PLATE
Product Lifetimes And The Environment

Social Sustainability Approaches in Electronic Textiles Crafts Communities

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Abstract: This paper reports on results from the EU H2020 WEAR project, which between 2017-2019 has facilitated sustainable innovation processes in the field of smart textiles and wearable technology. 46 design-technology interdisciplinary projects and start-ups throughout Europe were selected through two Open Calls, and funded to develop creative solutions for a broad range of sustainability challenges within the relevant industries.
The paper outlines collaboration between two WEAR teams (KOBA, Touch Craft) as makers and facilitators and their audiences through crafts and practical making of electronic textiles artefacts. In particular, it reports how engagement with communities (as customers and/or co-creators) was used to increase social cohesion and well-being as social sustainability potential. Findings highlight the importance of quality of interaction, in particular, ongoing, in-person exchange, either between crafter and customer (KOBA) or facilitator and crafts community groups (Touch Craft). It further emerged that social cohesion could contribute to finding solutions to environmental and economic challenges, through encouraging local production, made-to-order production and local business development.

Introduction

Designers and artists are challenging the processes by which smart textiles and wearable technology are currently designed, manufactured and used. Following two decades of technology-centred research and development, bringing advancements in sensing and data processing capabilities, miniaturisation, efficiency and accuracy, wearables and smart textiles are now entering the market, and a growing concern about environmental and social impacts becomes a focus in public debate. Addressing some of these challenges, the project WEAR (Wearable technologists Engage with Artists for Responsible innovation), funded through the EU H2020 ICT-36-2016 programme, has between 2017 - 2019 facilitated sustainable innovation processes in the field of smart textiles and wearable technology. 46 design-technology interdisciplinary projects and start-ups were supported through a cascaded funding scheme, to develop creative solutions

to environmental, social and economical sustainability challenges. Successful applicants were supported over six months with research and development budget, a bespoke mentoring support package and marketing activities.
Alongside the support for individual projects, WEAR developed an enabling framework, by bringing together industrial companies, SMEs, start-ups, actors of electronic textiles and wearable tech communities, designers, makers, local organisations and potential customers - leading to raising awareness and cross-sector open innovation for more sustainable processes in the relevant industries.
While results of the overall project and its outcomes (among them a Sustainability Strategy Toolkit) are addressed elsewhere (Baker et al., 2018; Bryan-Kinns et al., 2018), this paper reflects on socially sustainable practice explored through crafts and critical making, as addressed by two funded projects:

1. KOBA - a tailor shop for electronic textiles and wearable technologies in Berlin / Germany;
2. Touch Craft - a social enterprise for local community engagement and economic development in Penryn, Cornwall / UK.

Background

There is a strong interest and tradition in socially enriching practice through crafts in both academic and making communities related to electronic textiles (e-textiles), bringing together traditions of critical textile crafts (as practised in several impactful design and crafts schools, e.g. Bauhaus or Arts and Crafts movement), with the more recent development of Open Source and Open Hardware advocated in global maker communities.

Different concepts of crafts involving electronic textiles are reported in the open literature. Kettley (2010) describes crafts as a form of critical engagement, enriching crafters (and other beneficiaries) by producing "tangible computational products that seek to be metaphorically meaningful as well as useful".
Others promote crafts cultures and individual practices from specific regions, to provide meaning and new business opportunities for local communities (e.g. Tharakan, 2011). Others again utilise crafts as a means to advance engineering research, and develop innovative prototypes (e.g. Waldhör et al., 2017), while a fourth area of interest focuses on poetic storytelling and making use of crafts to create artistic artefacts (e.g. Sandra de Berducci [1]; Kurbak, 2018). Based on this distinction, we propose to classify the role of crafts in contemporary e-textile practice as follows:

1. *Application-based development for product innovation:* Crafts in this category can be understood as a handmade precursor of an industrially manufactured product. Crafters regularly use ready-made prototyping platforms (e.g. Arduino), however in the view of optimising the later product with regard to specific and robust functionality, energy consumption, washability and comfort.
2. *Crafts as meaningful making:* This category is interested in using crafts as an educational and storytelling method, to engage specific

communities and facilitate social enrichment. E-textiles are not produced with commercialisation in mind, but aim to enable inclusiveness and participation in technology development or within specific disengaged or disadvantaged groups or individuals.

3. *Artistic use of e-textiles for performance and conceptual fashion:* This category of makers is mostly concerned with the expression of hypothetical concepts and critical aesthetics.

Works in this category are less interested in reproducibility, or technical advancement as such, but focus on exploring underlying larger topics such as "sense reframing" (Schwartzman, 2011), body and consciousness, or artificial intelligence.

Social sustainability in e-textile crafts communities

The second and third categories outlined above can be tied to the current discussion on social sustainability in relation to design and craft (e.g. see Mazé, Gregory, & Redström, 2011; McMahon & Bhamra, 2015; Woodcraft, Hackett, & Caistor-Arendar, 2011), which forms an important ingredient in the contextualisation and setting of e-textile craft. Social sustainability is often addressed relating to two different goals[2]:

1. Social cohesion: increasing participation in social activities by individuals; helping to develop a sense of belonging; building links within the broader community; encouraging to contribute towards the community or provide support for others.
2. Quality of Life: increasing mental health outcomes; supporting education, training and skill development; providing access to community amenities and facilities.

To illustrate how these have been addressed by WEAR teams, we introduce two examples of supported projects in the next section.

WEAR Projects

Project 1: KOBA
KOBA defines itself as an "electronic textile tailor shop where anybody can place an order

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[1] https://www.sandradeberduccy.com

for custom-made wearable technology garments and accessories". It was run by artist collective KOBAKANT from January 2018 until February 2019, consisting of media artists and designers Hannah Perner-Wilson and Mika Satomi. The duo is widely known in the e-textile design community for the online knowledge platform "How to get what you want"[3], through which they freely publish materials resources, processes and codes.

Their focus is on textile and electronic Do-It-Yourself (DIY) practice. Commercial product development is not stated as a concern. Instead, they describe the KOBA shop as an artistic and public experiment, and "a story we are telling"[4]. While the audience around their previous work were mostly like-minded makers, designers, crafters and artists, the intention of the shop was to reach out to the general public and allow curious members of the public to discover the possibilities of e-textiles and wearables, and reassess the current production and use patterns of technology.

Original goals of KOBA proposal

KOBAKANT describes their original intention as creating "an electronic textile tailor shop where anybody can place an order for custom-made wearable technology garments and accessories." The proposal addressed social sustainability goals as follows:

- *Accessible/Democratic/Diverse:* Services to the general public, and keeping cost low to invite diverse customers;
- *Maintaining Diversity*: What, how and for who is technology made;
- *Made-to-order* service: May increase personal investment by customers, thereby more meaningful products;
- *Transparency:* Make processes and labour behind production visible;
- *Data/Privacy:* Developing non-exploitative technology solutions;
- *Open Design:* All works published as open-source hardware;
- *Education:* Customers will be instructed to be able to repair, recycle, and reuse parts of their products.

[3] https://www.kobakant.at/DIY/
[4] https://www.kobakant.at/KOBA/concept-revisited/

Reflecting on Activities

Upon setting up and opening KOBA after a preparation period of four months, KOBA curated a full programme of activities to run in parallel with the day-to-day business of the shop. These included:

- Commissions
- Shoptalks
- Exhibitions
- Commissioning essays / texts by mentors
- Ongoing critical reviewing of their shop concept

At the end of the six-month WEAR funding period, KOBA had established itself as a critical project and a place for outreach and community engagement. Audiences included the international e-textile community, and new members from adjacent local artists and technological fields. 14 commissions were completed, and several series of public events and exhibitions were curated and frequented by between 10 and 100 visitors per event.

Reflecting on their original intention of inviting the general public to the shop, the team felt KOBA had less of an impact in the neighbourhood than hoped. This was mainly due to the limited time the shop existed. They also noted that people already working in creative or digital industries were "feeling much more comfortable to come in". The high quality of interaction with customers however was pointed out as a positive outcome, rating the possibility of meeting in person highly in terms of importance. A strong common interest either in e-textiles or the shop itself was also identified as a beneficial starting point for customer relations. This quality of interaction extended into the commissions and the produced garments themselves, as they allowed both KOBAKANT and customers to get to know each other, learn and exchange personal stories, and in some cases "to become friends". This also had an impact on the produced garments themselves, which became meaningful to the wearer through sharing of stories with the KOBA team. According to Satomi, the environmental aspects of the work could not be assessed directly due to the lack of clear guidelines. The made-to-order process indicates however that tailored garments with embedded technology may require a slow production comparable to conventional tailored items, resulting in more meaningful products that need fewer replacements, and encourage care and repair.

Additional events around the commissions further contributed to social cohesion between the various audiences. A final exhibition and event provided the opportunity to showcase KOBA's process and results in multiple formats; from written stories to live-performed ones, the produced garments, verbal presentations, as well as the exhibition of the KOBA shop as such, including work-in-progress prototypes, textile and electronic samples, tools, sketches and models (see Fig. 1 and 2).

Figure 1 and 2. KOBA shop, final exhibition and performances.

Team 2: Touch Craft
Touch Craft defines itself as "a not-for-profit organisation that explores methods of embedding stories into textiles as a way to engage different audiences and contribute towards social cohesion and wellbeing." The project was co-founded by textile and interaction design researcher Lucie Hernandez, and developer Edwin Love. The team uses e-textiles to design innovative soft technology products together with local crafters, and facilitate workshops, encouraging participants to utilise the multi-sensory capabilities of e-textiles (visual, tactile) and electronics (sound, visual, tactile) for storytelling. Their approach is grounded in co-

creation and participatory design[5] (Hernandez, 2017).

Original goals of Touch Craft proposal
Touch Crafts' proposal responded to the Social and Workplace Ethics theme set by WEAR as follows:
• *Active involvement of people:* Embedding technology in communities' interests through crafts
• *Advocacy:* Advocate for community requirements and personalise functionality
• *Business models*: Create security and future resilience for the groups activities through reinvestment from profits

They further responded to the 'Environmental Sourcing and Life-cycle theme', providing clear links to the aforementioned social sustainability goals. These included:
• *Circular design*: Community determines best practices for reuse and repair
• *Design for attachment:* Develop a relationship with products, reducing replacement
• *Maintenance training:* Actively involving beneficiaries in repair activities.

Reflecting Activities
Touch Craft initiated two strands of work during the six-month WEAR funding period. One part aimed towards prototyping commercial e-textile interior products. The second was a series of community workshops (see Fig. 3 and 4), which however also explored the concept of market value of "team-initiated" e-textile products. Small batches of the two prototypes *Story Blanket* and *Sensory Cushions (see Fig. 4 and 5)* were fabricated and tested.
The value of community crafting for health and well-being of the participants emerged as the main benefit of the project. Hernandez observed that multi-sensory engagement with the crafted object "enabled people to engage on a deep level" and express and communicate personal stories through materials and local nature-related themes. Hernandez mentions that e-textiles have not yet been around long enough to assess if crafted objects can embody similar meaning to people as traditionally crafted artefacts do, however points out that the process was

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[5] see Sanders & Stappers, 2008

similar: using personal storytelling, defining a purpose and the addressee of the object. Participants reflected positively on collaboration, multi-sensory materials and meaning to personal memory. One participant describes their experience on collaboration as, "I was interested in the combination of sound and touch and feel, so the whole kind of concept behind the project". Another participant reflects, "I love working like this, and especially working with these embroidery silks, it takes me right back, granny showing me how to split the threads."

Figure 3. and 4. Touch Craft workshop and examples of work from workshop.

Figure 5. Touch Craft product development.

Identifying the communities both as "participants and producers", Touch Craft sees the benefits on "small-scale processes, slow, local production", "nurturing an emphasis on slowness, valuing present time, re-skilling through shared knowledge, learning and co-creation". They frame this as "durable practices" (see also Chapman, 2009) and observed that "through the act of cooperating and participating directly, people increase in confidence and develop their creativity and imagination." The aim is to encourage also business activities by producing and selling team-initiated e-textile products. By the end of the WEAR funding period, the prototypes were tested by the participants in their homes.

Discussion

The work undertaken by the teams above highlights that social sustainability aspects of knowledge transparency, open sharing, free education (or at least included in a service) are important to the e-textile communities who originated from a crafts background. Furthermore, these are linked to other sustainability goals through local production, made-to-measure and local business development.

Although KOBA was not intended as a for-profit business, by critically reviewing business practices it may inform how small-scale crafts businesses could use new ways of engaging with local specialist communities to create niche markets for profit. It additionally highlighted how merging different modes of operation could lead to innovative online/offline crafts and technology businesses models.

Touch Craft's clear goals and reflective rigour have helped in evaluating co-creation values resulting from a participatory design process. They point out the requirement for continuous exchange between communities and facilitators, however are not yet sufficiently progressed in their development to evaluate if sustainable business will be possible. This, however, highlights the shortcomings of funding schemes like WEAR, which only provide limited support for short periods of time. A more sustainable "slow business" approach may be needed, including the access to follow-on funding.

Both teams described how the quality of interaction between themselves and their customers/participants brought a benefit to their projects, which could in retrospect be described as a process of increasing social cohesion in their respective communities. For KOBA this was especially relevant for their commission work, during which the customer

and the artists shared the stories related to the commission (why the customer wanted it and what functional and poetic value it would carry), artistic objective (KOBA bespoke technology: what do people want), social sustainability requirements (e.g. open sharing of plans, transparency of making) and technical plans. KOBA challenges current business models prevalent in the electronics industries by allocating significant time and resources for one-off and bespoke commissions, allowing them to build e-textile wearables meaningful to their customers, and publishing detailed information about the process online - all this while operating out a physical, high-street store. The team however repeatedly stated that they had to start with unrealistically low prices to draw in customers, and their "real income" was earned through parallel teaching activities.

The participatory design approach used by Touch Craft allowed them to adjust the goals of their work. Improving quality of life of the workshop participants emerged as a benefit, however the team mentions that the strict timeline of the WEAR funded period was not beneficial for the exploration of slowness as an approach, and further funding will be required.

Reviewing the classification of using crafts in e-textiles, it becomes clear that both teams utilised a combination of these, with an emphasis on *Crafts as meaningful making.* While in the short period of receiving funding through the WEAR scheme it was not possible to explore all aspects of sustainability, benefits emerged from increasing quality of participation, providing education and skill development and transparency of processes and in exchange.

Summary

This paper reported of social sustainability approaches of two teams funded through the WEAR scheme. They addressed social cohesion and quality of life challenges, which are two distinct principles of social sustainability[6].

KOBA utilised a combination of outreach, community engagement and communications to build links between known and new individuals. For KOBA the open sharing of

information related to their processes was key, and the WEAR funding was used to test this within an experimental, yet traditional-style tailor shop scenario. By freely publishing all information related to commission, they also contribute to education, training and skill development for individuals who previously have not had participated in e-textile practice. It was however noted that maintaining a for-profit a shop as livelihood would not be possible due to high costs and current low demand.

Touch Craft used an iterative process of engagement with local crafts communities, increasing both social cohesion and quality of life for participants. Continuous exchange over longer periods of time was rated as highly important, allowing the community to build trust and confidence. Touch Craft has taken the first steps towards setting up a social enterprise, using e-textiles and crafts activities to both engage and enrich communities, and (at a later stage) generate income from group-initiated e-textile products.

One way to strengthen crafts-based enterprises, combining co-creation, educational and commission work may be through schemes like WEAR, to support local activities while also facilitating sufficient exchange and outreach through a European-wide network of crafts communities, customers and makers online. However it is clear that support over a longer time would be required to turn socially sustainable and crafts-based enterprises in the area of e-textiles and wearables into self-maintaining businesses. There is a need for more crafts/technology-business development schemes, which allows the crafter to test and implement "slow business" approaches, bringing together traditional crafts development with online and offline outreach and knowledge sharing activities that lead to sustainable community development.

Acknowledgments

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[6] these principles can be found in various Sustainable Development Goals (e.g. SDG 3, 4, 9)

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