The textile designer 2.0: A workshop guide for future workshop facilitators in smart textiles

S. Walker¹ & A. Piper²

1. A. Nottingham Trent University
2. B. Nottingham Trent University

This item was submitted to the proceedings of the Loughborough University Textile Design Research Group INTERSECTIONS Conference 2017 by the/an author (Leave Blank for Blind Copy).


Additional Information:

Publisher: Loughborough University (© The Authors)

Rights: This work is made available according to the conditions of the Creative Commons Attribution 4.0 International (CC BY-NC 4.0) licence. Full details of this licence are available at: https://creativecommons.org/licenses/by-nc/4.0/

PLEASE CITE THE PUBLISHED VERSION.
This paper reports upon an interdisciplinary workshop called ‘Designing with eTextiles’ led by a team of facilitators with backgrounds in woven and multimedia textile design, and textile engineering. The aim of the workshop was to support participants in multidisciplinary groups to develop smart textile concepts using electronic textiles (eTextiles). The paper discusses the roles of the facilitators, the workshop delivery including the hands-on activities designed to stimulate co-design thinking. The workshop outcomes illustrate the different results created from the workshop groups and their future applications. The reflections on behalf of the two textile design facilitators are analysed to discuss the transition from practitioner to facilitator. Final recommendations for future workshops suggest the need for facilitators to become co-researchers to support interdisciplinary design approaches to envisaging future possibilities of eTextiles within the market sectors of fashion, interiors architecture and healthcare.

**Keywords:** interdisciplinary; textile designer; innovation; eTextiles; co-design

**Introduction**

The ‘Designing with eTextiles’ workshop held in February 2015 invited delegates of the Network conference ArchTex to participate in advancing methodologies for design research in eTextiles at Nottingham Trent University. The EPSRC funded project ‘An Internet of Soft Things’ (IoSoft) played a pivotal role in organising the conference and enabling workshops of this kind to take place and the opportunity to collaborate with other research groups such as the Advanced Textiles Research Group (ATRG). The collaboration with the ATRG provided a context for the workshop participants to envisage future possibilities and applications of the Advanced Textiles Research Group’s technologies. These technologies included electronically functional yarn, thermistor reactive yarn and electronically heated textiles (Cork et al., 2013 and Lugoda et al., 2015). The workshop focused on design and creativity with the role of the ATRG technologies providing a context for participants to understand methodological implications to design and engineering. The role of the facilitators in the workshop organised a program of activities over 3 days to stimulate discussion and making with eTextiles. The activities included experimenting with hands on electronic components from locally based manufacturer of electronic sewable textiles: Kitronik. The team of facilitators organised group discussions to reflect on multidisciplinary practice and an opportunity to share results and outcomes of the workshop via an exhibition. The brief for the workshop participants included a focus on an area of application to contextualise a conceptual prototype. The brief also advised participants to think broadly beyond these categories in search of new undisclosed markets within the eTextiles domain. A panel of reviewers joined at the end of the 3-day event to deliver feedback and suggestions on the collaborations. This panel involved members from the ATRG group, students and a textile design lecturer.

**Co-design in eTextiles**

The workshop facilitators were particularly keen to facilitate collaboration amongst a diverse group of individuals. According to recent research in eTextile practice (Baille et al., 2012 and Glazzard et al., 2015), support towards the development of co-design relationships was key to enabling creativity and innovation to unfold between people from varied roles and backgrounds. Ariyatum et al., 2004 suggested that in new product development (NPD) stages in smart textiles clothing development, practitioners often struggle to understand new types of practice that is vastly different to their own thus leading to complications in communication. The key to the success of smart textiles is therefore collaboration. Interdisciplinary knowledge in the domain of eTextiles is now required if it is to become a leading market in the future. From a research practice perspective, the emergence of new methodological practices in eTextiles have enabled an insight into constraints and opportunities (Kettley et al., 2010 and Briggs et al., 2016). In organisational and strategic management, the shift in economic practice towards sustainable models for driving triple bottom line incentives and pushing service over product-centric logic provides an investment
for the eTextiles sector to consider when it comes to adapting to changing consumer behaviours and new technologically innovative products and service systems (Gardien et al., 2013 and Webster, 2013).

Co-design practice has suggested in recent years that making, doing, enacting and telling are important forms of practice-led research that emphasise on the opportunities of design (Fischer, 1998; Stappers et al., 2005; Steen et al., 2007). Sanders’ prolific work with co-design opened opportunities for cross-disciplinary practice to inform new tools and methods in the shape of a convivial toolbox (Sanders and Stappers, 2012). The facilitators in the workshop belonged to different backgrounds of design and science. One common factor shared was the influence of hands-on engagement with materials and tools. Hands on engagement with materials and processes in practice-led and design research is a means of forming, conceptuallising and externalising ideas (Philpott, 2012; Taylor and Townsend 2014; Piper and Townsend 2016). Writing, drawing and manipulating can, in themselves, induce or extend ideas and developments, it is “not part of action; it is part of thought” (Clarke and Chalmers, 1998:10). Similarly, moving away from ones’ own specialism by drawing from methods and techniques from other disciplines facilitates problem-solving, conceptual thinking and innovation by challenging established ways of thinking and working (Lehmann 2012; Abbot 2004).

The facilitators of this workshop were keen to apply the above theories to design a workshop that would enable co-design thinking and hands on engagement. Conditions for mutual learning drawn from the workshops led by Baille et al., 2012 and Glazzard et al., 2015 with eTextiles informed a methodology that would empower individual growth and ethical relationships. Evidently in the field of eTextiles is the need for collaboration and multidisciplinary knowledge (Kirstein, 2013 and Pailles-Friedman, 2016), future focus on the management of design, innovation and creativity is of importance for sustaining the discipline and the interdisciplinary knowledge that emerges from eTextile practice. Von Stamm’s (2008) argument for sustaining collaboration is through incentivising the need for developing ‘real teams’ in organisations. A problem however encountered is the misuse of knowledge available in teams that lead to emotional and psychological barriers from the lack of value proposition made clear (Ten Bhomer et al., 2013 and Walker et al., 2015). The facilitators’ desire in the workshop to innovate with a co-design methodology introduces the possibility of new tools and methods to address problems encountered in collaboration. Moreover, the specific characteristics of the roles of the facilitators made transparent to audiences in the design management field will likely provide future direction and improve prospects of productivity.

**Workshop Facilitation and Delivery**

The workshop delivered by two textile designers and two textile engineers specialised in textile design (Anna Piper and Sarah Walker) and electronic engineering (Ekael Mbise and Pasindu Lugoda) (Figure 1) Specialist knowledge from the facilitators informed the design of the workshop activities including concept and prototype development, textile techniques and materials and reflective practice. The textile engineers provided advanced specialist knowledge of technical and electronic textiles to support circuitry problems and to provide insight into future possibilities such as medical electronics, bluetooth connectivity and programming.
The facilitators acknowledged that the participants might be new to the experience of designing with e-textiles and to collaboration. The participants attending the workshop as well came from a number of different backgrounds and specialisms. The facilitators used this knowledge in the construction of the workshop plan and drew from their own specialisms to facilitate an environment that offer people the opportunities to merge skills, particularly technical taught skills and experiential knowledge derived from hands-on engagement with materials and processes (Polyani, 1966 and Lehman, 2012). As shown in the workshop program (Figure 2), the activities led by different members of the facilitator team incorporated a range of discussion-based and hands-on activities.
A brief given to the workshop participants included a pack of information about the workshop including aims and objectives, the scheduled program and backgrounds of the facilitators (Figure 3). The aims of the workshop were:

- To develop design concepts demonstrating potential applications for the technologies being developed at NTU.
- To explore what changes in approach to design (decision-making and thinking) are required when working with smart technologies.
- To consider how a multi-disciplinary approach can help to integrate smart technologies and design.
• To reflect on and suggest how multi-disciplinary approaches can be developed and facilitated.

### Brief

**Designing with Smart Textiles Workshop**

**Workshop Facilitators:** Anna Piper | Sarah Walker | Pasindu Lugoda | Ekael Mbise

**Overview**

In this interactive workshop you will work in multi-disciplinary groups to explore possible applications and the potential of the LED, RFID and Sensor Yarn technologies developed at NTU. Each group will be supported by a designer-maker and an advanced textiles specialist, to develop their design concept. Concepts will be presented and exhibited in a visual format at the conference exhibition on Wednesday 25th February.

Throughout the workshop we will explore current applications of available technologies, the future potential of smart textiles, as well as the barriers to successful integration of smart technologies and design. Each group will record their experiences, consider the impact of working with smart technologies on design thinking and how a multi-disciplinary approach can facilitate successful and innovative integration of design and smart technologies.

**Aims**

- To develop design concepts demonstrating potential applications for the technologies being developed at NTU.
- To explore what changes in approach to design (decision making and thinking) are required when working with smart technologies.
- To consider how a multi-disciplinary approach can help to integrate smart technologies and design.
- To reflect on and suggest how multi-disciplinary approaches can be developed and facilitated.

**Concept Development**

- Select one of the following smart textile technologies: LED Yarn | RFID | Thermistor Temperature Sensors | Textile Heating Elements | Sensor Yarn
- Develop a design concept to utilise and develop the technology for application in one of the following areas: Fashion | Medical | Health & Wellbeing | Sport & Lifestyle | Home | Sustainability | Retail
- Present your concept in a visual format of your choice. This may include: Concept & Presentation Boards | Prototypes | Samples | Film | Posters | Animation
- Record your concept development process and reflect on the impact of working with smart technologies on the design process (e.g. on design thinking, problem-solving, decision making).
- Present (alongside your design concept) the group’s findings and ideas about the following:
  - The impact of working with smart technologies on the design process.
  - How a multi-disciplinary approach can help to successfully integrate smart technologies and design.
  - How multi-disciplinary approaches can be developed and facilitated.

---

**Figure 3. TDRG – Workshop Brief**

Source: TDRG – Anna Piper

---

**Workshop Participants**

The ‘Designing with eTextiles’ workshop attracted participants from a number of fields. The group consisted of textile designers, fashion designers, product designers and a chemical engineer, who were at varying stages in their careers – from students to academic researchers, practitioners and lecturers. They had different levels of experience of working with both textiles and smart technologies. The
multidisciplinary nature of the group resulted in the development of distinct ways of working and outcomes to address the workshop brief, and raised questions concerning the integration of multiple design thinking approaches and opportunities to facilitate cross-disciplinary working.

Workshop Layout and Resources
The layout of the space was organised by the facilitators prior to the event and included workspaces for making and developing prototypes, tables of resources for both participants and facilitators, pin boards and presentation equipment (Figure 4).

![Figure 4. TDRG – Workshop Layout](source: TDRG – Sarah Walker)

Materials and equipment for the workshop included:

- Electronic textile components
- Sewing and embroidery materials
- Fashion mannequins
- Textile fabrics
- Textile samples and sketchbooks from the facilitators
- Research posters and concept mood boards
- Fashionable technology books
The provisions of the materials, equipment and space given to the participants offered a mix of specialist tools to assist in co-design development (Figure 5). The facilitators found it beneficial to provide examples from their own work to relate to any concept theory development emerging from the group discussions.

Data Collection and Analysis
Data gathered from the workshop included primarily consisted of taking photographs of participants working in the spaces with tools and equipment (Figure 6.). A visit to the Advanced Textiles Research lab had also provided another opportunity to gather evidence. The facilitators also gathered observations of the participants working as well as informal feedback on a day-to-day basis via notetaking and through the round-up group discussion activity scheduled at the end of each workshop day. At the end of the third and final day, a formal presentation of outcomes by the participants in their multidisciplinary groups asked them to comment on their personal experiences, learning and development as well as provide feedback on the structure and facilitation of the event. This feedback contributed to the analysis of workshop outcomes and provided valuable insights into group dynamics, and participant and facilitator roles.

Making with eTextiles
Led by Sarah Walker (a specialist working with eTextiles), the ‘eTextiles’ workshop introduced participants and (co)facilitators to basic eTextile circuits and soft switches. Those that were familiar with textile processes were able to assist their less experienced teammates with ‘stitching-out’ their circuits, whilst the textile engineers provided knowledge of electronics and circuits. Together they were able to work creatively to explore techniques, solve-problems and develop samples (Figure 7 and Figure 8).

The experience of undertaking hands-on making gave the group a shared understanding; discussions relating to the development of concepts facilitated through the making experience, not only through the hands-on engagement with materials, but also by giving them a common language and experience through which to express and communicate their ideas. Differing levels of skill and knowledge across the group
resulted in a collective questioning of materials, technologies and possibilities, and fostered a supportive sharing environment whilst challenging individual and group skills and understanding.

Textile designers found that engagement with process and technologies raised questions about what the materials could do, leading to further group discussion and material experimentation. This allowed the textile designers to consider and form ideas of what they might want the technology to do, providing the textile engineers with new challenges and opportunities to enhance the functionality and usability of technologies. Meanwhile, the non-textile specialists brought knowledge and experience of their own disciplines, offering different perspectives and a questioning approach to working with textiles and technologies. They were not constrained by pre-conceived limitations of textile processes. The non-textile specialists instead applied their established approaches (thinking and methods) to finding a common ground as to how to work with textiles. The development of new skills allowed them to ask simple but fundamental questions about textile processes (why? how? what if?), questions that the other textile and product designers may have overlooked due to their established experience.

Workshop Outcomes
The aim of the workshop was to explore current applications of available technologies and to develop a future concept with eTextiles. The brief also insisted that reflection on the process of integrating technologies was required so that new interdisciplinary methodologies emerged. Technologies from the Advanced Textiles Research Group provided workshop participants in their groups to reflect on the potentials and barriers of integrating technology into textile materials. The participants had to choose whether to develop a future concept for a fashion, medical, health and wellbeing, sports and lifestyle, home, sustainability or retail application. Each group recorded their concept development process and presented the outcome using a presentation format to convey their individual group concepts. A panel of eTextile specialists, students and a textile design lecturer and embroidered specialist came to offer feedback to the teams on their concepts.

**Concept Team #1 - Luz Illuminating Snood:** the team consisted of a textile designer, fashion designer, chemical engineer, weaver and product designer. The team adopted a problem centred approach responding to existing research in the field of mental health as the basis for their concept development. Significant discussion undertaken by the team establish how light is used within a garment prototype to
provide ‘light therapy’. The team identified beneficiaries of the prototype to those who suffer from mental health problems with possibly dementia or depression. Focuses of the group considered usability by the wearer for maximum comfort and benefit (Figure 9).

The team’s design process was structured, organised and controlled with each member being designated specific roles and responsibilities that drew upon their existing strengths and skills. This, demonstrated in the group’s concept presentation, included branding and a logo to communicate their concept. A PowerPoint presentation supported the communication of their concept development and a prototype provided a demonstration to the rest of the workshop participants and panellists.

The diversity of the group led to misinterpretation and misunderstanding of language and terminology, specifically in relation to the term ‘structure’ and the scale on which structures are envisaged and applied in different fields (particularly between the weaver and the chemical engineer in the group). However, this misinterpretation provided a platform for further discussion and the generation of ideas within the group, as well as allowing the group to develop a shared language and understanding. The concept itself had a specific application but several iterations of the design informed the team’s unique aspects of their concept and prototype.

Figure 9. TDRG - Concept Team #1 - Luz Illuminating Snood
Source: TDRG – Anna Piper
**Concept Team #2 - Heated Bathtub:** all team members were from design backgrounds (either textiles or product design). The concept built upon specifically the heated textiles technology developed by Ekael Mbise from the Advanced Textiles Research Group (NTU). The approach to the design concept developed on being haptic-led; responding to and engaging directly with the technology and its visual and haptic properties, to inspire design ideas and concepts (Figure 10).

The team’s creative and expansive thinking resulted in the development of an ambitious, playful and conceptual design idea. This group did not feel constrained by the technology and approached the process by being more open to questions such as ‘what if this was possible? As of result of this conceptual thinking, a number of alternative and viable applications identified many possible directions. For the presentation, this concept used mood boards and visual imagery, sketches and small tactile samples to communicate. The team had also made a prop to assist in its conceptualisation and tactile behaviour.

![Figure 10. TDRG - Concept Team #2 – Heated Bathtub](image)

Source: TDRG – Anna Piper
Both groups adopted varying approaches and design methodologies to the development of their concepts, with one inspired by a “real-world” problem and the other responding directly to the available technology. Both approaches resulted in the development of innovative concepts with viable and useful applications. The backgrounds of each individual team member were instrumental in terms of developing ideas, development and progress, prototyping, and concept visualisation. The group from a predominantly design background responded to and questioned the potential of the technology and material, using this as a platform for development. Whereas, the group with more varied backgrounds responded to a specific problem and to each other – questioning, misinterpreting and responding to ideas and discussion, to explore and subsequently refine their concept.

**Key Themes**

Through group discussion, observation and the development of the ‘Luz: Illuminating Snood’ and the ‘Heated Bathtub’ Concept a number of key themes, relating to design thinking, ways of working and cross-disciplinary practices when designing with smart technologies, became apparent (Table 1). Additionally, the two approaches adopted by the groups and the identified themes (above) have raised interesting questions about how different methodologies and approaches can be combined, integrated and encouraged through workshop facilitation to develop new approaches and innovative solutions for working with eTextiles. Moreover, the integrative approaches had also informed viable and design-led solutions for “real-world” problems. A future question and future development of smart technologies and products: How can creative expansive thinking be encouraged and facilitated as part of a cross-disciplinary design methodology? Should problem-centred and expansive creative thinking be integrated in a single design process, or is each approach suited to a achieving a specific type of outcome? Should a shared language be actively encouraged, or can miscommunication/ misunderstanding lead to creative and innovative thinking, and new perspectives? These questions have informed the development of a ‘toolkit’ for textile design facilitators of smart textile workshops that enlists reflexive criteria and utilise textile design skills and practices to support innovations in design processes for smart textiles applicable to a range of applications, including fashion, interiors, architecture and healthcare.

<table>
<thead>
<tr>
<th>Table 1. Key Themes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Key themes</strong></td>
</tr>
<tr>
<td>Problem-centred design thinking</td>
</tr>
<tr>
<td>Haptic-led design</td>
</tr>
<tr>
<td>Expansive creative thinking</td>
</tr>
<tr>
<td>Shared language(s)</td>
</tr>
</tbody>
</table>
Facilitator Reflections
The dominant challenge for the facilitators was the management of expectations and varying skill and knowledge levels within the group while new practice was developing. Although the prospect for innovation was high, it became evident that the facilitators had to contend with not just the expectations of the workshop participants but also of themselves being practitioners with specialist knowledge. The condition to let go of any existing role for the facilitators was a challenge. Flexibility of the role of the facilitator enabled this shift from practitioner to facilitator. This flexibility in attitude towards the participants enabled them to take control of their individual self-learning processes, find voice within the group and contribute with skills and knowledge to increase productivity and innovation.

In some activities, facilitators were themselves supported by participants. Individual vulnerabilities due to the distinct variation of practice exposed knowledge in need of guidance. Transparency however of sharing this vulnerability did lead to a co-researcher relationship forming with participants. One facilitator found by revealing her inexperience of handling eTextile components meant that as part of the activity introducing circuits and sewing that she could benefit and learn from the process. This is a particular interesting observation since perceptions prior to the workshop from the facilitators believed that they would be positioned as more experts as opposed to becoming learners. This indication of blurred boundaries and roles (Jacobs, 2007 and Kientz and Abowd, 2008) informed notions of identity and situated learner experienced in communities of practice (Lave and Wenger, 1991; Tovey et al., 2005 and Downes, 2008).

Future Guidelines
Subject to the challenges experienced as a facilitator, the self-reflection of this role identified transitional elements. The co-design methodology informed three pivotal stages as seen in Figure 11 to becoming a co-researcher. The facilitators have been able to inform a number of guidelines that subsequently have potential for becoming a basis for a toolkit. Those guidelines derived from the study include:

- Expect that in the role of a facilitator skills and knowledge as a practitioner is required to facilitate co-design with eTextile teams.

---

© 2017 The Authors. Published by Loughborough University. This is an open access article under the CC BY-NC license (https://creativecommons.org/licenses/by-nc/4.0/).
• This role is likely to shift both between being a practitioner with a focus on hands on making with participants into a facilitator that guides occasionally and gives direction to becoming a co-researcher as part of a team.
• Empathising with participant vulnerabilities by sharing your own experiences is encouraged in co-design projects to ensure that people feel safe and secure with the knowledge they apply.
• Congruence is a cognitive tool to maintain equal status amongst diverse groups of people. Facilitators are to ensure that maintaining this as a condition is vital for productivity and innovation.
• The use of tools and materials from different practices are essential to finding common interest amongst people in teams – this is to be accessible to people in teams where possible.
• Where possible extend activities beyond the workshop boundaries and include activities that place participants within a different culture or context e.g. this could be within a research lab such as the Advanced Textiles Research Group.

Conclusions
The guidelines are contextually specific but have the potential to be cross-discipline. There is also further scope to design tangible tools to transfer knowledge from a co-design methodology. Both the two textile design facilitators, respectively within their own research projects appreciate that there is future development and may continue as part of their individual studies to contribute to themes of sustainability and practice. The two textile engineers continue to focus on the next generation of electronic textiles and on providing platforms for design researchers to envisage future possibilities and applications. This paper reports on a 3-day workshop focused on designing with eTextiles. The collaborators of this workshop included two textile designers and two textile engineers from the Advanced Textiles Research Group at Nottingham Trent University. Participants from the workshop came from different specialisms within design and engineering science including textiles, product design and interaction design as well as chemical engineering. Professions and existing roles included students, lecturers, professors and independent companies specialised in eTextile craft. The workshop program aimed to support multidisciplinary teams in co-designing an eTextile concept. Materials and tools provided in the workshop assisted the hands-on making of eTextiles and the two workshop outcomes delivered by the participants in their multidisciplinary teams. Change in role was necessary for the facilitators between practitioner and facilitator and conditions of empathy supported the development of co-researcher relationships. A significant finding revealed the importance of the facilitators becoming learners during the workshop to find equal congruent status and identity with the participants. Conviviality of tools used in practice informed a number of guidelines that are cross-discipline. Facilitators of the workshop identify that accessibility to the guidelines could result in a toolkit made to offer beneficiaries in either leadership, organisational or managerial roles to appreciate the full impact of the use of guidelines and interdisciplinary methods in eTextiles.

Acknowledgements
The authors would like to extend thanks to the workshop participants, the panellists who attended the workshop presentations, the Advanced Textiles Research Group (ATRG) and the ArcInTex Network. An extended gratitude is also required for the EPSRC funded project ‘An Internet of Soft Things’ (IoSoft) and the Vice-Chancellor PhD bursary award for supervision and funding support of PhD studies.

References


---

**Sarah Walker**

Sarah Walker is a PhD candidate, workshop facilitator and lecturer at Nottingham Trent University. Her PhD research focuses on design and innovation management for eTextiles using interdisciplinary methods based in anthropology, psychotherapy and design research.

**Anna Piper**

Anna Piper is a PhD candidate, workshop facilitator and lecturer in Textile Design at Nottingham Trent University. Her PhD study focuses on developing a 3D compositional weaving methodology using cross-disciplinary sustainable textile and fashion design methods.