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# Sustainable HCI: Blending permaculture and user-experience.

## Callum Egan

Centre for Interaction Design  
Edinburgh Napier University  
callum.egan@napier.ac.uk

## David Benyon

Centre for Interaction Design  
Edinburgh Napier University  
d.benyon@napier.ac.uk

## Abstract

For approximately 10 years the SIGCHI Sustainable HCI (sHCI) and Sustainable Interaction Design (SID) communities have debated the contribution that HCI can make to sustainability. However, there has been little real progress in the field with few, if any, methods arising that take the discipline further. In this paper we present an approach to sHCI and SID that involves *doing*. Building on approaches from the maker community we propose to blend aspects of permaculture — an approach to sustainable agriculture — and user experience (UX) design to produce gardens

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that demonstrate sustainable practice and deliver a good UX. By blending the constructs from UX with those from permaculture and expressing the blends through the “material anchor” of gardens we create novel design interventions. These lead to user experiences that invite people to reflect on what sustainability really means and how people can make a difference.

## Author Keywords

Permaculture, user experience (UX); blending theory.

## ACM Classification Keywords

H.5.2 Theory and methods; user-centred design

## Introduction

Our work is to investigate what happens when permaculture and user experiences (UXs) are blended in novel, thought-provoking, engaging and appropriate ways. We look to create design interventions that foster reflection on the interconnectedness of nature and the place of people within it.

This work contributes to the design for sustainability agenda [21] and furthers the holistic focus of a number of researchers and commentators on sustainability and HCI. For example, Knowles et al. deal with social, environmental and personal needs, framing

sustainability as a problem of how to enable human fulfillment [14]. Meyers and Nathan [17] emphasise the ethical issues, the importance of critical reflection and how disruption is a necessary part of sustainability. They invoke the positive philosophy of Anthony Weston [23] who suggests a number of radical visions of environmentalism [24].

We draw upon a view of sustainability that is permaculture. This is a world-wide movement grounded in gardening and agriculture [2], [20]. Permaculture is both a philosophy and a design practice with sustainability at its core [11], [18]. We bring together permaculture and the experiences of people planning, using and reflecting on their use of technologies that we capture through the concept of UX. The coming together (or blending, see below) is achieved through creating gardens that aim to provide a “material anchor” [12] within which people will experience sustainability. Our philosophy is that the making of, and engagement with these gardens will enable us to grow UX (and hence sHCI and SID) as a sustainable design discipline in line with the philosophy of the *maker culture*, described by Tim Ingold as ‘a process of growth. This is to place the maker from the outset as a participant in amongst a world of active materials... in anticipation of what might emerge.’ ([13] p.21).

### **Background**

Permaculture is a particular, holistic approach to sustainable (agri)culture that emphasizes a number of important relationships between plants, space, land and produce [11]. One important relation is the different layers of plants in an ecosystem, from canopy to edge plants, to the rhizosphere. Another concerns the

relations between elements in a permaculture design which symbiotically create sustainable eco-systems.

Permaculture as an ethical design science offers people a space to dig deeper into how humankind can re-design living and doing in terms of actions that nourish a degraded planet, and most importantly enrich the soil under our feet [25]. It provides guidelines for design embedded in a philosophy of sustainability.

User Experience (UX) is about engagement and interaction [3]. It is an emotional as well as cognitive response to some technologies and content. Sometimes UX focuses on achieving a goal, but often UX is exploratory, loosely associated with achieving something, but also concerned with the many engaging interludes along the way [10]. UX is about anticipation, use and reflection. It is a felt experience [16] a unified whole where the experience lies in the relations between the factors rather than in the individual parts.

### **Blending Theory**

Our approach is to use blending theory (also known as conceptual integration) that brings concepts from permaculture and UX into creations that enable new experiences. Classic blending theory [7] is a theory of cognition that relies on the inputs from two conceptual spaces. The process of composition establishes correspondences between the spaces and brings the input spaces together into a blended space. In the blended space new relations are established that build on the relationships between the input spaces. Completion is the process where people’s cultural and cognitive models are integrated into the blend. Elaboration is the process whereby the blend is manipulated as a whole resulting in new insights [7].

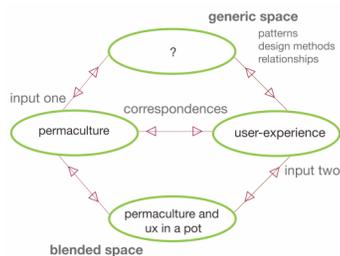


Figure 1: The blend and reverse-engineering of permaculture and user-experience.

An important contribution to blending theory is provided by Ed Hutchins who emphasizes the importance of a 'material anchor' to blending [12]. He argues that if one of the input spaces is grounded in a physical, embodied experience (as opposed to an abstract, conceptual experience) the power of the blend can be much greater. New inferences are not just possible, they become automatic. Hutchins provides a carefully argued contribution to this idea, drawing upon examples of his own work on Micronesian navigators and their use of rising stars and passing islands as material anchors for their approach to seafaring and navigation to classic examples of the effectiveness of mental models. Things that are difficult to think about in the abstract become obvious if they are blended with an appropriate material anchor. For example, an engineer will lay out the parts of an engine as she dismantles it in order to make reassembling easier. A chef will prepare ingredients for a dish and use the physical space around him to remind him of how to cook the dish. Indeed, Hutchins says:

"Problems that are too complex to hold in mind as a cultural model, and possibly some that are too complex to express at all in internal conceptual models, can be expressed and manipulated in material structure". ([12] p. 1574)

Our aim, then, is to use gardens as the material anchor, blended with novel user experiences, to create experiences that enable people to reflect on sustainability and HCI. Our approach is also a form of reverse engineering. By building gardens and reflecting on the user experiences that people have in that space we will uncover details of the generic space wherein the

correspondences lie. This enables us to reflect more deeply on sustainability and UX and sHCI and SID.

### Permaculture as design philosophy

Bill Mollison, co-founder of the term permaculture clarifies the philosophy:

"Permaculture is the study of the design of ... sustainable or enduring systems that support human society" [18]

The permaculture community is diffuse and well established in the West and developing nations, with an estimated three million practitioners worldwide [20]. The core design philosophy of permaculture founders' Holmgren and Mollison [11, 18], is enacted with particular emphasis on local conditions; think local, act global. Finding sustainable solutions to your own problems will inspire others to adapt these to new situations and provide incremental improvements.

Surprisingly, sustainable HCI-aligned research has largely only hinted at permaculture as a site worthy of enquiry. There is Norton et al's work on the development of an interactive domestic plant guild [19] and Blevis and Morse's short exploration of alternative agricultures [5], a keyword mention in Hirsch et al's CHI Panel [22] and the Australian permablitz movement [15]

Permaculture posits three core ethics that inform the design of *any* system: (i) care of the earth, (ii) care of people, and (iii) fair share (sometimes also called future care). It utilizes 12 guiding design principles: 1. Observe and interact; 2. Catch and store energy; 3. Obtain a yield; 4. Apply self-regulation and accept



Figure 2. The layers of permaculture and UX, in a pot.

feedback; 5. Use and value renewables and services; 6. Produce no waste; 7. Design from patterns to details; 8. Integrate rather than segregate; 9. Use small and slow solutions; 10. Use and value diversity, 11. Use edges and value the marginal; 12. Creatively use and respond to change.

### The Blend

We expect our work of building and engaging with permaculture gardens to contribute to the generic space that underlies the correspondences between permaculture and UX [see Figure 1.]. However, there are some clear mappings that we can build upon. For example, the first permaculture design principle maps very well to HCI practices such as ethnography and interaction design. The 7<sup>th</sup> principle highlights permaculture's and HCI's shared interest in the works of Christopher Alexander [1] and interaction patterns. The 8<sup>th</sup> principle is similar in perspective to a blended spaces view of design where the physical and digital are designed to commingle [4]. The 11<sup>th</sup> principle resonates with notions of liminality and the concept of boundary objects in CSCW which help to bridge different stakeholders.

The foundation of permaculture is its ethical standpoint [25]. The ethic of 'people care' shares much of HCI's focus on human centred design, but at present there is little evidence of actual sustainable HCI practice that aligns with the permaculture ethic of 'earth care'. Further, permaculture's third ethic of 'fair share' – a sharing of surpluses – remains a notion requiring further exploration in terms of HCI, but is evident in maker thinking [9].

### Pot Art: Permaculture and UX in a pot

Our poster is in fact a plant guild [see Figure 2.] augmented with suitable technologies which demonstrate the blending of aspects of permaculture and UX. The plants provide a material anchor for permaculture principles of sustainability and design including symbiotic relationships and layers of planting that mirror natural forest systems. Interactive experiences are provided through a Bluetooth plant monitor and its associated app [8]. Audio and video content delivers insights into sustainability as people interact with the exhibit.

Future designs will connect local gardens with similar projects in the developing world. Others utilise physical artefacts such as levers and dials to enable a 'tuning of place' [6]. More still, focus on renewables, water management, connecting real world design elements to library texts, and obtaining yield from the blended spaces. Fundamentally, the pot guild illustrates how permaculture and UX can be integrated into new experiences where each element is carefully chosen to maximise useful relationships [2].

### Conclusions

We propose that blending permaculture and UX using the material anchor of gardens is a novel approach to understanding sHCI and SID. From the pot garden proposed here, we will exhibit a palette garden (2m x 2m) at a UK National Gardening Competition. This will be followed by exhibits at our university campus. As we engage with the users of these spaces we expect to uncover more insight into the agenda for sustainable UX and propose design principles and methods to achieve this.

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