http://dx.doi.org/10.14236/ewic/HCI2022.51

Data-Driven Innovation for Sustainable Creative Practice

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We present a film exhibiting eight case studies of projects dealing with the intersections of environmental sustainability, data and technology, which have all been led by and rooted in the creative industries in Scotland. The film highlights how the creative sector has been utilising data and technology to address the climate crisis, by responding artistically to environmental data, as well as developing tools and technologies to empower individual and systemic change. Through presenting the film, we demonstrate the synergies between HCI research and technology-focussed work in the creative industries, in context of the shared goal of sustainability. Our overarching aim is to promote discussion about how knowledge from the creative industries can be seen as a powerful resource to be learned from in HCI and to inspire further HCI design and research, as well as to demonstrate the potential value of collaborative work between creative practice and HCI.

Climate Change. Sustainability. Creative Practice. Sustainable HCI.

***Figure 1**. Stills from the film. Left: a still of Rebecca Kaye' artistic representations of environmental data. Middle: an image of Michael Begg's practice of developing musical compositions based on weather data, in this case, experimenting with the sonification of melting ice. Right: An image of Jeni Allison's studio, featuring yarn samples used for her knitwear customisation app.*

1. INTRODUCTION

In the face of the climate crisis, there is a need for all sectors and disciplines to work to transform society toward a more sustainable and equitable future. Within HCI this work typically takes the form of investigating how platforms, services and technologies new and old can be designed to deepen people's understanding about sustainability as well as to support individual or systemic change. A number of domains in HCI, most notably sustainable HCI (DiSalvo et al, 2010; Knowles et al., 2018), persuasive technology (Knowles et al., 2014) and participatory design (e.g., Heitlinger et al., 2018), have contributed to knowledge of how sustainability can be supported both *in* design (i.e., how technology can be designed to be sustainable) and *through* design (i.e., how technology can be designed to engender sustainable behaviour) (Mankoff, 2007).

However, we argue that HCI is not alone in combining technology, data-driven methods and practices, and deep understandings of people and communities to drive environmental change; the creative industries are another place where these subjects readily fuse together, with many similar aims.

To demonstrate this, we showcase a 35-minute film which exhibits eight case studies of research and

Proceedings of the 35th British HCI and Doctoral Consortium 2022, UK

development projects based in Edinburgh, Scotland, that have been led by and rooted in the creative industries. Through these case studies, the film highlights four themes of how the creative sector has been utilising technology and data to address the climate crisis: *1. Artistic responses to environmental data; 2. Efforts to change patterns of ownership and consumption; 3. Tools to support understanding of carbon footprints; and 4. Platforms for empowering sustainable and circular communities.*

Through this film, we aim to demonstrate the synergies that exist between HCI research and technology-focussed research and development in the creative industries, in context of the shared goal of sustainability. Moreover, we aim to inspire HCI researchers to view sustainable technology design through a creative lens, as well as to highlight the key role that creatives have to play in making the urgency of the climate crisis tangible and in driving collective action.

2. FILM BACKROUND AND THEMES

In this section, we summarise the origins of the film, the themes it encompasses and the backgrounds of the artists, entrepreneurs, practitioners, and researchers who are represented as its subjects.

2.1 Creative Informatics and Film Provenance

This film has been created by Creative Informatics[1], a research and development funding programme in Edinburgh, Scotland that supports work across Edinburgh's creative industries engaging with Data-Driven Innovation (DDI). DDI is a cornerstone of the UK's industrial strategy for growth in the digital economy. This 5-year project supports a vast array of individuals and projects in the creative industries in engaging with DDI, through offering them funding and access to upskilling initiatives.

The individuals and projects that have been funded by Creative Informatics vary widely, but they all have roots in the creative industries, which include: advertising and marketing; architecture; crafts; product design, graphic design and fashion design; film, TV, video, radio and photography; IT, software, video games and computer services; publishing and translation; museums, galleries and libraries; and music, performing arts, visual arts and cultural education (Department for Digital Media, 2001).

A number of the projects that have been funded by Creative Informatics have engaged, in diverse ways, with the theme of environmental sustainability. This film is an effort to showcase their work, in order to demonstrate how creative practice can help foresee the opportunities of new technologies and data-driven methods to change the ways in which we live, work and engage with society, within the safe space of the ecological ceiling (Raworth, 2017).

We have chosen to showcase this work through the medium of a film, as a way of presenting it in a way that is accessible to both academic and non-academic audiences. Furthermore, we feel that the highly visual, interactive and musical aspects of the creative case studies that comprise this work are represented through film more viscerally, and in a richer way than through a traditional paper.

2.2 Film Themes

The film engages with four themes that interweave DDI, sustainability, and creative practice. These are: *1. Artistic responses to environmental data; 2. Efforts to change patterns of ownership and consumption; 3. Tools to support understanding of carbon footprints; and 4. Platforms for empowering sustainable and circular communities.*

2.1.1. Artistic responses to environmental data
The film showcases two case studies of artists who have used environmental data as input to their artistic practice. Specifically, the film features Michael Begg, a sound artist and musician who collaborates with climate scientists to create musical compositions of live and archival climactic and weather data streams. Focusing in particular on the climate issues affecting the southern ocean and the Antarctic, Michael Begg's work creates new representations of the changing climate. The film also highlights the work of Rebecca Kaye of Ploterre, a business that merges mathematics with design. Rebecca Kaye uses data about the natural world to create artistic visualisations through traditional mediums like screen printing, letterpress printing and textiles. For example, she has previously worked on creating screen prints visualising the diversity of species that partake in the morning chorus of birdsong during mating season.

Through their work, Michael Begg and Rebecca Kaye both hope to inspire their audiences' curiosity about, and feeling of responsibility toward the natural world. In this way, their work can be seen to link to active domains in HCI on data visualisation, physicalisation and sonification, especially related to how data about the world can be *made visceral* to activate emotion and help people develop a deeper understanding of data-driven arguments (D'ignazio. and Klein, 2020); their work demonstrates how artistic practice can be a powerful means toward this aim.

[1] https://creativeinformatics.org/

2.1.2. Efforts to change patterns of ownership and consumption

The second theme focuses on how DDI within the creative industries can support changes to unsustainable ownership and consumption patterns in society. Embedded within this theme, the first case study features knitwear designer and product developer Jeni Allison, who is using her extensive knowledge of the knitwear industry to develop an app that enables consumers to customise and order knitwear. The goal of the app is to advance a new slow manufacturing model for knitwear, where only one garment is produced on demand: a direct antithesis to the bulk production that underlies fast fashion. By enabling garment customisation, the app also hopes to support owners' attachment to their garments, in order to extend the lifespan of the manufactured products.

The second case study features the Edinburgh Tool Library (ETL), a tool sharing library that enables community members to borrow seldomly used tools, rather than purchasing them. ETL has been working on augmenting their digital library platform, in which data about the tools and tool use is stored, with additional information about the impact of tool sharing on carbon footprint. The purpose of doing so has been to inform ETL members about how they are reducing their own carbon footprint through borrowing, but also to provide evidence about how ETL is reducing the community's climate impact more widely. Furthermore, this project has enabled 400+ tool libraries across the world who also use the same software to contribute to and benefit from this new carbon tool, thus finetuning the data through crowdsourcing.

These two case studies can be seen as linking to a diversity of work in HCI. This includes, among other themes, how the lifespan of an object is tied to the object's history, its social value and the level of attachment its owner feels toward it (e.g., Odom et al. 2009; Houston et al. 2016). Specifically, the case studies show how where the goal is to alter consumption and ownership, there is a need to tie together an understanding of people's motivations for the (dis)use of their objects, as well as an understanding of how to augment their perceived value. For example, in ETL's case, value is made visible by demonstrating how the objects – when situated in a specific social and technical context - have impacted the community and worked to reduce climate impact.

2.1.3. Tools to support understanding of carbon footprints

In the third theme, the film explores how access to personalised carbon footprint data can support creative businesses in reducing their impact, ranging from cultural organisations to architects. The theme follows Caro Overy, who has been working on identifying how to support cultural organisations with identifying the practical climate impact of their work, especially those who may not have the capacity to carry out full environmental reporting. Her project aims to empower change by supporting these organisations in understanding which aspects of their climate footprint they have power over. The theme also follows start up Looper, who have launched an AI-powered platform to help businesses assess the climate impact and the circularity of their products and services. The work underlying this theme links to the domain of research concerned with understanding how best to present energy and climate data to support behavioural change (e.g., Froehlich et al., 2010; Strengers 2011). In line with such research on eco-feedback technologies, the case studies represented here attest to how beyond broad design principles, developing effective tools and technologies for supporting this form of change requires a deep situated understanding of organisations' specific needs, values and challenges.

2.1.4. Platforms for empowering sustainable and circular communities

The final theme follows two projects aiming to incentivise collective action toward sustainability and circularity in the creative industries. First, the film follows Sustainable Fashion Scotland's journey in developing a digital platform to connect Scotland's fashion community in order to accelerate collective action for sustainable fashion transformation. Instrumental to their work has been mapping the stakeholders involved in sustainable fashion, beyond just brands and designers (e.g., governmental bodies, farmers, manufacturers and companies working with recycling infrastructure) in order to ensure everyone is able to voice their perceptions of the challenges and opportunities related to future transformation of the sector.

The second case study is of the Creative Cred project: a collaboration between Ostrero, an organisation that works to grow the Circular Economy in Scotland, creative technologist Dr. Tom Flint of Edinburgh Napier University and economic anthropologist Dr. Juli Huang of University of Edinburgh. Creative Cred is a project focussed on developing a complementary currency to incentivise people in the creative industries to take a circular economy approach to their business. The currency, enabled by a digital backend, supports the exchange of measures of value beyond the economic – from the use of circular design principles, to the provision of circular services.

Together, these projects explore how collective action and community building, supported by technology and digital platforms, can deliver change within a creative sector. This work has strong links to action research and the participatory design of civic technology (e.g., Heitlinger et al., 2018; Prost et al., 2018). Beyond this, the work also highlights

just how much of an appetite there is within the creative industries for these forms of collective action, suggesting how HCI researchers might be inspired by, and seek to work with, changemakers already embedded in the creative sector.

3. TECHNICAL DESCRIPTION

The 35-minute, subtitled film comprises a 2-minute introduction and four self-contained 8-minute sections. The audience will be welcome to watch the film in its full length, or to stop by to watch parts of the film. We suggest playing the film on a loop for the entirety of the Interactions Gallery timeslot.

In order to exhibit the film, we will require a relatively quiet corner, a screen with good quality speakers, and several chairs/benches where the audience can sit. We will connect the film to the screen through a USB drive from which it can be played. The film is also hosted online on Vimeo (https://vimeo.com/723299867) and we will display the online link to the film in the film screening area for those interested in watching it at a later time.

4. CONCLUSION

Through presenting this film, we demonstrate how the intersection of creative practice, technology and DDI can be seen to share goals with domains in HCI aimed at promoting sustainable behaviour, empowering communities and driving systemic change. By doing so, the film hopes to demonstrate just how much there is to be learned from the creative industries' deep knowledge of people, planet and design when it comes to developing new tools and technologies for environmental sustainability. More specifically, we hope to promote discussion about how this embedded knowledge from the creative industries can be seen as a powerful resource to be learned from in HCI and to inspire further HCI design and research, as well as to demonstrate the potential value of collaborative work between creative practice and HCI.

5. ACKNOWLEDGEMENTS

This work has been funded by the AHRC as part of the Creative Industries Clusters Programme, with support from the Scottish Funding Council and the Edinburgh and South East Scotland City Region Deal (*AH/S002782/1*). We would like to thank the creative businesses, organisations and academics represented in the film for their participation. We would also like to thank Video Production Edinburgh for their work on the film production. Finally, we thank the wider Creative Informatics research and delivery teams for their contributions to both film production and to this paper.

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