

TRASH CASH

Title: What Else Do We Know? Exploring the application of design knowledge and skills for the circular economy beyond materials selection and design for production

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What Else Do We Know? Exploring the application of design knowledge and skills for the circular economy beyond materials selection and design for production

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Abstract

There has been an awakening in recent years in the field of design research to the idea that designers can take on a number of roles other than the traditional narrow focus on products. This paper draws on existing research to explore new ways of applying design knowledge in the circular economy, and in particular in relation to the development of materials. Early observations from the current EU H2020 Trash-2-Cash project build on this current understanding within a consortium project. Three new roles are presented: 1) bringing new design-driven insights - hands-on materials knowledge and introducing the social context; 2) translation, interpretation and boundary spanning to bridge disciplinary barriers; and 3) introducing design tools and methods to support interdisciplinary collaboration. This research concludes that there are various ways that designers can use their knowledge and skills to support circular materials systems other than designing products, but they need to be better equipped to identify and practice these roles.

Introduction

It has been suggested that designers could play a significant role in the circular economy; it is estimated that 80 to 90% of a product's lifecycle impacts are decided during the design phase (Graedel *et al* 1995). Yet the implications of this statement – that designers have the power to make sustainable choices - is far from the reality of mainstream design practice (Hornbuckle 2010).

However, there has been an awakening in recent years in the field of design research to the idea that designers can take on a number of roles other than the traditional narrow focus on products (for example Manzini 2015; Tan 2012; Cooper & Press 2003). Some *design scenarios* – the circumstances under which the designer applies their knowledge – may be more conducive to positively influencing circular materials systems (Hornbuckle 2010) and it

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would benefit designers frustrated with the constraints of their current practice to understand other ways in which to apply their skills and knowledge in the circular economy.

This paper draws on existing research to explore new ways of applying design knowledge in the circular economy, and in particular in relation to the development of materials. Early observations from the current EU H2020 Trash-2-Cash project will then add insights to current understanding on how design knowledge and skills can be applied and developed within a consortium project.

Defining the focus within the circular economy

‘The Circular Economy’ is a broad concept encompassing many ideas related to a number of disciplinary fields. A concern for health, the environment and social issues has led designers and design researchers to explore various avenues related to these connected ideas, from service design to design for emotional durability. The particular focus of the research presented in this paper is the circularity of materials, as a starting point, taking the commonly misunderstood notion of ‘specifying recycled or recyclable materials’ from its rather static and solitary position within the conventional design-for-production phase of the product lifecycle and reframing the design challenge as ‘the consideration of materials as part of a circular system’. The inevitable consequence of designers thinking about materials in a circular system is that to act, they sometimes need to break out of their conventional role.

This paper asks ‘what else do designers know’ which could support movement towards circular materials systems; what other roles can they perform other than attempting to use recycled or recyclable materials? The research reported here sets out a specific alternative scenario for the application of design knowledge – a research project where the aim is to develop new circular materials, as a particular case study, although the roles observed are applicable more widely.

About Trash-2-Cash

Trash-2-Cash is an EU Horizon 2020 funded Design-Driven Materials Innovation (DDMI) project (grant agreement no. 646226) focusing on the development of novel fibres made from regenerated cellulose and polyester derived from textile waste. The consortium consists of 18 European partners encompassing science, design and manufacturing expertise within research institutions and industry. Design involvement includes academic design

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researchers, textile and industrial designers (within agencies and manufacturers) who – according to the project proposal – will:

- Lead the recycling initiative, defining the material properties, and will feed the material scientists to evaluate newly developed eco-efficient cotton fibre regeneration and polyester recycling techniques.
- Develop new material and product opportunities via creative design from waste or process by-products
- Use design for recycling with the vision of closing the material loop.

The task of design can be seen to be that of informing the technical development stream using conventional design for production and design for recycling processes. This paper will reflect upon some ways that designers have so far expanded their role beyond this traditional notion of design.

The author is part of the ‘methodology team’ and therefore works closely with the coordinators to plan the workshops (where the main collaboration activities take place). During the workshops, the author is mainly responsible for observing how participants respond to the planned activities, and occasionally is involved in facilitating particular sessions. The research on which this paper is based therefore, adopts auto-ethnographic and ethnographic approaches to gather data and analyse the effect of these interventions whilst acknowledging the author’s involvement as part of the field of study.

The reflections included in this analysis come at an early stage of the Trash-2-Cash project, but significantly at the end of the first of three iterative phases. The first completed ‘Design’ phase, would perhaps most accurately be characterised as ‘setting up the collaboration’ and ‘forming design directions for the materials development’. The design involvement reported therefore reflects this focus; it is expected that phase 2 of the project will involve more conventional applications of design knowledge as identified in the project proposal extract above.

At this early stage the data comprises field notes, feedback ‘Tips & Tops’ and worksheets from Workshops #01-04, selective interview transcripts, as well as worksheets and reflective interviews with some of the facilitation team. These analyses should not therefore be viewed as conclusive but rather as early observations.

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Reframing the role for designers in the circular economy

On face value the role of designers in material circularity is fairly straightforward. Designers are involved in the selection of materials for products. How those materials are shaped, combined and the context in which the resulting product may be used will have a significant influence on whether that material can be an effective part of a biological or technical cycle (McDonough & Braungart 2002). Designers also have the ability to draw waste materials back into the material cycle by incorporating them into new high-value products. Therefore, the role of designers in the circular economy has frequently been framed by their traditional function of design for production. However, research suggests that fulfilling this role is far from straightforward; materials selection is constrained by existing modes of production and established supply chains, creating effective materials cycles involves systemic change across a large number of actors and even the apparently straightforward aim of ‘specifying recycled materials’ presents a myriad of problems for designers (Hornbuckle 2010; Chick & Micklethwaite 2008). Therefore, designers who want to work in a way that support materials circularity must find new ways of applying their knowledge and skills other than though materials selection alone, which is problematic.

Other roles for designers in the circular economy

In recent years design researchers have begun to expand this view of design’s role in addressing the challenges of material circularity. In this section, the author will present three ways that designers have been seen to apply their knowledge to positively influence materials use in the circular economy. The discussion will draw on existing research as well as early observations from the Trash-2-Cash project.

Experiential knowledge of materials and the social context

In 2005 Dehn was awarded a UK Arts and Humanities Research Council (AHRC) grant to investigate the role of designers in developing problematic waste materials. A designer herself for many years, Dehn was interested in the value of design intervention which goes beyond the straightforward selection of these materials. For example, playing or “tinkering” (Karana *et al* 2015) with materials enabled designers to bring new experiential materials knowledge to the materials development process, whilst also finding new applications and developing higher-value products. This observation has also been explored by Karana *et al* (2015) through a method they term Material Driven Design to facilitate “designing for material experiences”; fundamentally

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acknowledging the designer's ability to make materials meaningful by adding value through hands-on material development and making.

However, the value that designers can bring to materials development can be seen to go beyond hands-on materials knowledge and translation into meaningful products. In her research, Dehn found that the impacts were manifold:

- Transform our perception of waste
- Reappraise unconventional materials
- Promote sustainable values through involvement with design education
- Collaboration with manufacturers leading to design innovation and commercial success
- Design desirable products, generate business, create employment and sustain communities

(Dehn 2014)

Designers have the desire and ability to collaborate, to communicate, and to create positive social impacts. These applications of design knowledge have also been observed within the first four workshops of T2C and particularly workshops #03 & #04; the designers from agencies and academia both sought to introduce social issues into the conversation of how the new fibre might be used in future scenarios. This was also noted by scientists in the Tips & Tops feedback session which take place at the end of each workshop, commenting "I like the way designers connect to the wider context" [Post-Doctoral Fibre Scientist].

In workshop #03 one of the agency designers suggested running a session on 'Megatrends' which sought to explore how the project work might align with cultural trends. This was an unplanned intervention but was welcomed by the methodology team as it aligned well with the current project phase and challenged the project direction, broadening the participants' vision beyond the immediate and straightforward. The success of this design intervention was the impact it had on the dialogue within the group, not just amongst designers but also senior scientists. Subjects such as humanitarian issues, the refugee crisis and healthcare were bought into the discussion. In workshop #04, during an assessment exercise, the issue of migration reemerged in one discussion group of designers alongside the pollution and resource concerns of 'water/ocean' and 'cotton', highlighted in the corner of their worksheet. This ability to raise the discussion of material development above the more straightforward questions of western commercial markets and material issues to ones related to social and humanitarian needs is

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arguably an unexpected but nevertheless important application of design knowledge within the context of materials innovation.

Materials translation and project interpretation

The term *Materials Translators* was first introduced by the author in 2013 and refers to the important role of a person working with a materials collection in translating materials benefits for designers (Hornbuckle 2013), ‘boundary-spanning’ (Rieple *et al* 2005) the worlds of materials specialists (suppliers) and non-specialists (designers):

[Materials Translators] are in a unique position between the scientific and creative communities. From the investigation, it became clear that this position and consequential understanding enables these specialists to translate the benefits of materials for design through workshops, exhibits, talks, articles, books and consultancy
(Hornbuckle 2013:105)

This is supported by the author’s 2008 doctoral research which found that to encounter and understand alternative materials designers need to talk to a materials specialist; dialogue is the central method in obtaining materials information in a way that is understandable to designers (Hornbuckle 2010:185).

All but one of the Materials Translators observed in the study had a design background at least to the level of training but many had also practiced as designers, suggesting that having ‘design knowledge’ and consequently an understanding of design thinking and methods is an important feature of the Materials Translation. This is, it is argued, an alternative application of design and materials knowledge and could have a significant role in the circular economy as designers are tasked with setting aside conventional material selections and exploring alternatives which may challenge traditional modes of supply and production.

Within the current Trash-2-Cash project a materials library takes a central position in the project methodology, described in the project proposal as an “intermediary/facilitator”. In this context, the Materials Translator’s role is extended beyond what was observed in the 2008 study, spanning the boundaries of design, science and manufacturing and, as well as disciplinary differences, there are also barriers relating to national language, culture and location. Whereas the materials translators observed in the earlier study would mainly be working with a few different

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actors at any one time, T2C involves a large number of people across 18 organisations which arguably demands a different set of skills.

Initial observations suggest that the lead Materials Translator¹ in T2C and his colleagues are performing materials translation tasks such as interpreting material properties into senseoaesthetic language (in written reports and through dialogue) and using materials samples in specific ways to assist communication within the workshop. For example, in workshop #03 there were several discussions where designers were asking questions such as “how strong?” or “what does that Dtex look like?” and “what does Ioncell feel like”. In response, the lead Materials Translator went to find a specific sample to assist with the scientist’s explanation. In workshop #04 the Materials Translators made a selection of materials samples to demonstrate some of the properties that designers would hope to achieve through the material development process alongside some experimental presentations of materials properties which aimed to speak to designers and scientists alike. Therefore, it is clear that the Materials Translators within T2C are performing boundary-spanning or bridging roles within the consortium. However, what is perhaps less expected is the extent to which the lead Materials Translator also takes a central role in interpreting the project aims and objectives and indeed translating these for the broad range of disciplines, languages and cultures represented in the consortium. For example, during the Design Scenario presentation in workshop #02 the Lead Material Translator positioned himself at the front of the auditorium and frequently interjected to ensure design methods and ideas make sense to scientists and manufacturers, and within the context of the project. This is perhaps partly due to the experience of this person in a previous interdisciplinary project and his central role in devising the project methodology, incorporating design methods into a scientific process of material innovation. However, the ability to translate between disciplines is also a central skill which enables the project interpretation to be carried out in this way; as neither a designer nor a scientist the Materials Translator is in a position to take an overview of the project and the interests of its different stakeholders.

¹ For ease of understanding the author will continue to use this term for people working with a material collection, although the job title of this person is *Project Manager, Innovation & Research*

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Design tools and methods: visualisations to support the collaboration

The use of design tools was anticipated in the project proposal in relation to ‘lifecycle representations’ which will start in the second phase (year 2) of the project. However, during the first phase the use of design methods and tools had not been anticipated or well defined in the project proposal, yet their introduction and use was widespread in workshops #01 to #04 with varying success, for example in the ‘megatrends’ session described earlier. Given the confines of this paper the author will focus on one type of tool/method which emerged during the first project phase; the production of visual material to support the collaboration which was instigated primarily by the author as part of the research team at the Textile Environment Design (TED) research group at University of the Arts London (UAL).

Visualising information is seen as a powerful method of supporting understanding (Tufte 2001) and has become a dominant feature of design research in recent years (Boehnert 2016). The great number of barriers to understanding within this project quickly led TED researchers to identify ‘project visualisation’ as a method that could enhance the collaboration and aid understanding. One such example is the Capability Map produced by the author for workshop #04. Project partners were asked to complete an online survey of their knowledge and capabilities in line with the project focus on materials, recycling, design, manufacturing, end-users and lifecycles. A tabular ‘map’ was generated from the results identifying each person’s capabilities and knowledge (see figure 1).

The was to allow partners to quickly see who they might talk to when requiring particular expertise and to build a sense of community within the project. The map was provided in workshop #04 accompanied by an interactive task to be completed by partners in between scheduled sessions. A large poster of the material/product lifecycle was pinned within the workshop space and participants were given their own ‘face stickers’ to place within the project (see figure 2).

The aim was to visualise the knowledge that had been captured in the survey in a fun and engaging way that would draw attention to the map and also produce some research outcomes. Every workshop participant took part and some even added other colleagues (who are involved in the project but not attending workshops) using post-it notes. The feedback from the post-workshop survey was positive, with partners asking for it to be made available online and stating that it will become “increasingly useful”. In the post-workshop analysis, the author was able to code people by their discipline (design, science, manufacturing) which also gives an overview of

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where different types of knowledge reside within the project (faces have been removed for anonymity). Strikingly designers positioned themselves throughout the project space – in every section apart from fibre science, showing the ‘general’ nature of design knowledge compared to scientific knowledge which is specific. This echoes the point made earlier, that one potential benefit of design to the scientific process is to introduce a contextual awareness.



Figure 1 (left): A capability map was created from an online survey of project partners' expertise. Figure 2 (right): Face Stickers were placed within the 'project space' poster by each workshop participant

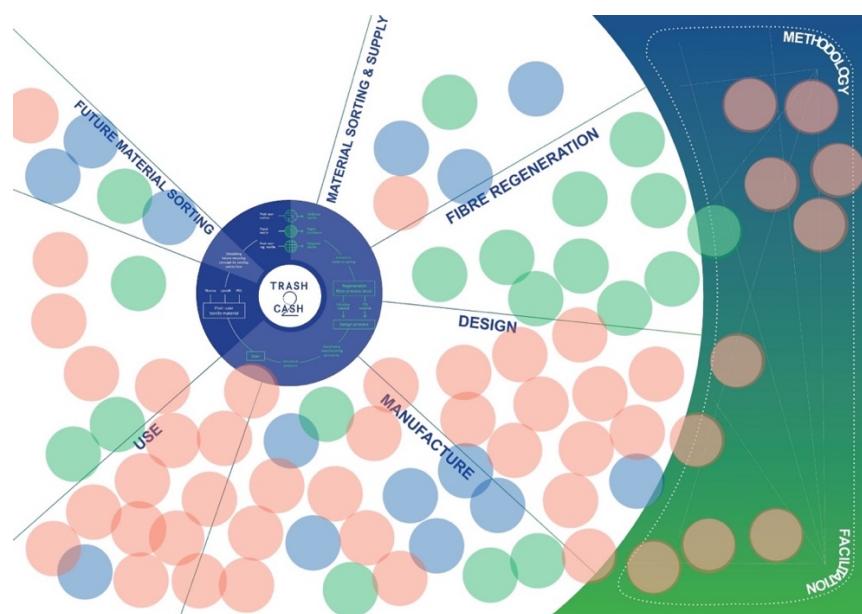


Fig 3: Capability ‘face’ map: participants were asked to place themselves within the project ‘space’ (faces have been removed for anonymity) Coded by discipline - red=design; green=science; blue=manufacturing/supply

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In summary, design knowledge in the form of tools and methods have been used in T2C to build and support the collaboration and in turn, it is hoped, the development of ‘circular’ materials. However, one central concern with all design tools and methods used in an interdisciplinary context, is that their value to the project is sometimes not clear to non-design participants and therefore every effort should be made to communicate the value of design tools and methods effectively.

Conclusions: new ways of applying design knowledge in the circular economy

Collaborative projects offer a unique opportunity to work towards circular materials systems, where the challenges are too complex and connected to a system of actors for designers to address independently. This paper has sought to present some of the ways that design knowledge can be usefully applied within this context drawing on recent research and observations from the Trash-2-Cash Design-Driven Materials Innovation project: hands-on materials knowledge to provide material and application insights, introducing the social context to address a wider range of sustainability issues; translation, interpretation and boundary spanning to bridge disciplinary barriers; and introducing design tools and methods to support interdisciplinary collaboration.

This however, is just a small selection of the ways in which design knowledge and skills have been applied within Trash-2-Cash, and shows that designers have a great deal more to offer than simply the selection of more appropriate materials. Importantly, more opportunities need to be identified for designers to apply knowledge in this way and scenarios for alternative design practice defined and communicated to designers.

On a final note, the design collaboration within Trash-2-Cash has not been without challenges. While designers have developed tools and methods for interdisciplinary collaboration on a small scale in recent years (for example Ellams 2016; Robertson 2011), there has been little written about the challenges of working in a large consortium and how designers can work together to achieve an effective and valuable creative offer. More work needs to be done to refine and define these methods for designers collaborating *with each other*, including a much clearer understanding of how design knowers from different disciplinary backgrounds and cultures can work together. Whilst being very rewarding, the design and methodology collaboration has also been surprisingly challenging and equipping designers

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with knowledge about how to integrate and differentiate between different design roles would be extremely beneficial in any future collaborative work.

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