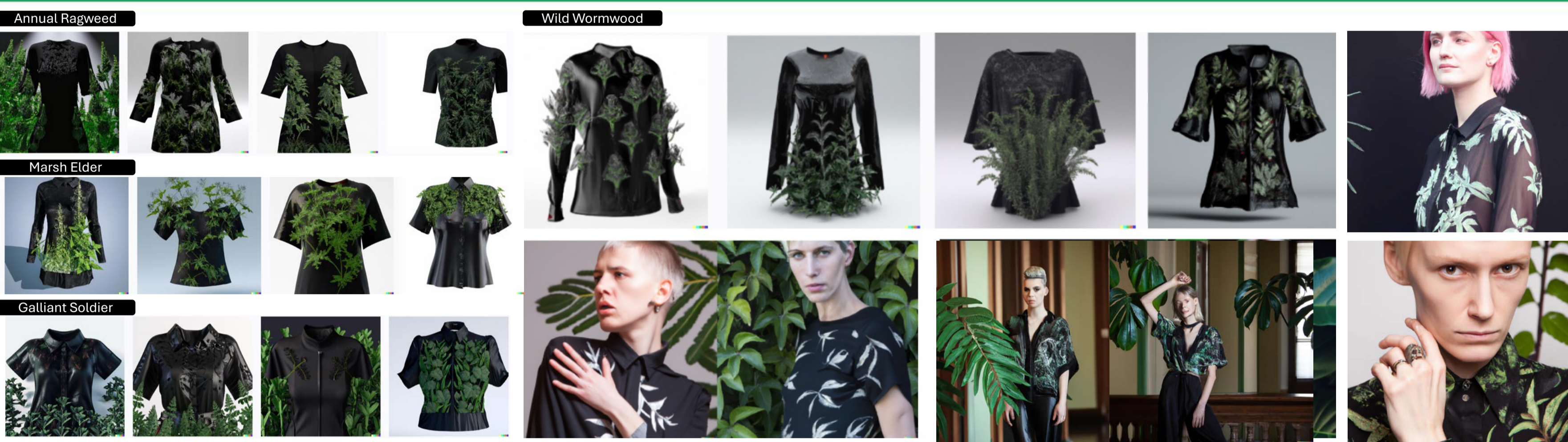
**BACKGROUND.** How can designers use AI, in combination with digital and handmaking processes, to create upcycled clothing for local, circular and urban contexts? This research builds on previous work which proposed early in the field of study, that designers needed to use technology as a supporting tool when making redesigned and remanufactured textiles and clothing (Earley 2010). This latest research for the **HEREWEAR PROJECT**, considers how new open-access artificial intelligence platforms (such as DALL-E) can support the design/redesign of processes and products for circular fashion, making the processes more time efficient, whilst retaining the aesthetic finish and connection that only hand-crafted techniques can deliver (Giri *et al* 2019). This research further considered how a sense of local identity and connection between users and waste clothing can be supported via the use of AI tools.

The author has been making 'upcycled' polyester shirts since 1999, with each shirt collection exploring different ideas about how designers can create a more sustainable, circular and equitable industry. Bittersweet Shirt (2023) has been re-crafted from a secondhand item to help people connect with nature in their region, and at the same time appreciate how our changing tastes make us waste clothes which can be transformed into something new and culturally relevant.

**CONCEPT.** This research enabled the author to act as a fashion microbusiness and test the Herewear Project's Bio TEN guidelines (Earley & Forst 2023) and the approaches to extending life of biobased products (Earley *et al* 2023). For this design brief, a local connection was sought to users based in Iasi, Romania, which is where project partner Maibine is based. Wormwood grows in abundance in Romania and has long been used as a medicinal herb for cuts and bruises, to treat indigestion, help with fever and infections, and as a type of insect repellent. It is also used in the liquor absinthe and to flavor other drinks like Vermouth.

Research shows that the fashion and textile industry has already produced enough polyester to clothe the world population, if it were to be reused and recycled. Oil is mined for transportation fuel, and polyester and plastic are made from the cheap waste parts of crude oil, which are not of the quality required to make petroleum. As global economies transition away from fossil-based fuels, we need new bio-based textiles for fashion, that can replace synthetics in our wardrobe. However, we must also **REUSE WHAT WE HAVE ALREADY MADE.**

In this research design guidelines that were being created for biobased clothing were further tested with used polyester shirts. Bittersweet Shirt was made with multiple bittersweet elements in the brief: the paradox of polyester and waste; the health and alcohol drinking habits associated with the plant used as decoration on it; the impact of AI on design and cultural economies and practices; and the local and global dynamics of fashion in a time of great political, social and economic unrest.



**(STEP 1) AI DESIGN PROCESS:** Using Dall-E, enter words to describe the design you want

>> Refine the precise range and order of words until the images created align with your concept and vision.

>> Include words to describe the styling details for the model and specific fashion shoot location if you wish.



**(STEP 2) BY-HAND TRANSLATION PROCESS:** >> Refine, edit and arrange AI-generated imagery in photoshop; print it on to transfer paper, and then test on waste polyester scraps. Find a used polyester shirt to overprint and collage the paper design to fit the shape/cut.

Above: The H&M short-sleeved shirt was originally made with recycled polyester. The paper design was hand crafted to fit the shirt – two pieces for the front and the back. The pleats in the original shirt create pleasing details when over-printed. Right: The long-sleeved shirt is vintage 1980's and more like a cropped jacket shape – good for wearing over a vest and with jeans. The designer can adapt each paper print to suit each individual shirt or collect and create repeat runs.

**(STEP 3) CROSS-CHECKING DECISIONS WITH THE BIO TEN:** >> This full lifecycle approach encompasses materials, transformation processes, extended use, and end of life treatments. The BioTEN inspire designers and design stakeholders within a systemic context. Table 1 below shows which of the approaches were used to make the Bittersweet Shirts. The checklist helps prompt designers to ensure make their decisions take into account a full range of circular, local, long-life and biobased considerations.

The **BIO TEN** are a set of strategies to help designers navigate biobased, local, and circular design in a transition to sustainability.

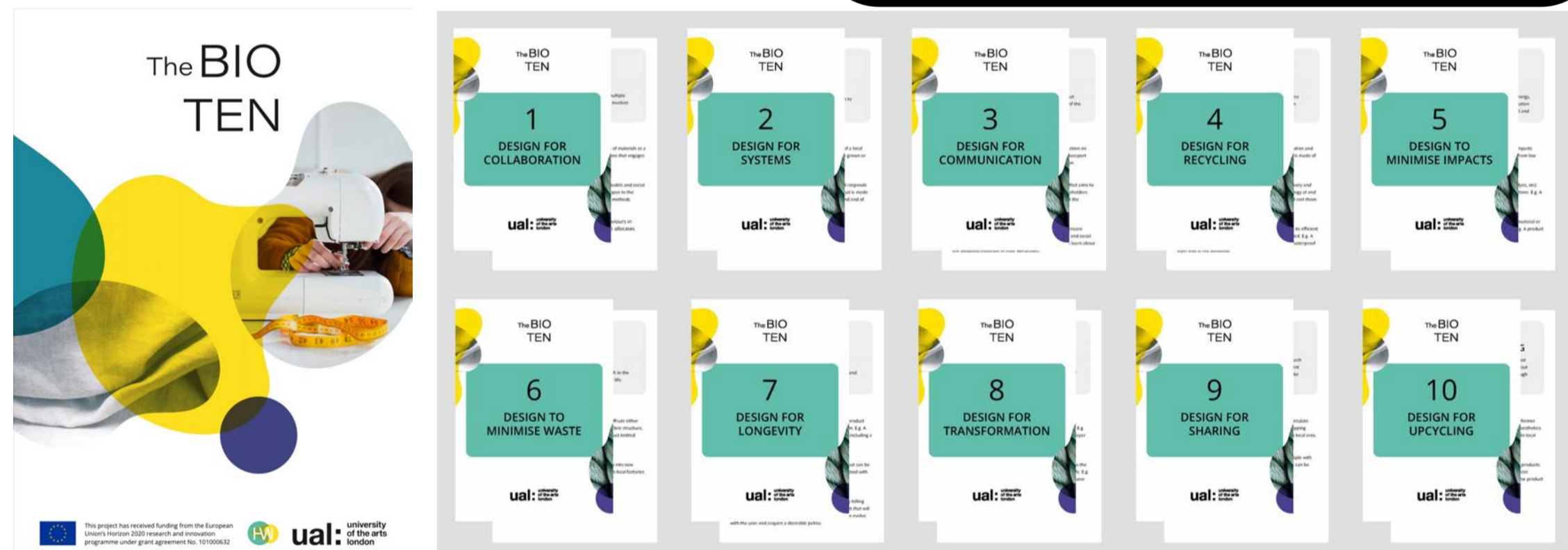


Table 1: How were the Bio TEN applied in the Bittersweet Shirt design?

| Bio TEN Strategy              | Detail within Bittersweet Shirts Prototypes  |
|-------------------------------|--|
| 1. Design for collaboration   | Designing with DALL-E; the human designer working in collaboration with AI         |
| 2. Design for systems         | Local remanufacturing loops keeps used products in circulation for longer          |
| 3. Design for communication   | n/a  |
| 4. Design for recycling       | Mono material garment ensures future polyester recycling process can be used       |
| 5. Design to minimize impacts | Low-impact overprint technique uses minimal energy/chemicals and zero water        |
| 6. Design to minimize waste   | Redesigning with used clothing, tapping into an abundant local waste stream        |
| 7. Design for longevity       | Emotional durability (local connection to plant); physical durability of polyester |
| 8. Design for transformation  | Multifunctional element of garments; styled as shirt or overshirt, or light jacket |
| 9. Design for sharing         | n/a  |
| 10. Design for upcycling      | Redesign approach allows for further processes to be added, like embroidery        |

### NEXT STEPS:

- Missing strategies 3 and 9 are currently being explored with a final shirt prototype – Iasi Shirt – to test the full spectrum of strategies within one circular/local/long-life garment.
- The key elements of the design development approach used here has been translated to use with biobased deadstock materials for a final stage of prototyping in the Herewear Project, with Germany-based microbusiness partner Vretena. A printed Autumn/Winter shirtdress range will go on sale in late 2024.
- The Herewear Hub launch in Autumn 2024 will share all tools and information from the project to anyone signed up to the community (and the TCBL organisation): <https://herewear.eu/> | <https://tcbl.eu/>
- The author is continuing to design with AI for circular economy research contexts and is now looking specifically at print design techniques and processes, aesthetics, and repair/durability methods for biobased clothing.

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>> Use words to describe the plant type and detail you need to create a repeating or non-repeating design with. Real plants can also be scanned and used, although seasonality and geographic distance means that using AI can be quicker, easier and cheaper.

>> Add details by overlaying. For this final design concept (above) the AI image was taken into photoshop and layered with a more detailed and recoloured plant image, to create a more finalised design concept from which to work by hand in the next stage of production.



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