# The T-Probe:

A fashion-led approach to advance understanding of novel and challenging material concepts and sensory experiences

## Volume One of Two

Ninela IVANOVA
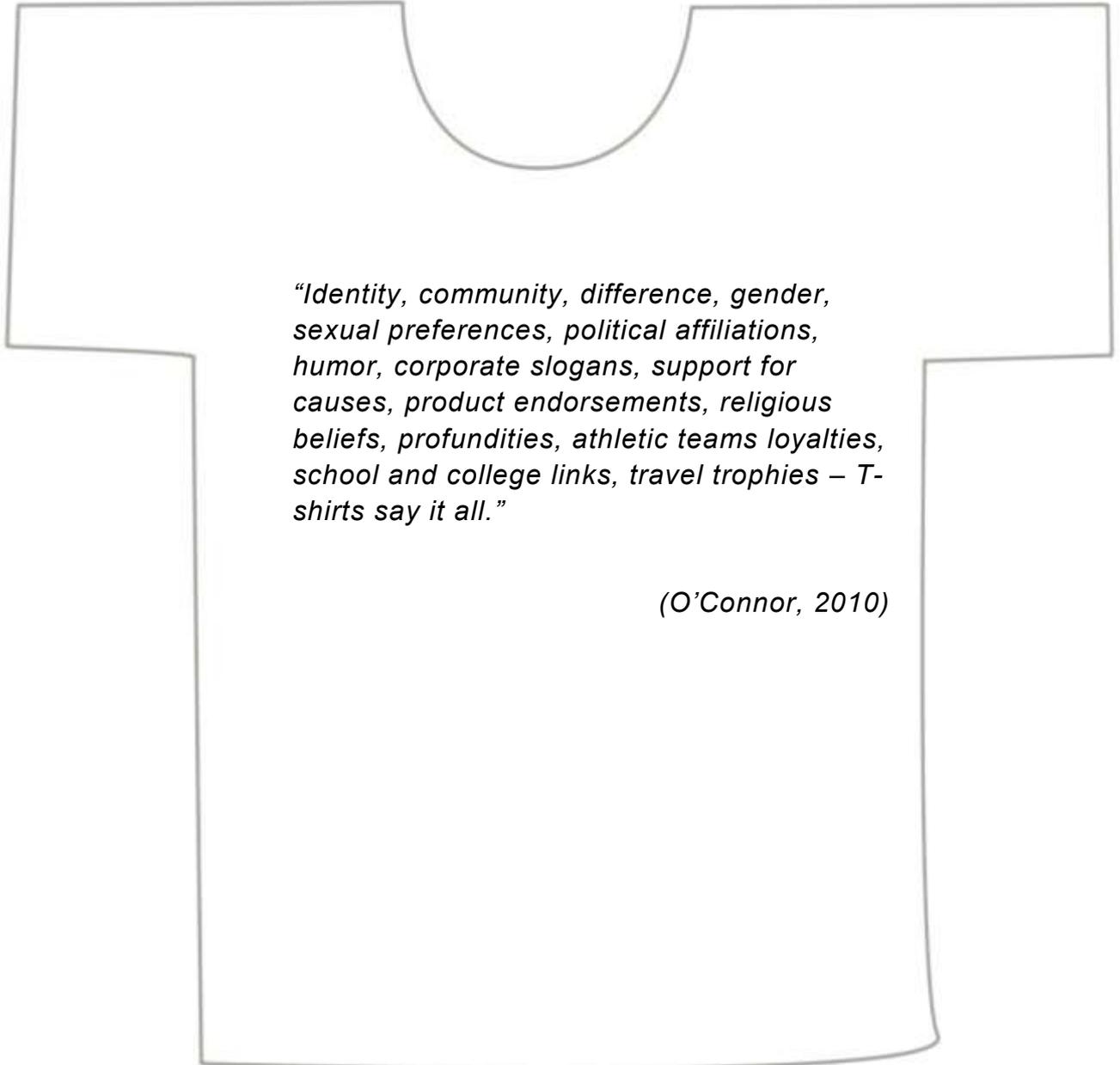
*"Identity, community, difference, gender, sexual preferences, political affiliations, humor, corporate slogans, support for causes, product endorsements, religious beliefs, profundities, athletic teams loyalties, school and college links, travel trophies – T-shirts say it all."*

*(O'Connor, 2010)*

# Abstract

The aim of this project was to pilot, assess and develop the globally worn everyday garment – the 'humble' T-shirt – as a wearable probe, defined in this research as the T-probe, to advance engagement with, and understanding of, challenging concepts relating to novel materials and sensory experiences.

In the course of addressing this primary aim the research expanded into a three-part enquiry reflecting the complexity of factors involved in introducing novel material concepts via a design probe, and attaining sensory experience and perception data via the two-pronged approach of observation and self-reported measures.

The value of the T-probe was thus explored via three separate but methodologically interlinked projects, selected based on common challenges associated with public perception and engagement:

**Project (I) Fungi materials for clothing:**
*Explores perception of mould as a novel material for garment design and fabrication.*

**Project (II) Fashion for deafblind people:**
*Studies how a fashion experience may be introduced to a sensitive user group, i.e. people with visual and auditory impairment.*

**Project (III) Synthetic ingredients for fine fragrance**:
*Engages consumer understanding of synthetic ingredients in perfumery*

Research Project (I) was a pilot study based on the researcher's personal design interest in the development and market introduction of novel bio-based materials.

Projects (II) and (III) were set up in partnerships with non-academic organisations: the charity for deafblind people *Sense* and the global company *International Flavors and Fragrances (IFF)* respectively, to further test the value of the T-probe in advancing understanding of materials and sensory experiences within contexts of social and / or market interest(s).

The findings of the research enquiry demonstrate that the T-shirt is well accepted and engaged with, and functions well as a probe in eliciting and enhancing participant sensory experience and perception of novel and challenging material concepts.

By following a systematic approach to the design and implementation of the T-probe from concept to actualisation, this doctoral research project contributes to an advanced understanding of issues related to the design and application of probes to fulfil specific research and design objectives within the various evolutionary stages of materials, products, technologies, and consumer experiences.

# Acknowledgements

This research project was a work of love and co-creation. It was a personal journey and a life-changing experience for the author, from being a fashion student to coming into the realisation through practice of what it is and what it takes to be a designer, researcher, and entrepreneur.

---

[1] The Arts & Humanities Research Council, available at: http://www.ahrc.ac.uk/

*International Flavors & Fragrances (IFF)* (Research Project (III))*.* The development of collaborative research projects that both fulfilled the aim of this research and satisfied the objectives of an external project partner, meant that the research and its methodology had resonance and implications outside the author's agenda, that continue to expand beyond the scope of the research.

Special *Thank You* to:

The communication guides form the Anne Wall Community Resource Centre[8] at *Sense,* who facilitated the communication between the researcher and participants, supported the participants in executing workshop activities, as well as ensuring their physical, emotional, and mental wellbeing for the duration of the study.

John Kirkham[9] for coordinating the research visits, assisting and advising on recruitment of deafblind research participants and support staff, and ensuring the project ran ethically, smoothly, and in a way that was non-intrusive to other community members and staff.

Ezzidin Alwan[10] for the invaluable photographic capture of the workshops for Research Projects (I) and (III), in a way that was professional, non-invasive to the research participants, and provided rich data for research analysis.

Joanna Norman[11] for assisting in the brokering of the *IFF* project.

Nick Gilbert[12] who kindly assisted in the hosting of the *Scented Tee* workshop (Research Project (III)), by providing a mini knowledge base session on the language and the finer points of handling fragrance.

George Newton[13] who created the visual identity for Research Project (III).  See further: www.thescentedtee.co.uk

---

[8] The Anne Wall Centre (currently TouchBase South East) is a day service that works with deafblind adults of all ages and individuals who have sensory impairments with additional learning and other associated disabilities (Sense, 2015).

[9] Activities Coordinator at the Anne Wall Community Resource Centre at *Sense*

[10] Web & Multimedia support at Kingston University London

[11] Enterprise consultant and lecturer at Kingston University London

[12] Fragrance consultant and writer at www.nickrgilbert.com

[13] Graphic designer at www.georgenewton.co.uk

The following scientists, who provided the knowledge base and practical guidance in the pursuit of a novel fungus-based material – a personal design undertaking of the researcher at the initial stage of the research process:

*To my mum, dad, and brother, thank you for the unconditional love, support and patience.*

*And Melanie Flory, there are no words…. For your love, generosity and kindness.  This thesis is dedicated to friendship.*

# List of Figures

# List of Tables

# Contents

Volume One of Two

Volume Two of Two. Appendices

Word count: 50 411

# 1.0   Background and Introduction

*This chapter provides the background to the research project.  By explaining its personal incentives and historical and contemporary contexts, it traces the formulation of the research questions, aims and objectives. In conclusion, the chapter outlines the thesis structure and introduces the three discrete research projects which comprise the practical research component of this doctoral dissertation.*

## 1.1   Personal background

The research project emerged as a result of the design practice and thinking that was being developed by the researcher whilst undertaking an MA Fashion course at Kingston University London (2010-2011).  At the time, the course offered a platform to challenge traditional notions of fashion and textiles fabrication, and propose concepts for future materials, garment design, and consumer experience, as the 2011 course handbook states:

> *"This newly established fashion program is aimed at dynamic designers with a thirst for fashion innovation. Its unique focus allows designers to question the role of the fashion designer and the body in the 21st century seeking out the new, and defining and devising new ways to design for a world we don't yet know." (Tilbury, 2011)*

Instead of producing collections as the traditional form of fashion narrative and presentation, the aim of the course was to encourage development of design processes and ideation beyond the historical scope of the fashion domain.  Interdisciplinary collaboration, environmental and social awareness were at the core of all project briefs.

Evolving themes from the students' work included novel materials, combining new technologies with traditional craft techniques, and the multi-sensory experience of wearing fashion (Tilbury, 2011).  Some of the more radical design outcomes of the course, including the author's design concept *Moulded Mind* (Figure 1.1-1 below), were exhibited collectively under the title *Body Laboratory* which denoted the hybrid, future-oriented nature of the practice (Tilbury, 2011).  However, the twelve-month timeframe of the course, although supporting the establishment of design concepts, had limited scope for further exploration of their applications and implications.



Figure 1.1-1 The author's *Moulded Mind* design installation as exhibited at Vauxhall Fashion Scout (Ivanova, 2011) suggesting the potential of moulds to fabricate future materials. Image courtesy of Ezzidin Alwan, 2011

Towards the end of the MA course an opportunity arose for the author to present a selection of the students' design practice at the *Techtextil* International Fair for Innovative Textiles and Technologies (2011).  Despite the strong trade orientation of the fair, the creative and visionary display of the work captured the attention of science and business delegates.

As a consequence, a personal interest emerged in:

*How fashion-led design thinking that deviated from the norm, i.e. conventional fashion production for the high-street market, could be introduced successfully to industry, other disciplines, organisations, and consumers;*

*How traditional fashion design skills, tools, and methodologies, which are nurtured within current undergraduate and postgraduate curricula, could inform and enhance interdisciplinary[14] practices.*

## 1.2    Context of the research

The contemporary design of materials and sensory experiences has limited but extensively documented examples of design practice which are being explicitly developed in response to scientific and technological advances (Antonelli, 2008; Braddock Clarke and Harris, 2012; Lee, 2005; Quinn, 2012; Ravensbourne, 2013; Royal College of Art, 2012; Harris, 2013).

Biotechnologies, materials science, and computing have enabled designers to initiate and mediate novel fabrication processes, sustainable products, and sensory experiences (Lee, 2012; Collet, 2012; Harris, 2013; Tillotson, 2013).  Collaborations between designers and scientists have opened up a range of possibilities for future sustainable materials design and fabrication processes, where, for example, clothes may be 'grown' in a lab, or sprayed directly onto the body (TED, 2011; TEDx, 2012).  Smart materials[15] and

---

[14] Involving two or more academic, scientific, or artistic areas of knowledge: involving two or more disciplines (Miriam-Webster Dictionary, 2015)

[15] Smart materials are materials that have one or more properties that can be significantly changed in a controlled fashion by external stimuli, such as stress, temperature, moisture, or pH (National STEM Centre, 2010)

nanotechnologies[16] have enabled human health and sensory wellbeing to be integrated into 'second skin'[17] fashion pieces (Tillotson, 1997; Lee, 2005; TEDx, 2012; Quinn, 2012; Quinn, 2013).

Despite the human, societal, environmental, and potential commercial benefits, which underpin such design concepts, applying novel material concepts across science, industry and the market, proposes distinct challenges linked to human perception.

A speculative example being the following scenario:

## 1.2.1 Launching a 'mouldy' T-shirt: design speculation

In acknowledgement of the environmental impact of the *"favourite cotton T-shirt"* (WWF, 2013), due to farming methods, material processing, and then laundry care associated with cotton products, the author explored the development of a material that may be 'grown' from fungi[18] (Figure 1.2-1 overleaf).  Such raw materials, as argued by Lee (2005), could provide sustainable alternatives to established textiles like cotton.

---

[16] Nanotechnology is a set of technological tools that rely on the ability to control matter precisely on length scales below 100nm (that is, below one ten thousandth of a millimetre). (London Centre for Nanotechnology, 2010)

[17] The idea of clothing as a 'second skin' to the human body often features in the language adopted to communicate innovative material concepts.  The usage of the term can be dated back to the 1960s when Hundertwasser – an artist, visionary and "responsible creator" (Restany, 2013) – theorised around the physical, psychological and social functions of 'the five skins of the human body'.

[18] A group of organisms including mushrooms, toadstools, moulds, yeasts and lichens

Figure 1.2-1 Sample textile materials, grown from 'cheese' moulds
(Park and Ivanova, 2013)

Additionally, a further benefit of re-introducing 'good' microorganisms back into our everyday habitats via this type of material application is emerging within science as a proposition for maintenance of health and wellbeing. The move towards an increasingly hygiene-monitored urban environment, some scientists postulate (Dunn, 2011; McKenna, 1992), could be a likely cause for some contemporary autoimmune and idiopathic diseases.

Novel materials design may thus provide a route for re-introducing and re-engaging with specific biological organisms that could re-balance our environment and relationship with nature, and potentially improve health and wellbeing.

During the initial stages of this research project, it became evident, subsequent to a review of the literature, discussions with scientists, and design-led material investigations that fungal materials could prove viable for fabrication (Appendix 1.1 'Fungi for fashion and textiles fabrication', p.306).

If such a scenario were to be realised in manufacturing, a pertinent question that would arise would be about how a high-street brand like *Marks & Spencer* would engage with the complex challenges of selling such a concept to the consumer (Figure 1.2-2 overleaf).

Figure 1.2-2 Fictional launch of a line of mouldy T-shirts. Graphic design by the author, 2013

Mould, to be converted into a durable material, would face the challenge of overturning its inherent negative associations with decay, disease and deterioration.  Shifting this perception would be necessary in order for such a material to succeed in a market place that increasingly demands transparency of material sourcing, production, and heightened aesthetic awareness from consumers (Fletcher, 2008; Fletcher and Grose, 2012).

1.2.2   Nylon: the manmade revolution

History provides a pertinent example of the challenging and lengthy process of introducing technical and material inventions to wider fashion and textile markets.

In 1664, the English naturalist Robert Hooke envisaged in his book 'Micrographia' that it would be possible to make

*"[..] an artificial glutinous composition, much resembling, if not full as good, nay better, than that excrement, or whatever other substance it be out of which the silkworm wire-draws his clew." (Corbman, 1985)*

At the turn of the twentieth century, an alliance between the three global industries of chemistry, textiles and fashion succeeded in synthesising the first man-made material, viscose rayon, produced from chemically pulped-down wood (Handley, 1999).  Over the following decades studies of polymerisation in natural fibres, which is the formation of long-chain molecules (polyamides), led to the invention of nylon by DuPont in the 1930s (DuPont, 2014).

Nylon was introduced to potential markets in 1939 (Figure 1.2-3 below), as part of DuPont's *Children of Science* exhibition at New York World's Fair, under the slogan *"better things for better living"* (Handley, 1999).



*Image removed due to copyright issues.*

Figure 1.2-3 Sample of the first nylon fibre produced by DuPont in 1939

The initial promise from science was that this new yarn in its fabric form offered affordable luxury fashion garments, in comparison to the relatively more expensive silk.  Ultimately, significant time and effort in branding and promoting the new *"beauty fibres"* was required *"in order to convince users and consumers that synthetics were as 'good' and 'luxurious' as silk"* (Handley, 1999).  Generic man-made textiles initially consisted of: viscose, acetate, polyamide, polyester and acrylic.  Marketing teams worked

towards establishing brand names arising from blends of these materials such as 'Dacron', 'Terylene', 'Trelenka', Crimplene', 'Orlon', 'Courtelle', 'Tactel', 'Tencel' (Handley, 1999).

However, early synthetic fabrics and their marketing as 'artificial silk' did not meet the scientists' expectations, and evoked a negative public perception bound by the *"artificiality, and counterfeiting of the authentic"*, as stated in a report commissioned by DuPont in 1927 (Handley, 1999).

Handley (1999) portrays this negative perception of synthetic materials aptly:

> *"Although we have become, almost unconsciously totally dependent upon man-made materials, deep within the collective psyche still lingers a suspicion, if not a prejudice, against the words 'plastic' and 'synthetic'." (Handley, 1999)*

Another issue with synthetics was the lack of established use in design contexts.  Engagement with the French couture industry was sought to improve public perception of man-made materials (Handley, 1999).

Elsa Schiaparelli was the first to embrace the new materials and combine them with traditional design processes.  In 1932, she worked in collaboration with the French textile company *Colcombet* to invent a range of materials with different structural and aesthetic properties, e.g. *Rodophane* – a 'glass' fabric – which she made into translucent capes (Figure 1.2-4 overleaf) and dresses that framed the body (Watt, 2012).
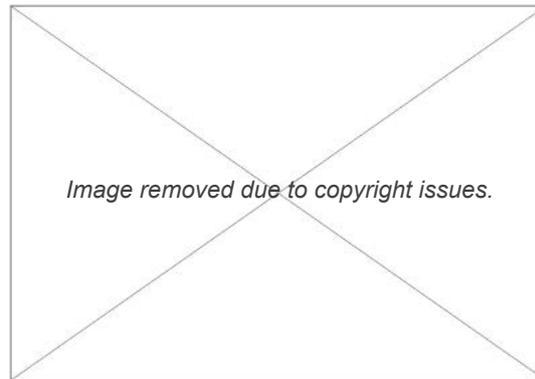
Figure 1.2-4 A 'glass' cape by Elsa Schiaparelli, 1932 (Watt, 2012)

By 1946, nylon was well known to the American public and nylon 'silk' stockings were in high demand.  The material's fragility, psychologically implying the sexual vulnerability of female hosiery, began to transform perception of synthetic products.  The Nylon Merchandise Laboratory, a DuPont showroom in Wilmington (DuPont, 2014), presented a range of fabrics and garments to demonstrate the limitless design opportunities for polyamides and plastics.

> *"DuPont had realised that selling a new material meant selling an abstract concept, which relied on associations with comfort, performance, economy and luxury." (Handley, 1999)*

Over the following decades developments in science, technology, and in particular the space age, influenced the image of synthetics and their adoption by the fashion and textiles industries.

In the 1960s, a time of rapidly evolving mass culture, Paris-based designers André Courrèges, Pierre Cardin, Emanuel Ungaro, and Paco Rabanne found inspiration in outer space, in a break away from haute

couture[19] towards ready-to-wear[20].  The designers transformed the new range of materials, including silver-finished fabrics, bonded nylon jerseys, PVC, and plasticised aluminium (Lurex), into a new design language of geometric, spare and liberating shapes, bold colours, futuristic accessories and flat shoes (Handley, 1999).  Clean and simplistic silhouettes became the canvas for introducing the new materials and technologies, as illustrated in Figure 1.2-5 below.



*Image removed due to copyright issues.*
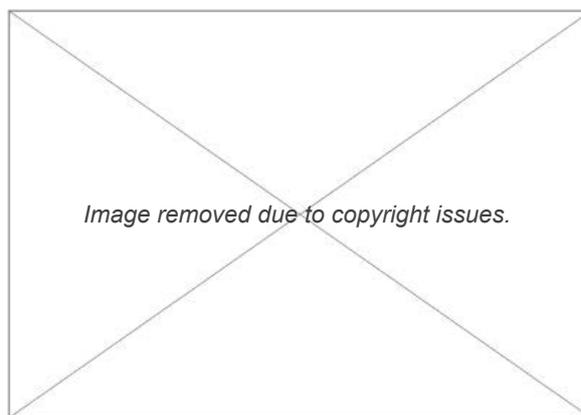
Figure 1.2-5 Cardin's dresses in the patented mould fabric 'Cardine', 1968

Elisabeth Längle writes about Cardin:

*"He revoked the simplicity of the shift dresses with two- and three-dimensionally moulded applications, providing them with plastic sex appeal. The lifestyle of the young appeared to be a boundless*

---

[19] From French for "high dressmaking" and refers to clothes that are considered haute couture by French law, approved by the *Chambre Syndicale de la Haute Couture* and often require a thousand hours of work including elaborate embellishments and finishes (Vogue, 2014)

[20] Made for the general market and sold through shops rather than made to order for an individual customer (Oxford Dictionaries, 2015)

*playground where Cardin's fashion took on colours, shapes and volumes as the building bricks of success." (2005)*

Further developments of synthetics within couture, ready-to-wear, sports- and performance-wear up until the present day (Lee, 2005; Handley, 1999) show a clear evolution of these fabrics, both in their materials make-up and their social implications.


## 1.3    Conclusions and critique

The story of nylon serves as an example of a timeline of the market assimilation process of novel materials, related terminology and an urgent requirement for a shift in societal perception and attitudes.

Negative perception of synthetics and how they were publicly received, was fuelled by the popular perception that science in its use of technology was becoming more 'unnatural', and was further exacerbated by the poor tactile, visual and behavioural qualities of the early synthetic materials.

Over decades, design approaches have explored the potential of synthetic materials, and their relationship to future manufacturing in fashion and textile arenas.  With hindsight, a more holistic or a stake-holder approach by the science and engineering sectors, which would essentially entail consideration of all human, material and sensory factors, these new synthetic materials may have achieved speedier and more fluent integration on the marketplace.

Since the introduction of the internet in 1995 (Castells, 2001), textile materials and fashion products now operate in a world of increasing openness, and instant access to the viral dissemination of information and education prior to any material realisation:

*"The internet is providing us with* exabytes *of information every day. News travel faster and now has an extremely short lifespan. Being a trend watcher back in the day, we had to wait. Wait for the new magazines in the news stand, wait for the fairs and events like the Milan Furniture Fair, and wait for the new brochures. News and knowledge had high value, sources were everything. How different it is now. Information is everywhere. It is not so much a question about the* **what**, *but more an issue of the* **quality** *(Is it true? Where does it come from?), and the* **why** *(Why is this happening?)." (Lieshout, 2013)*

From the above, an investment in the presentation and education of design and marketing of concepts that are interdisciplinary-informed, to best present the advantages and disadvantages of newly developing materials, is required to make such novel ideas socially acceptable.  It appears then that inviting stakeholders, e.g. end-users and consumers (Suri, 2007), to engage with novel and challenging material concepts and related experience at the early stages of their development, may inform and ensure the desirability and market viability of such concepts.

## 1.4    Formulation of research question, aim and objectives

Designers often present emerging material concepts to the public via various formats of exhibition, as opposed to day-to-day appeal and wearability.  This thesis addresses the communication and relatability gap between designer and public by adopting a design- and research-minded approach to the notion of novel materials and related sensory experience. Instead of focusing on how scientific and technological advances could provide new opportunities to produce design outcomes, it proposes a role for the designer to create strategies that allow for consideration and gradual integration of currently complex design concepts that incorporate global trends and appeal, and relate to contemporary lifestyles.

The thesis will go on to explore the development of a methodological framework of making conceptual materials and sensory experiences tangible, communicable and acceptable to users and consumers. In turn, such ideas may then become potentially marketable and of interest to industry.

In product design and service innovation realms, cultural or design probes have evolved as experimental vehicles for testing new and innovative ideas and products, by making them tangible, understandable, and ultimately acceptable to the end user (Gaver, Dunne and Pacenti, 1999; Gaver *et al.*, 2004; Gaver *et al.*, 2006; Tilbury, 2009; Boehner, Gaver and Boucher, 2012; Michael *et al.*, 2014; Philips, 2014). In their various formats, probes are designed to be culturally familiar, yet are often odd and intriguing enough to unravel and challenge preconceptions within the design domains they address. In this way, *probology* (Gaver *et al.*, 2004) has emerged as an approach to scoping out new design and market opportunities.

The exploratory nature and discursive potential of the probe approach (further discussed in Chapter 2.0, p.19) was considered appropriate to the development of the methodological framework.

A review of how probes have been used to propose potential human relationships with conceptual materials and technologies (Chapter 2.2.3 'Conceptual materials design', p.32) revealed limited examples of speculative artefacts where the intention to test, introduce or extract ideas, engage understanding and enhance perception, has been the main objective of the designer.

Consideration of a more research-minded approach that would enable the researcher to extract, record and analyse public feedback in a way that is not directed by the researcher's own design agenda, and instead informs and inspires the further development of the above-mentioned design concepts, became a focal point of preparation for the practical research

component of this project (Chapter 2.4 'Formulation of the potential format of the probe for this research project', p.49).

It was considered that in order for a design probe to operate successfully in this particular context that the article, as a conduit for various material and sensory concepts, had to be:

i.      Fashion-led, i.e. wearable and capable of being experienced, due to the nature of the research projects dealt with in this thesis, which considered human engagement with materials and sensory experiences in close contact with the human body;

ii.     Simple, neutral, familiar, usable, and versatile, to be applicable within a range of design and research settings;

iii.    Capable of operating within a range of social contexts.

The 'humble' T-shirt appeared an obvious and appropriate choice.  The T-shirt already has an established history of operating as a bridging mechanism across various demographics, and has been successfully implemented for branding, campaigning, political and social activism (Chapter 3.0, p.58).

From the above, the formalisation of the research aim was as follows:

Table 1.4-1 Research aim

> Pilot, assess, and develop the potential of the T-shirt to operate as a design probe in introducing novel and challenging concepts relating to materials and sensory experiences.

The term 'T-probe' was employed by the researcher as an easy-to-use reference for the project.

The following research objectives were derived directly from the research aim:

Table 1.4-2 Research objectives

1) Explore how design probes have evolved as an approach to scoping out new design and market opportunities (Chapter 2.0 'Probes in research and design practice', p.17)

2) Review the potential of the T-shirt to operate as an interface to enhance engagement with materials and sensory experiences (Chapter 3.0 'The T-shirt', p.58)

3) Design a methodological framework to test the use of the T-shirt as a probe (Chapter 4.0 'Methodology', p.74)

4) Explore the value of the T-shirt as a probe within a variety of challenging contexts (Chapter 5.0 (p.106), Chapter 6.0 (p.155) and Chapter 7.0 (p.198))

## 1.5   The selection of three discrete research projects

The value of the T-probe was tested by employing the approach within three separate, but methodologically interlinked projects related to fashion, materials, sensory experience and perception.

The three projects were selected based on the following common objectives:

a) To elicit, study and record participant sensory experience and engagement with novel and challenging material concepts and sensory experiences;

b) To enhance designer, industry, and consumer understanding;

c) To further knowledge and understanding of factors affecting public perception and engagement with novel material concepts and sensory experiences in the domains of Design (Projects (I) and (II)) and Industry (Project (III)).

**Research Project (I): *Fungi materials for clothing***

Research Project (I) *Fungi materials for clothing* was a pilot study based on the researcher's design-led investigation in the potential use of fungi as a novel and sustainable material for garment design and fabrication (Appendix 1.1, p.306).  In this case, the T-probe was employed to help connect the potential end user and industry with the concept of fungus-based artefacts and products (Chapter 5.0 'Research Project (I):  Fungi materials for clothing', p.101)

Projects (II) and (III) were set up in partnership with external organisations, i.e. the charity for deafblind people *Sense* and the global company *International Flavors and Fragrances (IFF)* respectively, to test the applicability of the T-probe and related methodology beyond the personal agenda of the researcher / designer.

**Research Project (II): *Fashion for deafblind[21] people***

Research Project (II) was set up and run collaboratively with *Sense*, the UK charity for the deafblind, to explore methods of linking fashion interest to a group of people with visual and auditory impairment who are currently isolated from mainstream fashion and design experience (Chapter 6.0 'Research Project (II): *Fashion for deafblind people*', p.155). In this case the T-probe was used as a centrepiece to the Project, in order to study how a fashion experience may be introduced to the deafblind user group.

**Research Project (III): *Synthetic ingredients for fine fragrance***

Research Project (III) emerged in conversations with the marketing team of the *International Flavors and Fragrances* (IFF), a company with an interest in advancing consumer perception, particularly in enhancing understanding of synthetic ingredients versus natural, in relation to developing contemporary fragrances. The project was therefore looking to implement the T-shirt as a design probe to advance consumer understanding of synthetic fragrance ingredients and their use in olfactory design, processes, and marketing (Chapter 7.0 'Research Project (III): Synthetic ingredients for fine fragrance', p.198).

*The following chapters describe the development and testing of the T-probe as an approach to advance engagement with novel material concepts and related sensory experience.*

*Chapters 2.0 and 3.0 explain the formulation of the T-shirt as a probe.*

---

[21] A person is deafblind if they have a combined sight and hearing impairment that causes difficulties with communication, access to information and mobility. (NHS Choices, 2014)

*Chapter 2.0 'Probes in research and design practice' (p.19) reviews the use of design probes as a newly-evolving method to scoping out future-focused design and market opportunities.*

*Chapter 3.0 'The T-shirt' (p.58) provides the rationale to the selection of the T-shirt as a broadly fashion-led probe, due to it being an established wearable communication platform addressing challenging topics.*

*Chapter 4.0 'Methodology' (p.74) discusses the devising of a methodological framework with a view to evaluating the potential of the T-shirt as a probe.  The selection of relevant research methods within the overall methodological framework is explained in relation to the specific objectives of the three research projects, and the gathering of data from which relevant conclusions could be drawn.*

*Chapters 5.0 (p.106), 6.0 (p.155), and 7.0 (p.198) describe how the T-probe and related methodology were applied in practice within Research Projects (I), (II), and (III) respectively.  Each chapter begins with a reminder of the background to the project and outlines the specific challenges to sensory experience and perception of a novel material concept, thus providing the rationale for employing the T-probe in the specific case.*

*Chapter 8.0 'Conclusion' (p.261) discusses the research findings in relation to real world applications.  It outlines how the research aim and objectives have been addressed, and summarises how the T-probe has evolved as an approach to advance participant understanding of novel and challenging material concepts and sensory experiences.  The contribution to knowledge is clearly stated.  The thesis concludes with a critique of the research, recommendations for future work, and the author's personal vision.*

## 2.0    Probes in research and design practice

*This chapter reviews the use of design probes as a newly-evolving method to scoping out future-focused design and market opportunities.  A comparison between the use of probes in research and in design practice is made.  This serves to demonstrate the versatility of design probes as an approach to research and innovation.  The chapter concludes with a formulation of the potential format of the probe to best fulfil the purpose of the three research projects.*

## 2.1    Probes in Science

*Probe, n*., from the Latin word *proba,* refers to a test, an examination, or a sample for testing (Oxford English Dictionary, 2014).  In science, probes function as devices that gather and feedback data about a phenomenon.  Examples include using probes to explore unfamiliar territories, e.g. outer space (NASA, 2010) and deep sea (National Geographic, 2012), and the technological development of probes that are specific to:

a) The examination of inaccessible situations, such as imaging technologies that enable novel research in various scientific fields (National Geographic, 2010);
b) The testing of existing theories, e.g. NASA's *Gravity Probe* (National Geographic, 2011).

During the research process, the work of Dr Melanie Flory[22], a neuroscientist who is well-established in using electrodes, and various

---

[22] Dr Melanie Flory is involved in a project that looks at probes technologies from applied physics, aiming to expand the type and use of probes in neurological settings.

stimuli, as probes in animal and in human populations, served as a platform for enquiry for the development of the researcher's own ideas.

Probes are a relatively recent approach that is being developed in design research, and therefore this encounter prompted an interview with the neuroscientist to help understand how a probe operates on a practical basis (Volume Two, Appendix 2.1, p. 312). This was driven by a curiosity regarding the advantages and disadvantages of using probes that go beyond the current literature, with somebody who uses probes professionally on a day-to-day basis. Dr Flory explains that in the pure sciences[23] and medicine, probes are often referred to as interventions, interpositionings, or interferences.

Below is an excerpt from the interview that lists the functions of a scientific probe:

*"[i.] as an intervention, to create specific outcomes;*

*[ii.] to evaluate possible outcomes that are hypothesised;*

*[iii.] as interference to create new outcomes deliberately;*

*[iv.] measurements against which they [scientists] can then use to either invent, innovate, or create new bodies of theory, that then become the basis, the platform for new methodologies;*

*[v.] looking at a "typical" […] population statistic, and extrapolating from that […] statistic, generalised concepts, generalised behavioural patterns, or generalised predictions.*

---

[23] Sciences that depend on deductions from demonstrated truths, such as mathematics or logic, and are studied without regard to practical applications (Flory, 2014).

Flory (2014) further speculates that it may be different how probes are used in design and fashion, e.g.:

*[vi] as a personal intervention to gain public perception;*

*[vii] an intervention, to shift tastes, or to shift thoughts, about what design means on a personal and group basis." (Flory, 2014)*

This led to the following questions:

*How are probes conceived, designed and introduced to operate as a research method within Design?*

*How does the history of the design probe inform the development of a research approach for this project?*

The ethics of involving human participants in the research process that Flory underlines, will be considered and expanded upon as the research-in-practice progresses (Chapters 5.0, 6.0 and 7.0).

## 2.2    Design probes

## 2.2.1  Cultural probes

In the Design domain, probes were introduced as an interactive research technique.  In their initial format, probes were a collection of devices, including cameras (Figure 2.2-1 overleaf), voice recorders, maps, postcards, photo albums, and diaries, which addressed various aspects of a person's everyday life (Gaver, Dunne and Pacenti, 1999).

*Image removed due to copyright issues.*
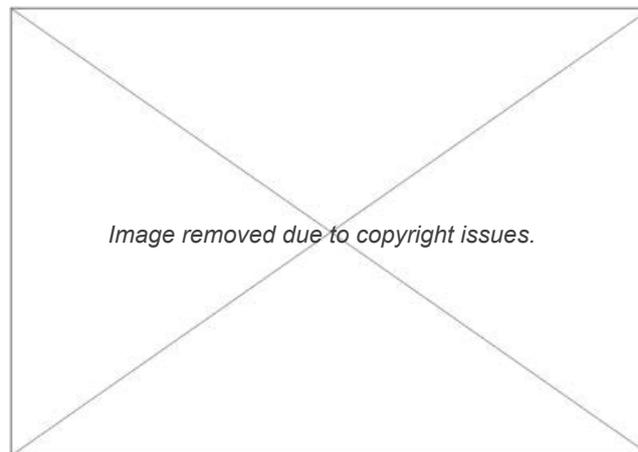
Figure 2.2-1 A disposable camera from the probes package (Gaver *et al.,* 2004)

The method was piloted by interaction designers and researchers William Gaver, Anthony Dunne and Elena Pacenti (1999) as part of *Presence*, a two-year European-funded project.  The project was aimed at scoping how elderly people from three culturally-distinctive European cities could engage more actively with their communities via technology.

Initially conceived as C*ultural probes*, the packages were developed to enable the designers to better understand the cultures they were designing for.  Through mystery, play, and ambiguity, which were considered and incorporated in the design of the probes, the designers aimed to *"subvert stereotypical representations of the elderly as frail and marginalized"* (Boehner, Gaver and Boucher, 2012), and to inspire equally playful design responses.

Probes have also been used to enable better understanding of the design domain they address, by unravelling, challenging and dispelling the preconceptions that exist within it.  A series of *Domestic probes* were designed to explore notions of domestic technologies, and their relation to home as a design domain (Gaver *et al.*, 2004).  The probes packages included items such as a *Friends and family map*, which was adapted from

ethnographic studies, a camera, and a *Dream Recorder*. These items were aimed at providing glimpses of people's everyday lives, to inspire novel modes of interaction with technology within the home environment.

The appropriation of probes within the design research domain was driven by limitations of existing social research methods, as argued by Gaver, Dunne and Pacenti (1999). Employing probes was not aimed at extracting an objective account of the attitude and opinions of the research participants, which could be otherwise obtained from focus groups[24] and surveys[25], but rather at inspiring innovative design projects.

Probes were therefore designed to provoke, expose and capture subjective responses that described personal relationships to products, spaces, systems and services (Gaver, Dunne and Pacenti, 1999; Gaver *et al.*, 2004; Gaver *et al.*, 2006; Boehner, Gaver and Boucher, 2012). The outcome and value of such an approach would be the development of unexpected and new design outcomes.

Upon realising the need for an approach that was more *"playful in intent, delivery, and eventual designs"* (Boehner, Gaver and Boucher, 2012), Gaver, Dunne and Pacenti (1999) drew from the theory and techniques of the Situationist International[26] and Surrealism[27]. Inspiration for the probes

---

[24] A qualitative research technique to uncover insights on consumer attitudes and behaviour, within a meeting of a small group of individuals who are guided through a discussion by a trained moderator, or a consultant (Marketing Research Association, 2015)

[25] Any measurement procedures that involve asking questions of respondents, e.g. questionnaires and interviews (Web Center for Social Research Methods, 2006).

[26] Revolutionary alliance of European avant-garde artists, writers and poets formed at a conference in Italy in 1957; Developed as a critique of capitalism based on a mixture of Marxism and surrealism; In the field of culture situationists wanted to break down the division between artists and consumers and make cultural production a part of everyday life (Tate, 2015a))

[27] A movement of writers and artists who experimented with ways of unleashing the subconscious imagination (Tate, 2015b))

came from Fluxus[28] boxes, packages of diverse games, cards and suggestions.

> *"Hence, the Cultural Probes process emerged as a design led, arts inspired, approach to developing new understanding and perspectives of cultural communities." (Boehner, Gaver and Boucher, 2012: 186)*

In order to operate efficiently, the design of the probes is carefully considered so that they are culturally familiar, yet peculiar and intriguing to the research participants. Boehner, Gaver and Boucher (2012) assert that the intent at the designing stage of the probes is essential to the quality of participant engagement and response that can be elicited. Boehner, Gaver and Boucher (2012) encourage that probes be thoroughly thought through, and specifically tailored, to operate within the context they address.

Once selected, the items are repackaged and accompanied by assigned requests for action, e.g. taking photos, drawing, mapping out, and noting personal responses.

The induction of the participants to the project's objective and the probes packages is experimental, loose and open-ended, to allow space for interpretation, by both the research participant and the designer, upon return of the probes:

> *"One needs to receive a probe packet, take the probe items out of the kit, hold them, reflect on them, live with them, and use them." (Boehner, Gaver and Boucher, 2012: 187)*

The probes return *"a richly textured but fragmented understanding of a setting or situation"* (Boehner, Gaver and Boucher, 2012). The

---

[28] An international avant-garde group or collective that was founded and flourished in the1960s but still continues today; [...] played an important part in the opening up of definitions of what art can be (Tate, 2015c))

participants' responses in themselves in turn become probes to the designers, to elicit an intuitive, subjective and empathetic interpretation. The designers' response to the returned data then manifests in sketched out ideas and the development of testable prototypes (Boehner, Gaver and Boucher, 2012).

The *History Tablecloth* (Figure 2.2-2 below) is an example of a design outcome that was produced from the data derived by the utilisation of the *Domestic probes* (Gaver et al., 2006). It proposes a new form of interactive digital technology for the home. The *Tablecloth* would light up underneath objects left in one place for long periods, in order to map out an interaction between the people, objects and surfaces that are involved in domestic activities.

*Image removed due to copyright issues.*
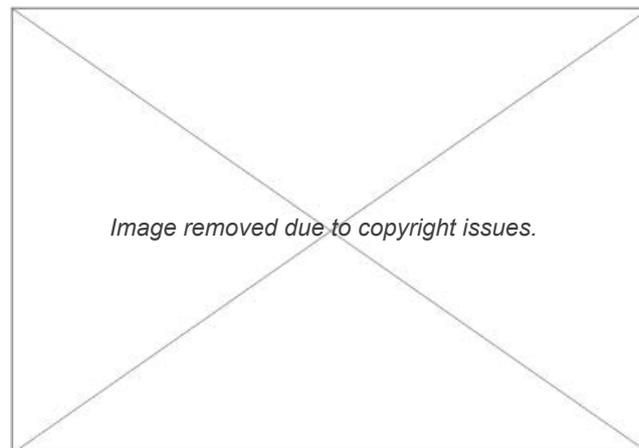
Figure 2.2-2 *The History Tablecloth*: design visualisation (Gaver *et al.,* 2006)

As part of follow-up research, the *Tablecloth* was deployed in a volunteer's household to serve as:

i.     A platform for reflection on domestic technology;
ii.    Means for social interaction;
iii.   An aesthetic object (Gaver *et al.*, 2006).

The interaction with the *History Tablecloth,* and how its presence affected the research volunteers, was observed and recorded over a four-month period (Gaver *et al.*, 2006).

Even though the *Tablecloth* was not identified by Gaver *et al.* (2006) as a probe in itself, its installation as a fully-functioning prototype in the research field, furthers understanding of the potential value of design probes in situ, to expand notions of novel technologies.

Design probes enable a dialectical space between research participants and designers.  This helps explain and reframe the issues that the probes address.  They shift the focus of designers from designing products which directly respond to consumers' needs and wants, to creating new understandings of cultures, technologies and applications:

> *"We often act as provocateurs through our designs, trying to shift current perceptions of technology functionally, aesthetically, culturally, and even politically." (Gaver, Dunne and Pacenti, 1999)*

Gaver *et al*. (2004) have argued that as designers they embrace the ambiguity and subjectivity of this research method.  This encourages them to tell stories about their participants, rather than drawing generalisations when interpreting the data from the probes.

Despite the lack of strict objectivity as defined within a reductionist scientific approach[29], this initial application of probes within design research closely aligns with the primary definition of scientific probes as devices for testing and data collection, as well as with Flory's definition of a probe as *"interference to create new outcomes deliberately" (Flory, 2014)*.

---

[29] The idea of reducing complex interactions and entities to the sum of their constituent parts, in order to make them easier to study (Shuttleworth, 2008)

Therefore, probes are used to inspire alternative design outcomes which are not pre-defined by a problem-solving attitude, but are rather aimed at unfolding[30] alternative design scenarios, which sits well with the personal, idiosyncratic nature of the probes return that is the cause for inspiration.

## 2.2.2  Speculating design futures

In a keynote lecture for the *Interaction Design Association*, Anthony Dunne (2012) talks about the middle space between problem-solving design[31] and critical design[32].  Dunne calls this middle space a 'What if?' space, or a speculative design[33] domain, which explores not how the physicality of the current reality, or the near future, could be improved through design, but rather how design can create *"alternative"* and *"preferable"* scenarios (Interaction Design Association, 2012).

Despite the fact that Dunne (2012) does not specifically talk about design probes, he argues the value of design speculations as a means to trigger different ways of seeing and interpreting reality, in order to enable the development of alternative and desirable situations.  Dunne describes this as *"a shift from designing for how the world is… to designing for how the world could be"* (Interaction Design Association, 2012).  He asserts that a transformation of attitudes, beliefs and values in society would create physical change in the material world.

---

[30] This creative approach to scoping out new design and market opportunities via design probes is aligned with Flory's theory relating to *The Sequence and Flow of Unfolding New Realities (Flory, 2014)*

[31] Design as means to resolve societal and environmental challenges (Interaction Design Association, 2012)

[32] Design proposals to challenge narrow assumptions, preconceptions and givens about the role products play in everyday life (Dunne and Raby, 2015)

[33] A kind of design that is used to create not only things but ideas (Dunne and Raby, 2013)

Dunne (2012) further argues the value of design in exploring preferable futures by making ideas tangible, tactile and visible.  He proposes that through collaborative work with scientists, economists, ethicists, and anthropologists, design can create open and public platforms, where concepts could be discussed and taken forward.

From the above, the use of design speculations can be seen as an approach that expands the understanding of design probes, and how they are used as part of research and design processes.

In like manner to the *History Tablecloth*, prototypes of materials, products and systems (Design Interactions Research. 2015) are also being conceived of as probing tools for testing out ideas and experimenting.  The speculation artefacts are often exhibited, in order to stimulate open discussion amongst design and science disciplines, industry, and the public, about the social, cultural, ethical, and political implications of existing and emerging technologies.

An example of this approach is the *E.cromi* project by Alexandra Daisy Ginsberg and James King (2009-2011).  Ginsberg and King worked collaboratively with a scientific team, who developed a conceptual self-diagnostic medical toolkit that employs genetically-modified *E.coli* bacteria as an alternative form of biological computing (Figure 2.2-3 overleaf).  Whilst the technology was being developed in the lab, the designers created a timeline of potential applications.

*Image removed due to copyright issues.*

*Image removed due to copyright issues.*
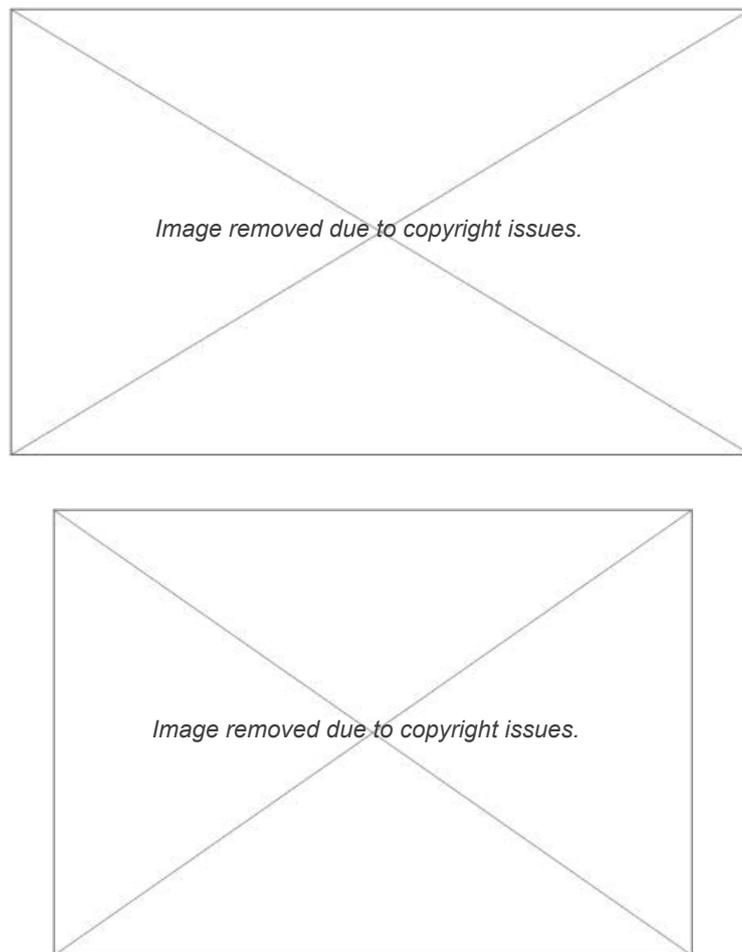
Figure 2.2-3 *E.chromi* and the *Scatalog* briefcase (Ginsberg and King, 2009-2011)

*E. chromi* won the Grand Prize at the 2009 International Genetically Engineered Machine Competition (iGEM).  The team argued that speculating various scenarios that derive from the development of new technologies, at both the scientific and the human scale, creates an open space to discuss the agendas arising from potential uses of novel technologies, and therefore to consider which scenarios are more desirable (Ginsberg and King, 2009-2011).

Within business, market leaders such as the technology company Philips have embraced the potential of design on a more strategic level (Gardien and Gilsing, 2013).  Philips' *Design Futures*[34] launched their *Probes* series in 2006, to explore far-future lifestyle scenarios around the use of technology in everyday life (Philips, 2014), which comprised five main areas: politics, economic, culture, environments and technology futures.

Philips asserts that the probes are created through rigorous, multi-disciplinary research that picks up on 'societal signals'[35] and emerging technologies.  In their conception, the probes are not meant as prototypes of marketable products, but rather aimed at enabling possible lifestyle concepts to become tangible, thus creating space for testing and discussing them (Lieshout, 2013).

Phillips has demonstrated the specific value of probes as a solution to environmental problems with the design of the *Microbial home* probe (2011).  The project incorporates *"a domestic ecosystem that challenges conventional design solutions to energy, cleaning, food preservation, lighting and human waste"* (Philips, 2011).  In this probe (Figure 2.2-4 overleaf), the aim was to propose using biological processes to elicit outcomes to optimal energy consumption and a reduction of environmental pollution.

---

[34] A design department within Philips that explores how emerging 'societal signals' and technologies could potentially shape lives in future years (Philips, 2014)

[35] Relates to emerging behavioural changes in society (Lieshout, 2013)

Image removed due to copyright issues.

Image removed due to copyright issues.

Image removed due to copyright issues.
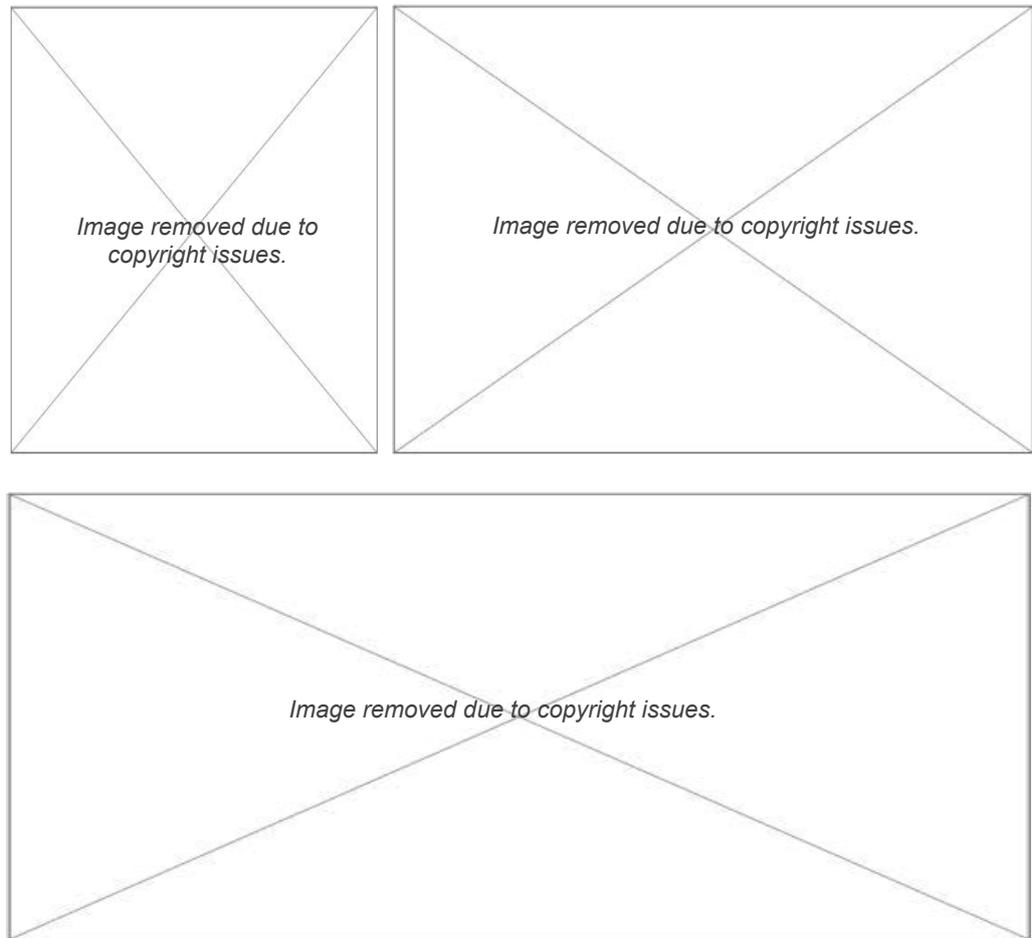
Figure 2.2-4 *Bio-light*, *Filtering squatting toilet*, and *Bio-digester island* probes from Philips' *Microbial home* (Philips, 2011)

Claudia Lieshout, Creative Director Lifestyle Trends at Philips Design, explains that such testing through design probes is the way forward to gain insights into how people would relate to the future provocations if they were real (Lieshout, 2013). The *Design Futures* department assert that the debate generated by the use of probes informs new design directions and business strategies for the company (Philips, 2008).

## 2.2.3  Conceptual materials design

In keeping with this thinking, other designers have also explored probes in the form of provocations, prototypes, and design fictions, in order to postulate potential human relationships with future materials and technologies.  Examples of such practice include the works of Nancy Tilbury, Barth Hess and Lucy McRae (references to follow) who were involved in the development of some of Philips' probes (Figure 2.2-5 below).
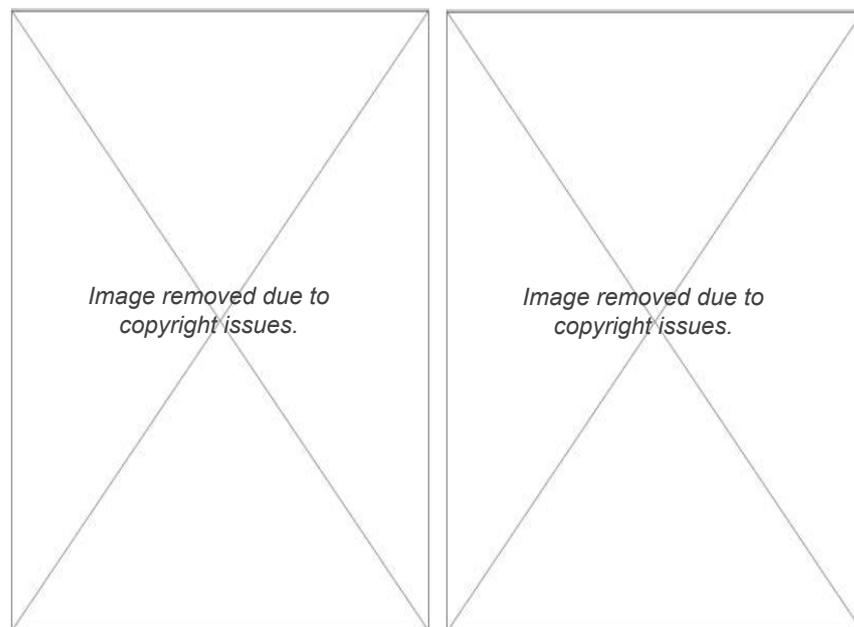


Figure 2.2-5 SKIN probes series: *Bubbelle* and *Frisson* (Philips, 2006)

Nancy Tilbury is a designer whose work challenges notions of the human body and materials in the twenty-first century.  As briefly outlined in Chapter 1.1 'Personal background' (p.1), Tilbury's ideas were at the core of her teaching on the MA Fashion course at Kingston University London, which influenced the development of this research proposal.

Tilbury's work often challenges boundaries of traditional fashion, pushing them toward a hybridisation of craft, design, science and technology. Potential outcomes of such investigations are illustrated in *Digital Skins – Body Atmospheres* (Tilbury, 2009), a conceptual 'fashion futures'[36] film that explores the materiality of fashion in 2050.

The film (Tilbury, 2009), an ongoing collaboration with visual artists *125 Creative,* stems from the potential of biotechnology, synthetic biology, nanotechnology and the concept of self-assembly, to propose novel fashion materials and experiences.  Amongst the design provocations are: *Cloud Gown*, a couture dress that would appear as gas and nano-particles; dynamic cosmetics and body modifications in the form of electrodynamic *Body Moisturiser*; *Abeo Electric Eyes* and *Dynamic Varnish* that change colour and shape; *Digital Skin* which uses light as a fashion material and body adornment; and pieces such as *Flesh Dress* and *Body Facet Wedding Ring* (Figure 2.2-6 below) which would be grown as skin extensions.



*Image removed due to copyright issues.*
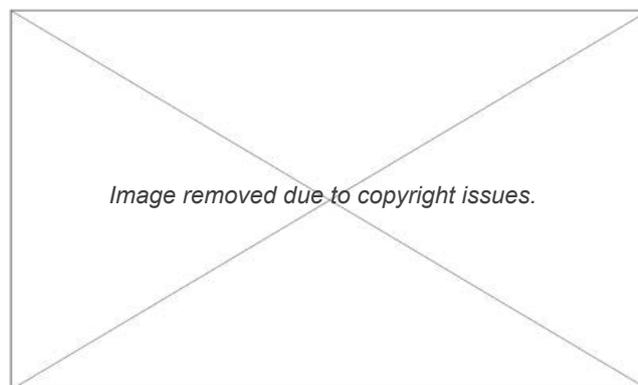
Figure 2.2-6 Fictional *Body Facet Wedding Ring* (Tilbury, 2009)

---

[36] 'Fashion futures', 'textile futures', and 'material futures' are terms which are often used in the language of designers to describe collective thinking about future directions within their respective domains (Wagner, 2013; Quinn, 2012; Ravensbourne, 2013)

Despite the fact that Tilbury's designs remain futuristic in terms of wearability (Figure 2.2-7 below), they challenge ideas, perceptions and use of fashion materials, forms, functions, and sensory experience. Her concept for 'soft', intelligent and emotional 'skin' interfaces, propose a catalytic role for fashion in bridging technology, fashion, communication and commerce.



*Image removed due to copyright issues.*
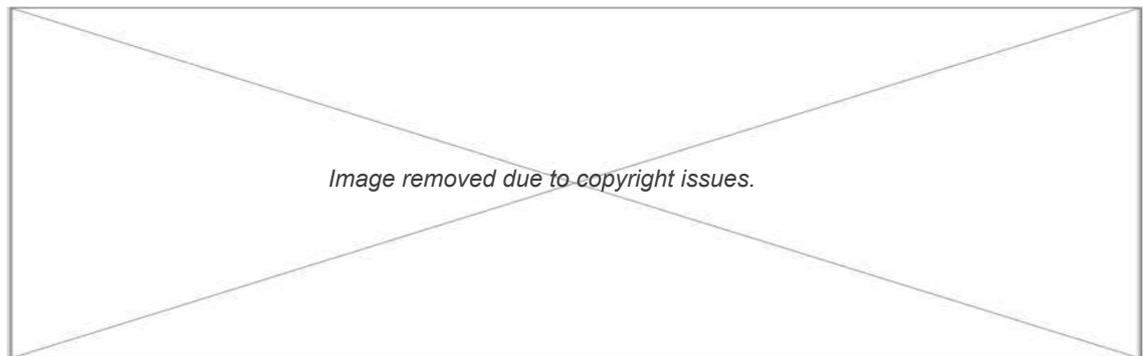
Figure 2.2-7 *Skin Sucka* (2011): a future vision of microbots, powered by bacterial energy and 'feeding' on household dust to perform cosmetic treatments to the body, as well as producing threads of cloth (Alive, 2013)

*LucyandBart,* design collaboration between Bart Hess and Lucy McRae*,* was born from a shared fascination with body modification and perceptions of beauty. The duo works by experimenting with low tech materials, e.g. foam, balloons, hooks and eyes, to explore ways of re-shaping the human silhouette (Figure 2.2-8 overleaf), and by so doing opens up a space for reflection on how current technologies are reshaping society and the material world (Dazed, 2010)[37].

---

[37] An influential independent youth culture magazine, showcasing "*agenda-setting editorial and pioneering fashion photography, [...] read in print and online by over 1.7m style leaders*." (Dazed, 2015)
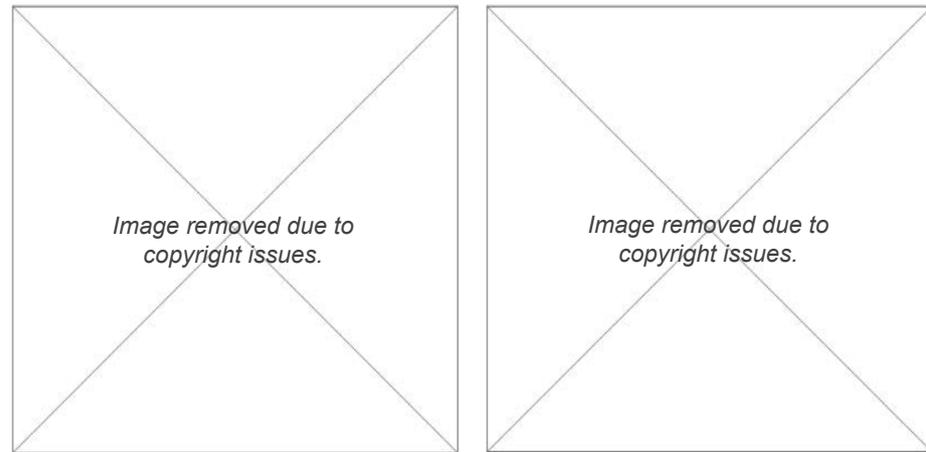
Figure 2.2-8 *Evolution* and *Grow on you #2* by *LucyandBart* (2008)

In their essence Hess and McRae's fashion probes bear design properties that are similar to the original probes packages. The hands-on and playful exploration of everyday materials has resulted in a tangible and sensory-engaged understanding of what it may feel like to wear something that is culturally unfamiliar, or unusual in the context of fashion.

The resulting aesthetic of Hess and McRae's work may be perceived as disturbing or challenging to understand by a lay audience, an in that sense easily discarded as art. This, however, reiterates Dunne and Raby's argument, when questioned whether critical design can be seen as a form of art:

> "It is definitely not art. It might borrow heavily from art in terms of methods and approaches but that's it. We expect art to be shocking and extreme. Critical Design needs to be closer to the everyday, that's where its power to disturb comes from. Too weird and it will be dismissed as art, too normal and it will be effortlessly assimilated. If it is regarded as art it is easier to deal with, but if it remains as design it is more disturbing, it suggests that the everyday as we know it could be different, that things could change." (Dunne and Raby, 2015)

Also pertaining to the speculative design domain, synthetic biology[38] has generated a 'What if?' space in materials design. Carole Collet's *BioLace* project (2012) speculates a scenario post 2050, in which plants could be genetically modified to become hybrid organisms that produce both food and fabric. Collet probes future fabrication processes for textiles, product, building and systems design, and architecture, and proposes that there will be scientific laboratories investigating the genetic control of plant morphology development for these very purposes (Collet, 2013).

Through a series of photographic fictions[39], textile prototypes, and animations, the *BioLace* project aimed to translate technologies that appear foreign and within the realm of science fiction, into accessible design frames in order to *"expose and understand the societal implications of new emerging technologies"* (Collet, 2012).

Collet highlights an essential role for designers to engage with emerging technologies in order to create bridges with societal and cultural needs, as well as generating a critical design discourse. A demonstration of this would be Collet's prototypes of a genetically modified tomato and a strawberry plant that grow lace roots (Figure 2.2-9 overleaf), and in so doing evoke the notion of how plants may evolve more resourceful and sustainable methods of textile manufacture called biofabrication. This echoes the work of Philips' *Microbial home* (2011), where probes postulate that living technologies[40] may enable novel modes of sustainable material production methods.

---

[38] A biotechnological domain that merges biology and code to enable a bottom-up engineering of new biological systems

[39] A photographic representation of imagined past, present and future design concepts

[40] The design and creation of biological components which are non-existent in nature, yet embody the essential properties of life, such as self-organization, adaptability, capacity to evolve and react to environmental stimuli, etc. (*European Centre for Living Technology.* 2015)

*Image removed due to copyright issues.*
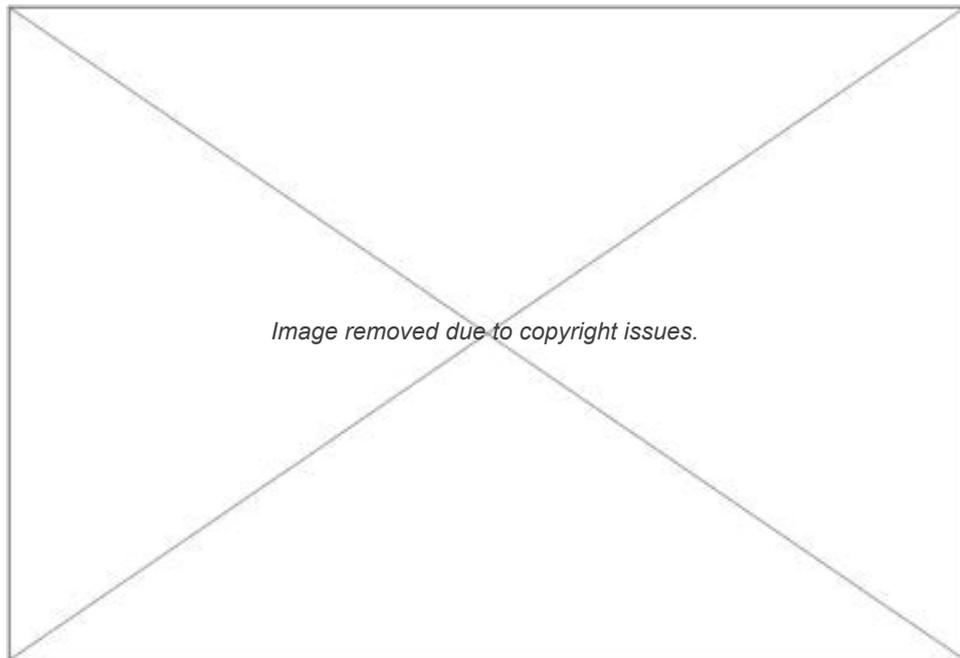
Figure 2.2-9 *Tomato Factor 60* and *Strawberry Noir*: photographic fictions (Collet, 2013)

Collet has also created open exhibition platforms to collate emerging design ideas in the field of biofabrication, e.g. the *Alive / EnVie* exhibition (Collet, 2013). For example, designers like Natsai Chieza and Amy Congdon[41] consider how the materials, tools and techniques of fashion and textiles practice would evolve with the eroding of boundaries between Science and Design (Figure 2.2-10 and Figure 2.2-11 overleaf).

---

[41] Both graduates from the MA Textile Futures course at Central Saint Martins College of Art & Design (CSM), University of the Arts London; Amy Congdon is currently a PhD Candidate at the Textile Futures Research Center (CSM) and Natsai Chieza is undertaking independent research.

*Image removed due to copyright issues.*
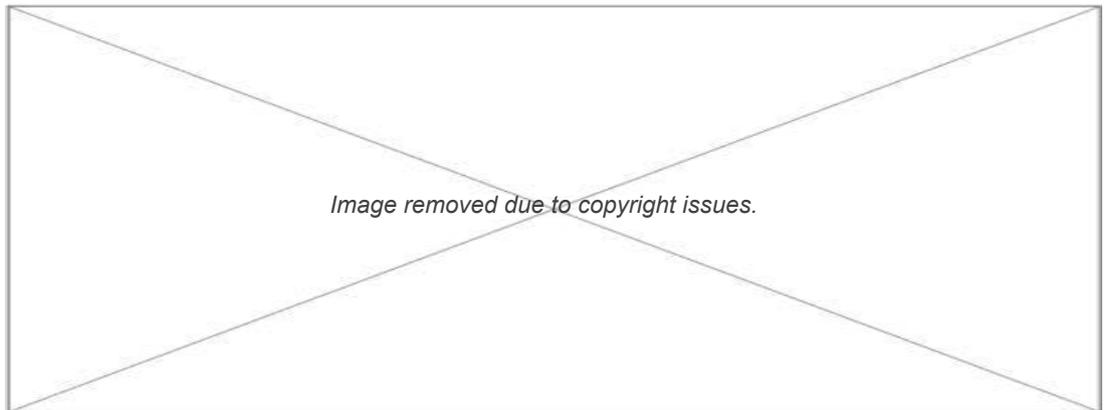
Figure 2.2-10 *Biological Atelier*: speculative body adornment (Congdon, 2013)



*Image removed due to copyright issues.*
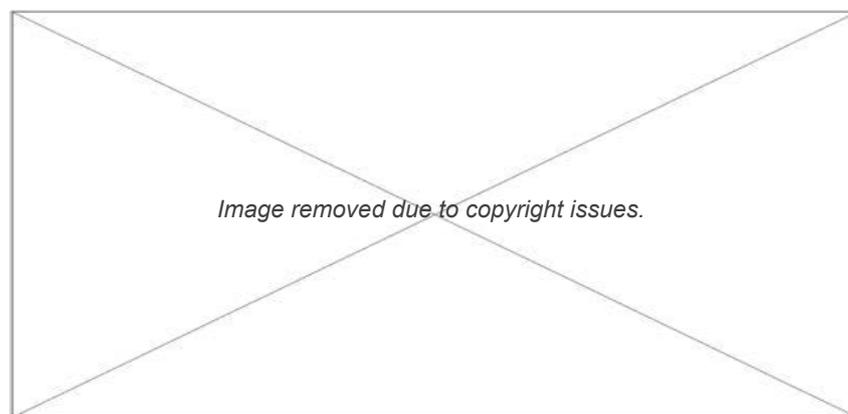
Figure 2.2-11 Textiles samples, screen-printed with dyes extracted from bacteria (Chieza, 2013)

Jenny Tillotsons' *Scentsory Design*® (2011) work demonstrates the use of fashion as a bridge between design, science, technology and industry. Through the development of multiple design probes, Tillotson has postulated novel forms of design for sensory wellbeing. This has resulted in the construction of workable prototypes that aim to further the development of related technology and inform future industry and users.

*Scentsory Design*® (Tillotson, 2011) originated as a concept to explore the creative convergence of the science of smell and its effect on the human brain and senses. Her thesis-by-practice *'Interactive Olfactory Surfaces:*

*The Wellness Collection – A Science Fashion Story'* (1997) postulated that with advancing textile, bio-sensing, micro- and nanotechnologies, it would be possible to create an 'active' garment that would function as a 'smart second skin'. An 'active' function of this garment would be to create, modify or enhance personal mood and sensory experiences, in response to data collected from bio-sensors that are interwoven within the fabric of a dress.

The practical development of the initial concept was taken forward through a number of collaborative design briefs. The resulting prototypes aimed to test in practice the convergence of perfumery with product design and emerging digital technologies, to produce a new mode of scent delivery as electronic scent, or *eScent*® (Figure 2.2-12 below).
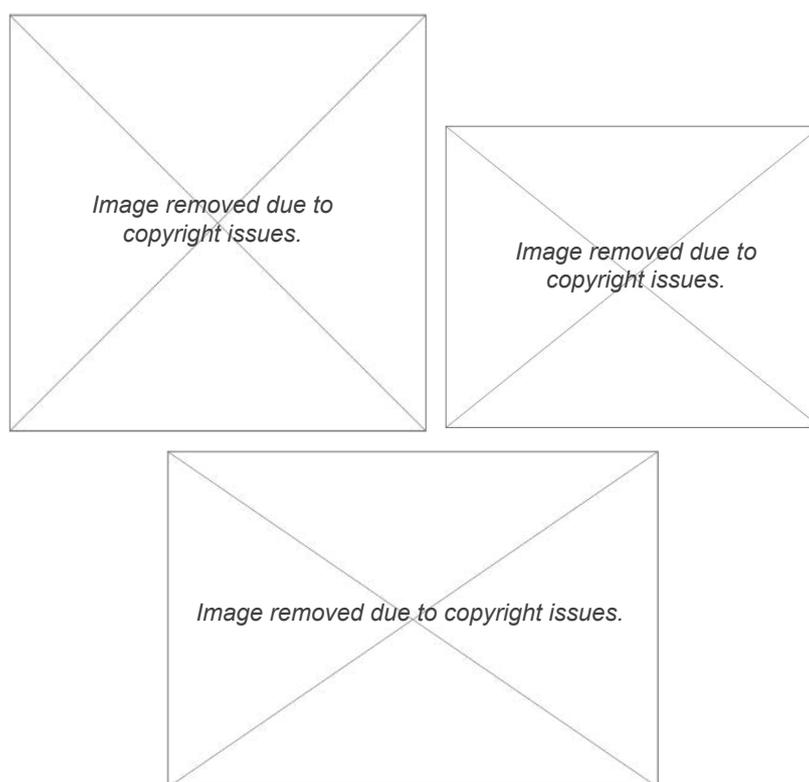
Figure 2.2-12 *SmartSecondSkin dress, Dontenay-aux-Roses mood-enhancing bag and eScent*® *wireless sensor system broaches (Tillotson, 2011)*

A knowledge-transfer research fellowship with *Philips*, to explore the electronic delivery of scent as part of everyday fashion garments and products, resulted in the development of a working prototype in the form of a pendulum (Tillotson, 2013).

The pendulum was conceived as a mood-elevating device that contained a spectrum of therapeutic essential oils.  The oils were incorporated into a sensory bed comprising 'scent cells', which would enable their release, to alleviate the negative effects of stress, sleep disorders, and post-natal depression (Figure 2.2-13 below).
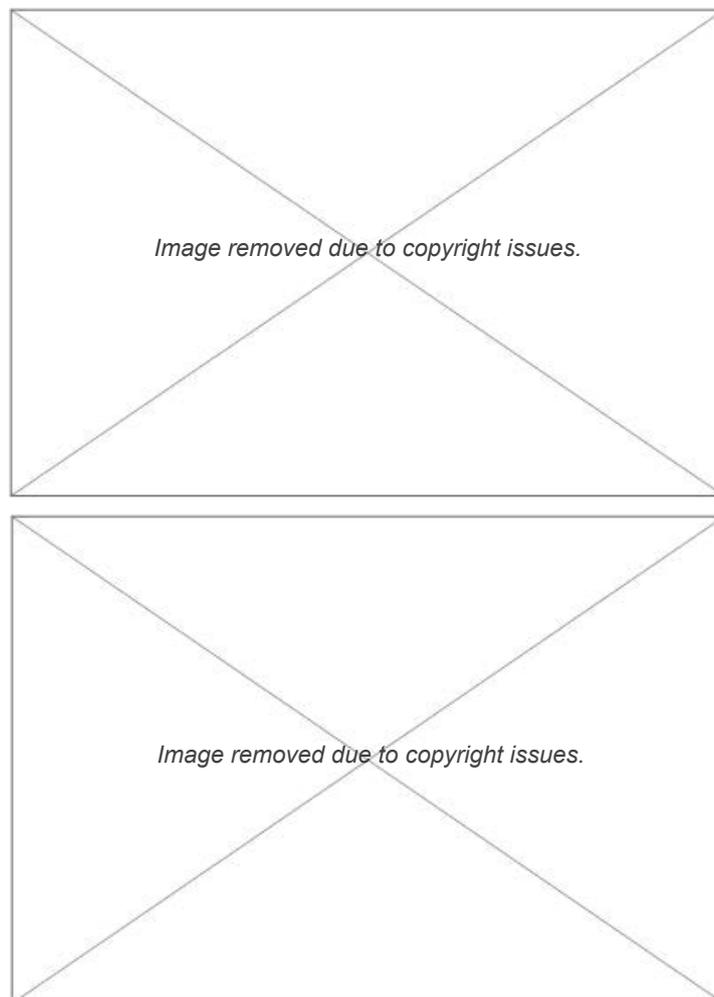




Figure 2.2-13 *Smell the Colour of the Rainbow*: concept design and interchangeable therapeutics scent bed design (Tillotson, 2013)

Based on the prototype, jewellery designer Slim Barret[42] designed a product range of wearable electronic scent devices, which contained a sensory-bed unit with seven mood-enhancing pods that corresponded to the colours of the rainbow, and a matching 'aroma-pod' pendant (Tillotson, 2013).

Since 1997 Tillotson has researched how the *eScent*® technology could become fully-functional and wearable, and her work overall has aimed to:

a) Revitalise understanding of the wellbeing potential of scent within everyday life, e.g. to improve general wellbeing, reduce boredom, enhance creativity and learning capacity;

b) Scope out further applications for scentsory design in realms such as sports and performance wear, and in the home entertainment industry.

While not all examples in this section have been explicitly defined as probes when conceived by the designers, the author's approach has been to extract the speculative intent and characteristics of design probes, and then trawl the literature for examples of how these have and may be evolved in practice.  In all of the aforementioned examples, the intention to test, introduce or extract ideas, engage understanding and enhance perception, has been the main objective of the designer, which has been manifested in the design of speculative artefacts in order to achieve this end.

---

[42] An internationally recognised artist and jeweller (*Slim Barret.* 2015)

## 2.3    Critique to the probes approach

### 2.3.1  Properties, applications and values of probes in research and design practice

From the contemporary review of the design probe and its evolution as discussed in Section 2.2 'Design probes', (p.21), it is fair to conclude that probes are used by designers either as an interactive research technique, e.g. the probes packages developed initially by Gaver, Dunne and Pacenti (1999) (Section 2.2.1 'Cultural probes', p.21), or an extended form of design practice, e.g. Phillips' *Design Probes* (2006) (Section 2.2.2 'Speculating design futures', p.27).

When used in research projects design probes operate much like scientific probes, in the sense that they are collections of items and devices that are sent out into a population, or a design domain, in order to understand specific aspects of it, and in turn inform design outcomes.   As demonstrated by the existing literature, the uniqueness of this approach is differentiated by the specific aim of design probes to seek an inspirational and subjective, rather than an objective account of the experiences and preferences they address.

To achieve insights that are relevant, requires that probes are designed to operate specifically within the context they address.  Through careful crafting of their physical and material properties, the probes provide a uniquely considered way of engaging with the research participants.  They create platforms for reflection and discussion.  Within an open, dialectical and empathic process, co-creation emerges, hypotheses are formulated, ideas are sketched out and prototyped.  The process results in unexpected design outcomes that expand notions of design on a personal and group basis.

The value of the probes approach to design researchers, therefore, lies within the probes ability to:

a) Unravel, challenge, and dispel stereotypes (particularly in relation to designed products and technologies);

b) Create new understandings of cultures, technologies and applications;

c) Inspire alternative and preferable design scenarios.

When probes are used in design practice, they cease to operate as information seeking research tools, and become a method for instigating and introducing concepts and / or prototypes of materials, products and experiences.  The presentation of the design probes into the public domain thus serves to create platforms for transformation of attitudes, beliefs and values in society.

Therefore, design probes can be seen as having both 'critical' and 'speculative' value.  This depends on whether the focus of the probe is to provoke and expose attitudes, beliefs, thoughts and feelings about that which is current, or to ascertain factors that can inspire future design and creation.  It appears then, that in order to elicit the desired outcomes, whether that is in a research situation, or in the design domain itself, the selection, design, and introduction of probes is neither pure science, nor pure creativity.  A combination of multi-disciplinary expertise, designers' intuition and sensitivity to human factors, is required to create strategies that would evoke personal semantics and experiences in the situation that is being probed.

## 2.3.2  Existing critique

Existing critique around the use of probes in research is mainly concerned with how probes are designed and used.  The designers and researchers who conceived and developed the *Cultural* and *Domestic Probes* packages

(Gaver, Dunne and Pacenti, 1999; Gaver *et al.*, 2004)
had anticipated that the playful and dialectical nature of the probes would inspire their appropriation within other research areas, and in particular Human-Computer Interaction (HCI)[43]. However, Gaver e*t al.* (2004) argued that there was a misappropriation of the inspirational intent of the initial probes. Gaver *et al.* (2004) maintain that a tendency to rationalise probes towards the production of specific and comprehensive results compromises the multi-dimensional value of design probes.

Boehner, Gaver and Boucher (2012) also discuss their reservations regarding design probes as a research method within social research studies. They argue that the use of probes can be misappropriated in the following ways:

i. As a form of discount ethnography, i.e. as a method to gain rich insights about a population without investing the time that is generally required for ethnographic studies[44];

ii. As a data gathering tool, often combined with other data gathering techniques, which are aimed at reducing possibilities rather than expanding them.

Boehner, Gaver and Boucher (2012) explain that these uses of probes do not reflect the open mindset inherent within the probes approach, but rather limit its application to the objective information-seeking and conclusion-driven attitudes of a conventional data-gathering method.

---

[43] Human-Computer Interaction (HCI) is a discipline concerned with the design, evaluation and implementation of interactive computing systems for human use and with the study of major phenomena surrounding them. (HCI Bibliography, 2015)

[44] A predominantly qualitative research method developed originally by anthropologists studying the cultures of non-Western societies; Also used in other fields of social research, such as sociology, management and human computer interaction to study settings; Aimed at producing a detailed description of how a particular social group operates, based on observation of, and often participation in, the group; may be supplemented by interviews and gathering of documents and artefacts. (University of Cambridge, 2015)

To counteract this problem, Boehner, Gaver and Boucher (2012) propose that an assimilation of design probes within social research studies could introduce an interventionist approach, i.e. probes could be combined with traditional data-gathering techniques, in order to prompt new and unexpected participants' responses. In such an approach the probes that could be designed, would be those that easily allow for comparison and coding between the different data sets. An additional benefit of this approach would be the opening-up of conversations and the formulation of hypotheses.

Lastly, Boehner, Gaver and Boucher (2012) assert that the design probes approach in itself could challenge perceptions of traditional research practices, and their inherent values of replicability, objectivity and generality. This would be *"in favour of a more human engagement with the social"* (Boehner, Gaver and Boucher, 2012).

In response to this existing critique on probes design and use, Wallace *et al.* (2013) propose a framework that aims to conceptualise the relationship between the probes' design and the probes' application. This proposed framework has evolved from a number of projects that used probes as tools for design and understanding of self-identity in sensitive cases, e.g. people living with dementia (Wallace *et al.,* 2013). The framework has been synthesised in the paper *Making Design Probes Work* (Wallace *et al.,* 2013).

Wallace *et al.* (2013) explain that their framework could propose in practice a more focused approach that would lead to a more invested interaction with research participants, which in turn would generate layers of 'meaningful' data, as opposed to purely inspirational data probes:

> *"We design probes that are purposefully directed towards the phenomenon we are addressing, the ideas for our probe designs are not random; they are forms of tentative hypotheses towards empathic understanding of and also future design ideas that are informed by*

*aspects of a particular context that we have hunches about." (Wallace et al., 2013: 3443)*

In that sense, their probes are designed to operate as 'scaffolds for creativity and response' within the specific contexts they address, as Wallace *et al.* argue (2013). They underline the main properties of these scaffolds to be openness, boundedness, materiality, pace and challenge.

Wallace *et al.* (2013) further ascertain that through careful consideration of the above properties, their probes are crafted to facilitate a co-creative process. In order to achieve this, researchers are encouraged to use empathy[45] and build relationships with their participants based on trust, investment, reciprocity and communication.

### 2.3.3  Benefits and limitations of probes

In addition to the review of design literature around probes, a questionnaire was compiled and distributed to designers and researchers who have explored the potential of the probes approach (Volume Two, Appendix 2.2, p.314). This primary insight was sought in order to provide a more comprehensive and critical evaluation given that design probes are a relatively recent concept (See further Volume Two, Appendix 2.2.1, p.316 for the interviewees' responses). The main interest of this enquiry was to ascertain the benefits of design probes, and help inform a future strategy that would work with, or around the limitations of probes.

It is evident from both the literature review and the questionnaire feedback that probes support innovative work in their own unique way. Using probes

---

[45] Similarly, Mattelmäki and Battarbee (2002) encourage design researchers to use empathy and connect on personal level with research participants, rather than viewing them objectively as test subjects.

in research provides empirical data that could not have been obtained otherwise.  Gaver *et al.* (2004)  have argued that this should be considered a methodology in its own right, i.e. *probology*.

The uniqueness of the approach is manifested in the personal, idiosyncratic nature of the data that is received, and used to help conceptualise design proposals (Kerridge, 2014).  Kerridge further ascertains that probes generate ancillary activities that are aligned with the designers' agenda (Volume Two, Appendix 2.2.1, p. 316), which has also been evident in the work of Wallace *et al.* (2013).

From all of the above, and the specificity of probes (discussed in Chapter 2.3.1 'Properties, applications and values of probes in research and design practice', p.42), the appeal of probes for this research project lies within the following collective properties:

a)  Their interactive and dialectical potential as 'scaffolds for creativity';
b)  The versatility of probes in addressing current or future situations;
c)  The careful designing of the probe to allow for open processes, e.g. intuition, interpretation, and co-creation;
d)  Their ability to transform attitudes, beliefs and values;
e)  The value of the personal, idiosyncratic nature of data that is returned;
f)  The unfolding of new design avenues.

As outlined within the existing critique of the approach, and supported by primary responses to the questionnaire, the main considerations around the use of probes in research projects is the misunderstanding and misappropriation of probes toward more specific and comprehensive results, i.e. results that can be quantified and rigorously analysed, as opposed to serving an inspirational purpose for the designer / researcher in the further development of prototypes (Gaver, Dunne and Pacenti, 1999; Boehner, Gaver and Boucher, 2012).

Another downside of the intensive work that is involved in designing probes is that their implementation, and the handling of research data, can easily be underestimated (Volume Two, Appendix 2.2.1, p. 316).

It can be also observed that within the *Energy & Co-Designing Communities* (ECDC)[46] project (Michael *et al.*, 2014) probes were used as only one of the approaches comprising a research strategy[47], to ensure multiple levels of engagement with research participants. Kerridge (Volume Two, Appendix 2.2.1, p.316) informs that in this particular case the feedback from the probes was treated in ways that were not necessarily rigorous, which did not justify the time and effort invested in making, placing, discussing and supporting the probes.

The template proposed by Wallace *et al.* (2013) scopes a potential approach to the use of probes that ensures more meaningful data is gathered, due to direct engagement with the research participants, and mechanisms to extrapolate empirical data from that interaction. As Jen Ballie reports:

> *"I found taking a prototype or tangible thing to a meeting, or embedding them within workshops produced a better response. The tactile nature of these artefacts has more of an impact on the end user / participant." (Volume Two, Appendix 2.2.2 Jen Ballie on design probes, p.317)*

Further to the inspirational purpose of the early probes (Gaver, Dunne and Pacenti, 1999; Boehner, Gaver and Boucher, 2012), to create design

---

[46] A project by the Departments of Sociology & Design, Goldsmiths, University of London which has aimed to understand how new technologies can be designed to engage communities in reducing energy consumption; The interviewee Tobie Kerridge was one of the researchers on the project.

[47] Other methods included field trips and workshops (Michael *et al.*, 2014)

outcomes and publically open platforms for discussion, Wallace *et al.*'s design probes (2013) are crafted to create a one-to-one engagement with the research participants, from which personal meanings can be found and expressed.

Given the above arguments, it was thus considered that, for the purposes of this doctoral research project, probes could be designed in such a way, so as to ensure outcomes that are generated at various points of engagement with the research participants, and potentially other stakeholders.

One aspect of this would be to consider whether a probe could be designed to operate both as part of a research strategy, and as an outcome of design practice. This two-fold approach would combine the research nature of the probes (Discussed in Section 2.2.1 'Cultural probes', p.21) together with the speculative capability of probes (Section 2.2.2 'Speculating design futures', p.27 and Section 2.2.3 'Conceptual materials design', p.32). Through this combined approach, it was considered that new values and applications for probes could emerge.

## 2.4 Formulation of the potential format of the probe for this research project

In speculative design practice, probes often address technologies and experiences that appear foreign and within the realm of science fiction. In conceptual materials design in particular, design probes are used to test potential human relationships with future materials and technologies. The research projects outlined in Chapter 1.5 (p.15) and further discussed and Chapters 5.0, 6.0 and 7.0, align with this idea.

As demonstrated by the practice of the designers reviewed in Chapter 2.2.3 'Conceptual materials design' (p.32), probes are a relatively recent

design approach to making future design concepts tangible, tactile, visible and communicable.  This is aimed at scoping design and market opportunities, forming partnerships, and drawing strategies that could lead to the development of these alternative and desirable situations.

In considering how design probes of such speculative value could be developed within a methodological framework, the practice of designers Helen Storey[48] and Becky Earley[49], was additionally reviewed to inform an alternative format of a fashion-led probe.  Despite the fact that these designers have not necessarily identified their creative practice as designing probes as such, their work can be regarded as probing, in the sense that it creates platforms for discussion of preferable design scenarios.

The approaches developed by Storey and Earley to engage in a debate about fashion and 'sustainability', pertain to a shift in design thinking, toward a more catalytic role of designers in transforming the fashion and materials industries.

Some designers have migrated from traditional 'solo' practices and into the public domain to become communicators, educators, activists and facilitators (Fletcher, 2008; Fletcher and Grose, 2012).  The rich material understanding and skill set of these designers has led to the development of working methods that engage understanding of fashion materials and

---

[48] Helen Sotrey is currently Professor of Fashion and Science at the London College of Fashion (LCF), University of the Arts, where she works as a designer and educator to blur disciplinary boundaries and produce socially and environmentally sustainable outcomes. (Helen Storey Foundation. 2008)

[49] Becky Earley is currently Director of the Textile Futures Research Centre (TFRC) at Central Saint Martins College of Art and Design, Univeristy of the Arts London, lead researcher in Textiles Environment Design (TED) at Chelsea College of Art, University of the Arts London, and industry consultant as part of the MISTRA Future Fashion research consortium in Sweden. (Earley, 2014)

processes, bring consumers closer to products, and foster social and behavioural change.

A pertinent example is the collaboration between London-based designer Helen Storey and the chemist Professor Tony Ryan from Sheffield University.  The partnering of their ideas has led to the conception of 'intelligent' materials that respond to the environment around them.  One outcome of their practice has been the development of *Catalytic Clothing* concept (Figure 2.4-1 below), a concept aimed at generating a critical discourse around the environmental sustainability of the fashion system (Quinn, 2013).

*Image removed due to copyright issues.*
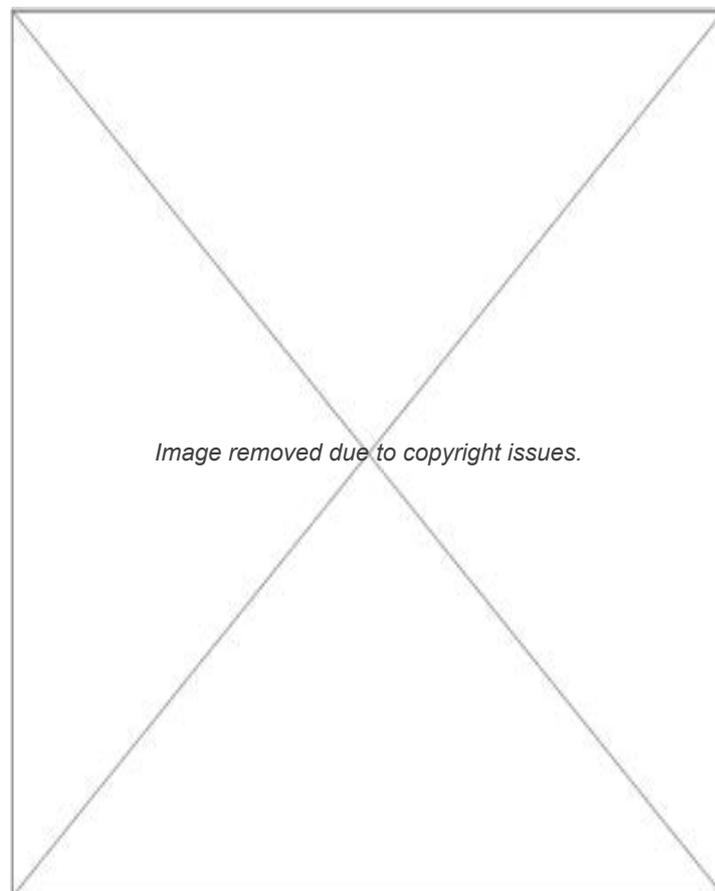
Figure 2.4-1 *Catalytic Clothing: Herself* couture dress (Story & Ryan, 2010)

With the aim of actively engaging clothing consumers in sustaining a greener and cleaner environment, Storey and Ryan (2012) propose modifying the technology, currently used in catalytic converters[50], to transform any fabric into a material that interacts with the air around it and purifies it.

Current research within commercial laundry brands are consequently investigating how this technology could be applied to existing clothing items as they are being washed. While its market application is being developed, Storey maintains this creative narrative via a series of art installations and animations which have been designed to instigate active public engagement in societal and environmental change (Storey *et al.*, 2014) .

The project *Fields of Jeans* (first installed in 2011) (Figure 2.4-2 overleaf), facilitated similar understanding through the familiar and universal nature of denim clothing:

> *"We want ordinary people to become an extraordinary movement. Every human body, and every move it makes, will be a tiny act of kindness to the planet, the seeming impotence of 1, will be replaced by a movement of the many." (Storey and Ryan, 2012)*

---

[50] Catalytic Clothing harnesses the power of a photocatalyst to break down air borne pollutants. A catalyst is a term used to describe something that makes a reaction proceed at a greater rate but isn't actually consumed during that reaction. A photocatalyst gains the energy it needs to be active from light. The two biggest sources of air borne pollutants are industry and motor vehicles. Although the majority of the pollutants are prevented from reaching the air, using technology such as catalytic converters, some do escape. It is these pollutants that Catalytic Clothing will break down.(Storey and Ryan, 2012)
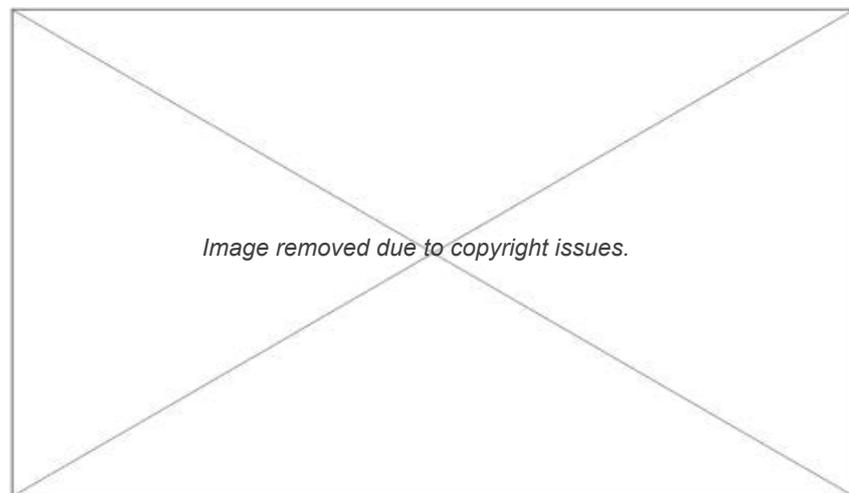
Figure 2.4-2 *Fields of Jeans* (Story & Ryan, 2011)

Designer Becky Earley further highlights the active role of users and consumers in transforming less sustainable aspects of the fashion system. This has been demonstrated through the *5 Ways* project[51] (Earley and Fletcher, 2003), which drew upon five everyday garments to bring focus to the ecological value of consumer behaviour.  The project stemmed from Max-Neef's taxonomy of human needs (1992), amongst which were higher needs, e.g. identity, participation and creation.

From that, a brief for five *Super Satisfiers* (Earley and Fletcher, 2003) was designed and developed in collaboration with a group of fashion and textile designers via workshop discussions.  An example of the outcomes, titled *Updatable* (Figure 2.4-3 overleaf), was a T-shirt which critiqued the throw-away culture of short-lived and disposable clothing.  The project illustrated how the users themselves could re-fashion an outdated garment essential, such as a T-shirt, to give it a desired new appeal.  It was anticipated that this activity may potentially lead to the creation of durable emotional

---

[51] A joint project with Kate Fletcher – sustainable design writer, academic, and industry consultant

connections of a consumer with their fashion wardrobe, ultimately resulting in less buying and discarding of fashion items.



*Image removed due to copyright issues.*
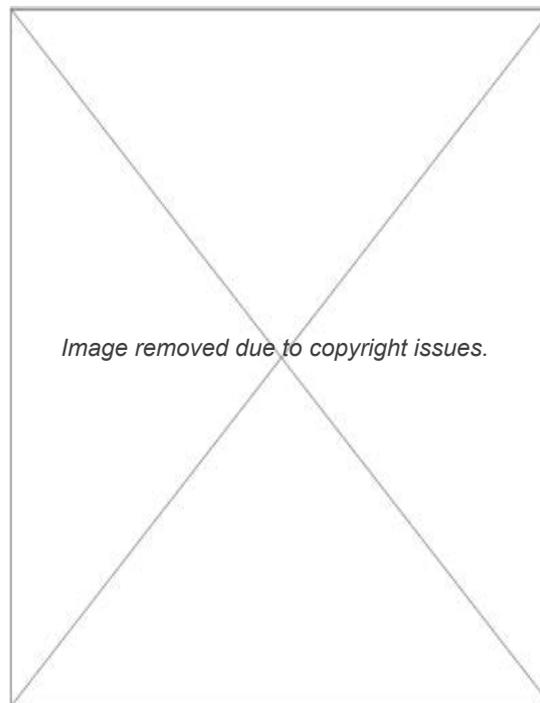
Figure 2.4-3 *The Updatable T-shirt* (Earley and Fletcher, 2003)

Earley's transformative ideas for fashion have been explored through the ongoing project *Top 100 (Earley, 2014)*, which began in 1999 as a personal design interest. Earley informs that every time she has an idea, she picks a second-hand polyester shirt, and re-fashions it to bring the idea to life, thus providing a tangible medium for discussing it (Earley, 2014). This has resulted in the creation of a series of shirt collections which have been developed through different textile printing techniques and textile interventions, to create eco-design narratives (Figure 2.4-4 overleaf).
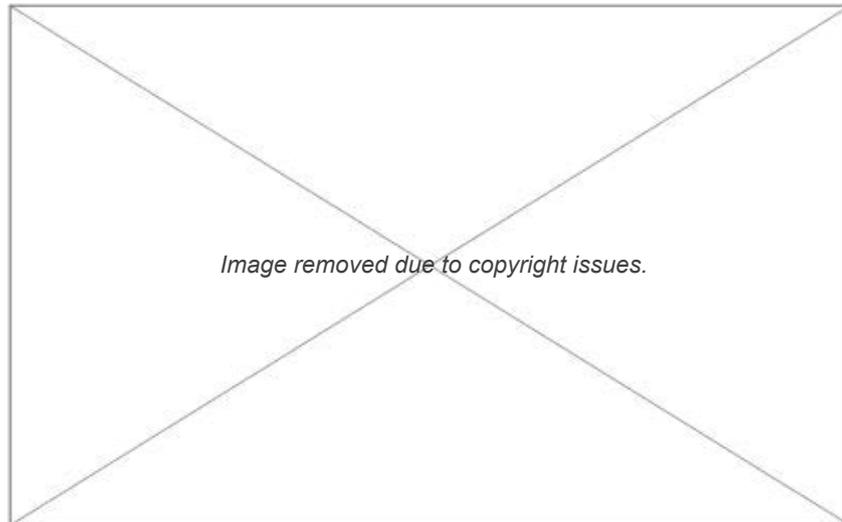
Figure 2.4-4 *Top 100* design techniques (Earley and Fletcher, 2003)

Earley's approach has further evolved into a series of creative workshops, prompting active engagement and exchange of ideas with both designers and consumers. Examples include the *Black Hack* project (Earley, Ballie and von Busch, 2012), the development of the *TED's TEN* strategies (Earley and Politowicz, 2010), and the creation of the *Textile Toolbox* online platform (Earley *et al.*, 2014).

The latter is based on the development of ten 'provotypes'[52], which suggest new materials, processes, services, systems and business models for the future sustainability of the fashion industry (Earley *et al.*, 2014). The bases of some of the 'provotypes' are in the simple forms of a shift dress, a hand-quilted jacket and shirts. Similarly to the *Updatable* T-shirt (Earley and Fletcher, 2003) and *Fields of Jeans* (Storey & Ryan, 2011), the familiar, everyday nature of these selected garments has been employed to provide an accessible reference point for discussing pertinent and

---

[52] A term adopted from Boer and Donovan (2012), which encompasses the idea of design probes; they are designed in such a way so to expose and embody tensions the surround a field of interest for various stakeholders.

complex ideas. This contrasts with the futuristic appeal of the probes, which were reviewed in Section 2.2.3 'Conceptual materials design' (p.32).

In considering the format of a probe that would operate successfully to introduce material and sensory concepts that in some way engaged with the body, it was established that the article as a conduit for various concepts had to be broadly fashion-led: wearable and capable of being experienced.

Therefore, from the above-mentioned examples of probes, the following potential formats of a fashion-led probe for this research project emerged as the three main contenders:

a) Speculative prototypes (Tilbury, 2009; Congdon, 2014);
b) Crafted couture or high-fashion pieces (Storey and Ryan, 2012);
c) Everyday clothing items, e.g. scarves, shirts, T-shirts, etc. (Earley and Fletcher, 2003; Earley, Ballie and von Busch, 2012; Earley, 2014).

The speculative prototype a) was considered unsuitable because:

i. The futuristic aesthetic of the designed artefacts could potentially alienate lay audiences, and therefore exclude certain demographics;
ii. Such concepts are normally presented via film, animation and photography, making it difficult for the probe to become experienced and wearable;
iii. They are often publically disseminated within exhibitions and via online forums, presenting a challenge towards a methodological documentation of the public interaction with the probes.

On considering option b) crafted couture or high-fashion pieces, it was similarly estimated that this type of probe was also not a complete fit for the project because of the time and the financial resources that would be required to distribute such a probe to a research population.

For these reasons, it was considered that probes a) and b) would not fulfil the intentions of this research project.

Item c), the everyday clothing item, emerged as the best fit because of the following characteristics:

i.      Its wearability provides an accessible point of reference to a wider research demographic;

ii.     Its familiarity provides a relatively culturally neutral ground for discussing novel and complex ideas;

iii.    Its replicability and customisability can be quickly employed as a blank canvas for the development, exchange, and communication of ideas, as seen in garments such as Earley's shirts.

It thus became apparent that a neutral and versatile fashion-led probe for this research project was pivotal, and the T-shirt that is worn universally around the globe emerged as the single strongest contender.  An in-depth discussion of the properties of the T-shirt will be provided in Chapter 3.0 'The T-shirt' (p.58).

## 3.0   The T-shirt

*This chapter briefly outlines the historical development of the T-shirt from its humble beginnings as an underwear garment to a universally recognised and valued communication platform.  In highlighting the value of the T-shirt as an instrument, indeed even a forum for communication and education, the rationale for its selection as a design probe emerges naturally.  In conclusion, this chapter demonstrates the appropriateness of utilising the T-shirt to fulfil the research aim of this thesis, i.e. advance understanding of novel and challenging concepts relating to materials and sensory experience.*

## 3.1   A brief history of the T-shirt

> *"I've always thought of the T-shirt as the Alpha and Omega of the fashion alphabet.  The creative universe begins with its essentiality, and, whatever path the imagination takes, ends with its purity."* (Armani, 1996)

The T-shirt appeared as an outerwear garment at the turn of the twentieth century.  It evolved from the woollen and flannelette undershirts worn by sailors as part of their uniforms in the British and American navies at that time (Gordon and Hiller, 1988; Harris, 1996; Volsing, 2014).  The demanding and labour-intensive nature of their work meant that sailors would often strip down to their undershirts to enable easier movement.  Thus this simple garment, which is referenced as the 'proto T-shirt'[53], moved from underwear to outerwear (Harris, 1996).

---

[53] A predecessor of the T-shirt with elbow-length sleeves and a placket with two buttons on the side of a collarette hemmed with binding (Harris, 1996)

By 1913 the crew-neck T-shaped undershirt with short sleeves was officially listed in the U.S. naval uniform regulations (Figure 3.1-1 below). This is considered to be the first formal acknowledgement of the T-shirt as an outer garment (Volsing, 2014). Having started as a piece of clothing suitable for physical training during the years of the First and Second World Wars, the T-shirt gradually grew in popularity[54].



*Image removed due to copyright issues.*
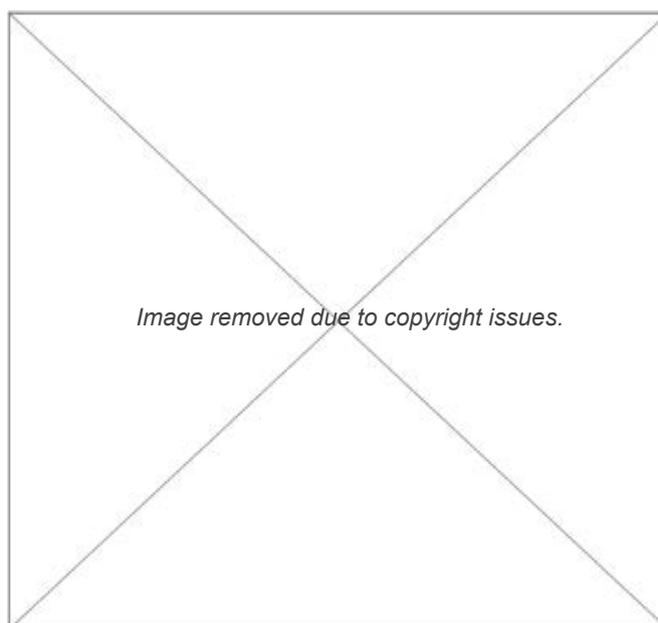
Figure 3.1-1 Item No. 218: the Navy T-type T-shirt as featured in a U.S. study of clothing and equipment for the Tropics in 1944 (Harris, 1996)

Kristian Volsing[55] (2014), Curator of the *History of the T-shirt* display (Figure 3.1-2 overleaf) at the *Victoria & Albert Museum (V&A),* reports that

---

[54] The first mass market T-shirts were sold in 1938 by the American department store Sears as 'gob' shirts, i.e. sailor's shirts, for 24 cents (Volsing, 2014).

[55] Kristian Volsing is an Assistant Curator, Furniture, Textiles & Fashion / Contemporary Architecture, Digital and Design at the *Victoria & Albert Museum (V&A)*, London. In September 2014, Volsing curated a display on the *History of the T-shirt* , where the range of T-shirts were displayed on mannequins alone, and not in styled looks, to underline the T-shirt importance as material culture in its own right.

the term T-shirt which was adopted to describe the simple silhouette of the garment, was first used in print in F Scott Fitzgerald's *This Side of Paradise* in 1920, and was entered in the American *Merriam-Webster Dictionary* in the same year.

*Image removed due to copyright issues.*
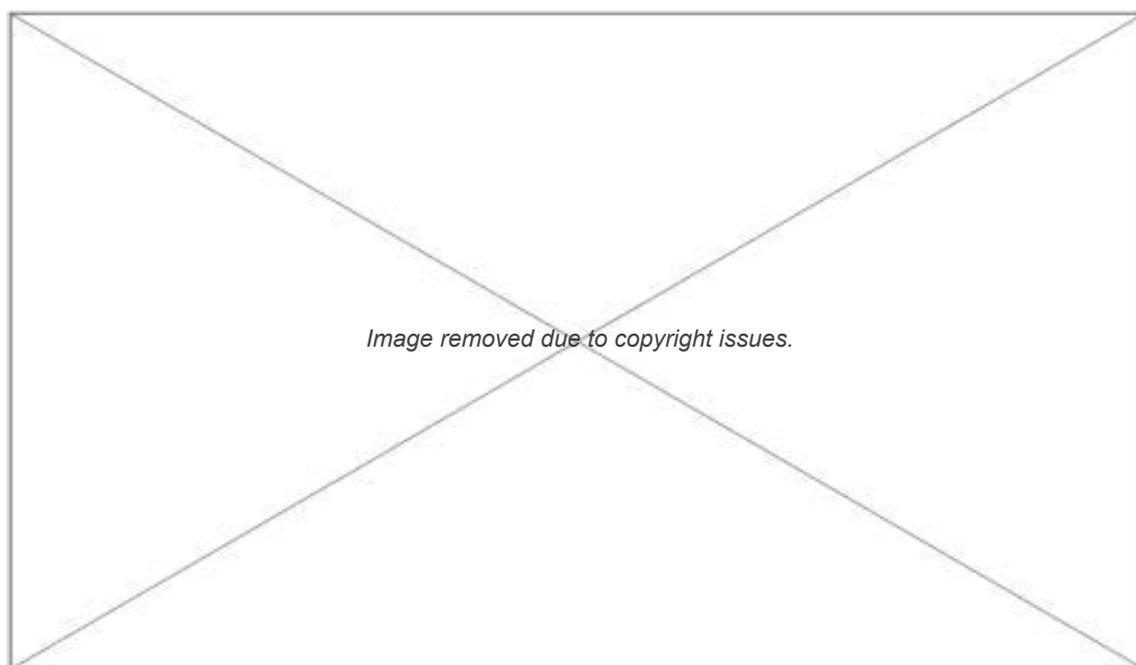
Figure 3.1-2 *T-shirts 101: 1913-2014*, display at the V&A Fashion Gallery, London. Image taken by the author. September, 2014

During the First World War, cotton became the preferred material for T-shirts because it was cooler in the summer and dried more quickly in the winter (Volsing, 2014). The comfort and breathability of cotton, as well as the T-shirt's existing associations with masculinity which came from its use in the army and navy (Figure 3.1-3 overleaf), made it a preferred choice for sports and leisure wear in the post-war period (Harris, 1996).
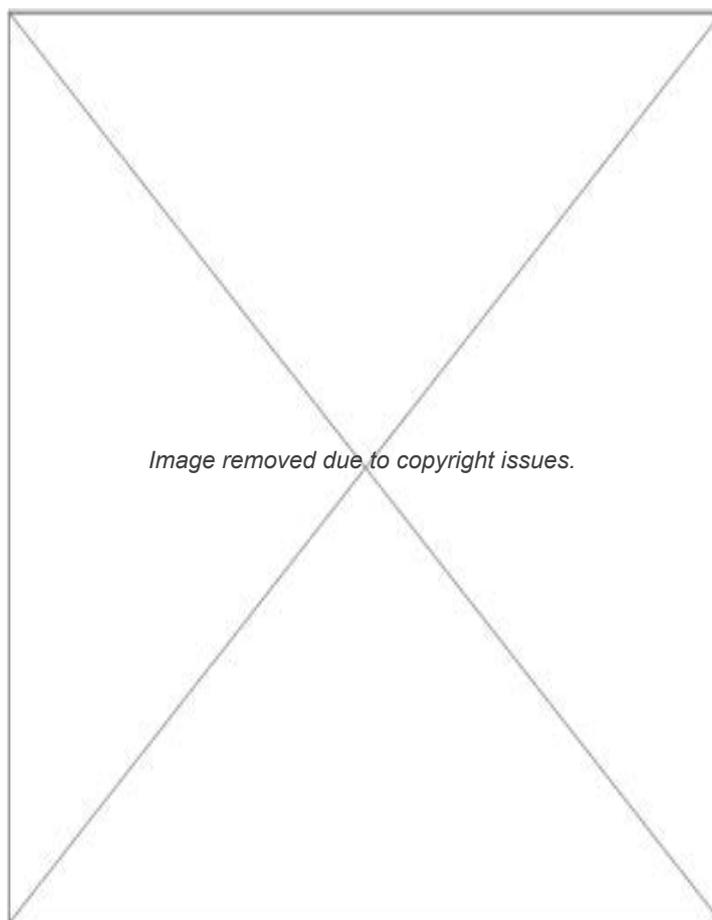
Figure 3.1-3 First magazine cover appearance of the T-shirt, 1942. Photograph by Eliot Elisofon, 1942 (Harris, 1996)

During the following decades, the T-shirt was gradually adopted across all demographics (Gordon and Hiller, 1988; Fresener, 1995; Harris, 1996; Talbot, 2013; Volsing, 2014). Anthropologist and fashion writer Kaori O'Connor[56] (2010) explains that iconic actors like Marlon Brando[57] (1951; 1954) and James Dean[58] (1955) assisted in popularising the T-shirt

---

[56] Founding editor of *The Fashion Guide* and Senior Research Fellow in the Department of Anthropology at University College London

[57] *Warner Bros* production *A Streetcar Named Desire* (Kazan, 1951) and Stanley Kramer Productions *The Wild One* (Benedek, 1953)

[58] *Warner Bros* production *Rebel Without a Cause* (Ray, 1955)

(Gordon and Hiller, 1988; Harris, 1996; Volsing, 2014).  The baby boomers[59] adopted the T-shirt as *"the ultimate wearable motherboard"*, by turning it into a *"youth culture uniform with jeans"* (O'Connor, 2010) (Figure 3.1-4 below).



*Image removed due to copyright issues.*
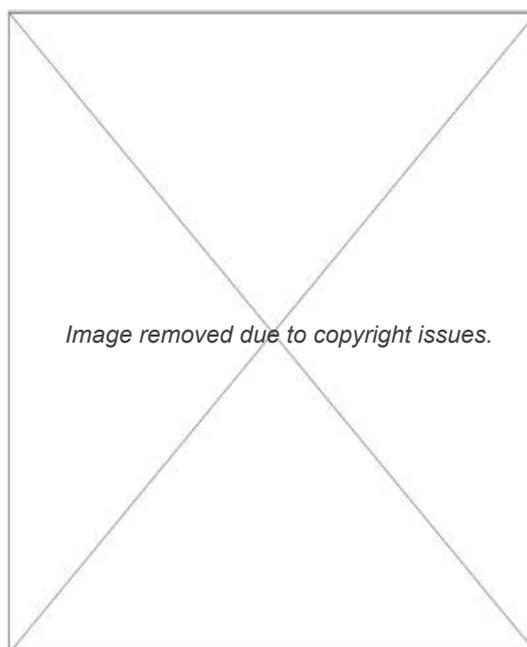
Figure 3.1-4 James Dean in the 'T-shirt-and-jeans look' of the Fifties (Fresener, 1995)

The film and music industries, fashion and sportswear brands, anti-fashion, political and art movements recognised the T-shirt as a medium for identifying brands and scoping new market opportunities (Gordon and Hiller, 1988; Harris, 1996; Talbot, 2013; Volsing, 2014).

---

[59] A saturation of infants and children on the consumer landscape post World War II (O'Connor, 2010)

## 3.2    The slogan tee[60]

The advance of screen printing technologies[61] and the invention of transfer prints[62] in the 1960s led to a transformation of the plain white T-shirt into 'a walking billboard' (Fresener, 1995), i.e. the slogan T-shirt.

> *"Identity, community, difference, gender, sexual preferences, political affiliations, humor, corporate slogans, support for causes, product endorsements, religious beliefs, profundities, athletic teams loyalties, school and college links, travel trophies – T-shirts say it all."*
> *(O'Connor, 2010)*

The development of the slogan T-shirt as a valuable bridge between concepts, cultures, paradigms, etc. has made it one of the most ubiquitous and accomplished garments of our society today.  T-shirts have become the preferred choice of platform for wearable engagement and discussion. In view of this, the following section outlines examples of the T-shirt's *"power as a messaging tactic and a carrier of knowledge"* (Talbot, 2013) demonstrating these qualities.

The use of the slogan T-shirt during the Sixties and Seventies, offered a means for music fans to become active participants in the industry, wearing their allegiance and openly associating themselves with the beliefs, values and aspirations of favourite bands (Gordon and Hiller, 1988).  Stephanie Talbot, author of *Slogan T-shirts: Cult and Culture*

---

[60] Another term used to describe the T-shirt that references the T-shaped silhouette of the garment

[61] One of the earliest methods of printing; involves the passing of ink or any other printing medium through a mesh or 'screen' that has been stretched on a frame, and to which a stencil has been applied

[62] The invention of plastisol inks allowed quick mass customisation of T-shirts via heat-transfer printing (Gordon and Hiller, 1988)

(2013)[63], traces the evolution of the slogan T-shirt from its identity in the Sixties and Seventies to its development to encompass a spectrum of creative, commercial and ideological practices.

Talbot (2013) references the term *"The medium is the message"* which was coined by philosopher and media theorist Marshall McLuhan in 1964, to denote the importance of the medium to successfully getting a message across (McLuhan *et al.*, 2002). Talbot (2013) elaborates that this is even more powerful in the case of a slogan T-shirt because clothing is perceived as an extension of the self, i.e. who you are and what you mean is what you wear, to be seen by all.

The social and political power of slogan T-shirts was demonstrated in 1984 when British fashion designer Katharine Hamnett[64] wore an oversized T-shirt to a reception with the then British Prime minister Margaret Thatcher. The T-shirt declared '58 % DON'T WANT PERSHING[65]' and was aimed at bringing notice to public opinion at the time (Figure 3.2-1 overleaf). The slogan expressed the anti-nuclear stance that was taken by the majority of British citizens at the time, who were opposed to Thatcher's purchase of U.S. missiles. (Talbot, 2013)

---

[63] The book can be read as a compendium of the various applications and meanings of the slogan T-shirt

[64] Katharine Hamnett is a British, designer and global brand founded in 1979; considered the pioneer of ethical and environmental fashion since 1989. (*Katharine Hamnett.* 2014)

[65] A US ballistic missile capable of carrying a nuclear or conventional warhead (The Collins English Dictionary, 2015)

*Image removed due to copyright issues.*
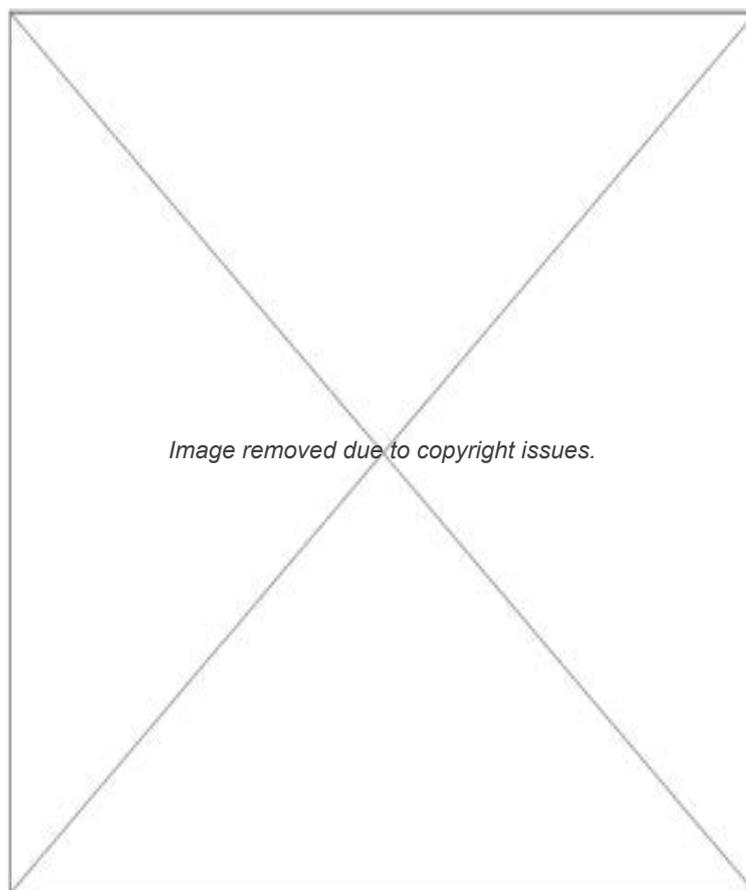
Figure 3.2-1 Katharine Hamnett and Margaret Thatcher, 1984 (Talbot, 2013)

Katharine Hamnett explains that her commitment to the slogan T-shirt arises from its effectiveness to bring notice to *"things that need to be said or that we need to be reminded of in three words or four"* (Talbot, 2013). A series of slogans aimed at drawing attention to the social, political and environmental concerns of the day, were driven and designed by Hamnett's personal dedication to ethical and sustainable design practices and policies (Figure 3.2-2 overleaf).

Examples of Hamnett's famous slogans include: 'WORLDWIDE NUCLEAR BAN NOW' (1983), 'SAVE THE WORLD' (1983), 'ÇHOOSE LIFE' (1983), "STAY ALIVE IN 85' (1985), 'NOT IN MY NAME' (2003), and 'SAVE AFRICA: MAKE TRADE FAIR' (2003). These were printed in outsized block lettering to emphasise the power and urgency of the message.
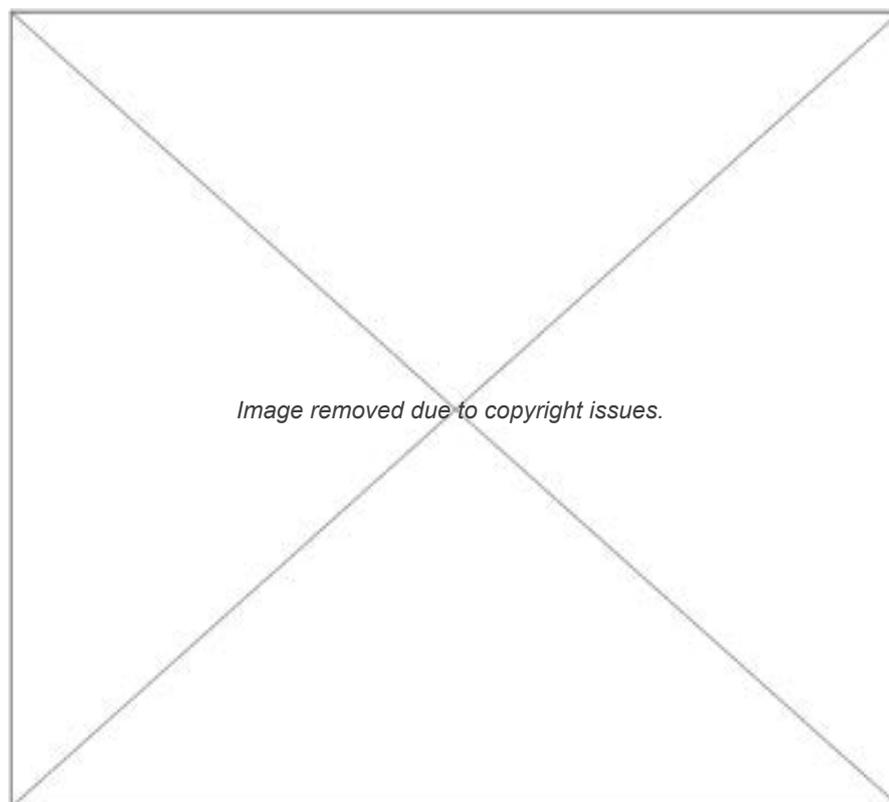
Figure 3.2-2 Katharine Hamnett in an eponymous slogan T-shirt (Snell, 2005)

According to Hamnett, the combination of the aesthetic of the lettering and the intent in the message itself is what attracts people to become part of a movement, a campaign, and to make a personal statement:

> *"By wearing the slogan T-shirt, you use your body to put over a clear message." (Talbot, 2013: 116)*

Talbot's research for *Slogan T-shirts: Cult and Culture* (2013) ascertains that Katharine Hamnett inspired many practitioners referenced in the book. Talbot (2013) underlines that Hamnett's *"assertive and universally recognizable proclamations"* set the blueprint for slogan T-shirts the world over.

A recent example of the political power of the slogan T-shirt to engage debate around societal issues appeared in *Elle UK*'s December issue on

feminism (Lyons, 2014). The T-shirt (Figure 3.2-3 below) with the slogan 'This is what a feminist looks like', was a re-design of the same iconic message T-shirt, produced by the *Fawcett Society*[66] (Lee, 2014). A major difference in how this feminist message was newly conveyed is that images of the T-shirt, worn by prominent figures such as actors Benedict Cumberbatch (Figure 3.2-3 below) and Emma Watson, British Deputy Prime Minister Nick Clegg, and leaders of the Labour party Ed Miliband and Harriet Harman (The Fawcett Society, 2014; The Guardian, 2014), were widely publicised, demonstrating the symbiosis between a message and its medium, as argued by McLuhan and Talbot.



*Image removed due to copyright issues.*
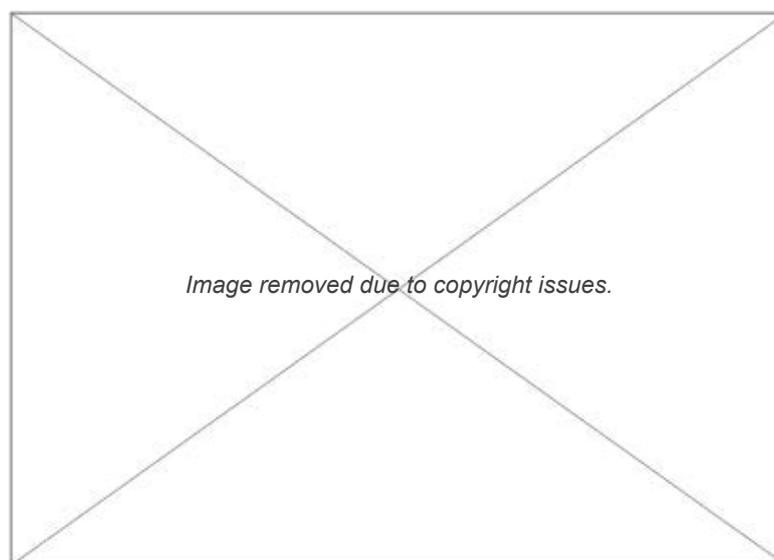
Figure 3.2-3 British actor Benedict Cumberbatch in the feminist T-shirt.
ELLEUK.COM #ELLEFEMINISM

In addition to advocating gender equality, the feminist T-shirt drew attention to current concerns of sustainability and ethical manufacturing

---

[66] The UK's leading charity campaigning for women's rights and gender equality (The Fawcett Society, 2014)

(The Fawcett Society, 2014). According to the parties involved in the production of this tee, the T-shirt was ethically manufactured from sustainable materials. However, upon the launch of the T-shirt campaign, it transpired that this may not have been the case (Chua, 2014), thus generating a negative message of a different nature and counter to the intent of the T-shirt.

Further examples in which charities employ slogan T-shirts as agencies of appeal, to increase awareness and to shift attitudes, beliefs and behaviours, include *Avon*'s 'Embrace Your Pink' T-shirt (Figure 3.2-4 below), designed as part of *Avon*'s breast cancer awareness campaign (Avon, 2015), and the *Orchid Charity T-shirt* – a collaborative project between the male cancer charity *Orchid* and the London College of Fashion (2014).

*Image removed due to copyright issues.*
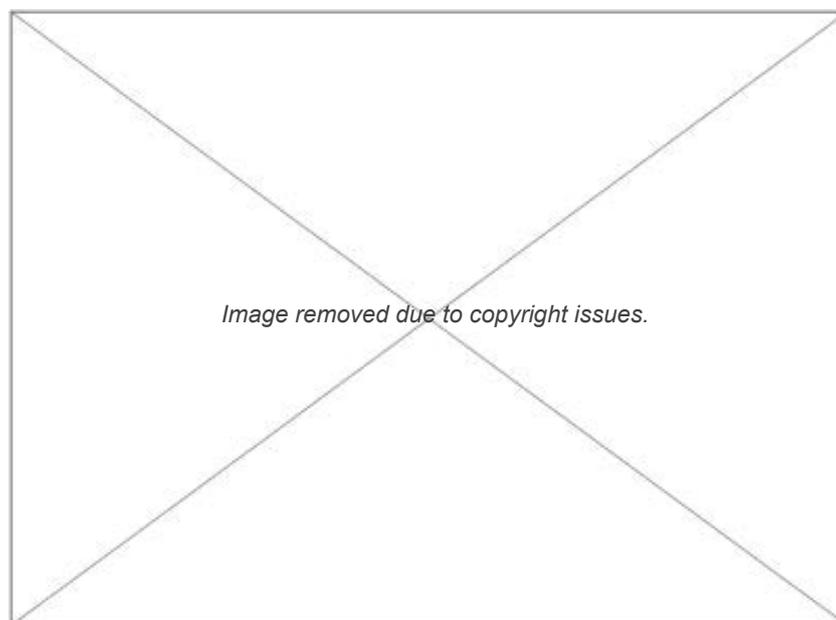
Figure 3.2-4 Team Avon on the Avon Walk for Breast Cancer. Courtesy of the *Avon Foundation* (O'Connor, 2010)

## 3.3 T-shirt to T-probe

> *"Human affiliations tend to bond around t-shirts […] Though it looks superficially simple, t-shirts are incredibly important in the emotional impact they have."* (Wired, 2014)

The World Wide Fund for Nature (WWF)[67] has cleverly used the T-shirt to campaign for environmental-related issues such as fresh water preservation, ethical manufacturing and fair trade, by reversing the message from 'Save the planet' to 'Save the T-shirt' (Figure 3.3-1 below).



*Image removed due to copyright issues.*
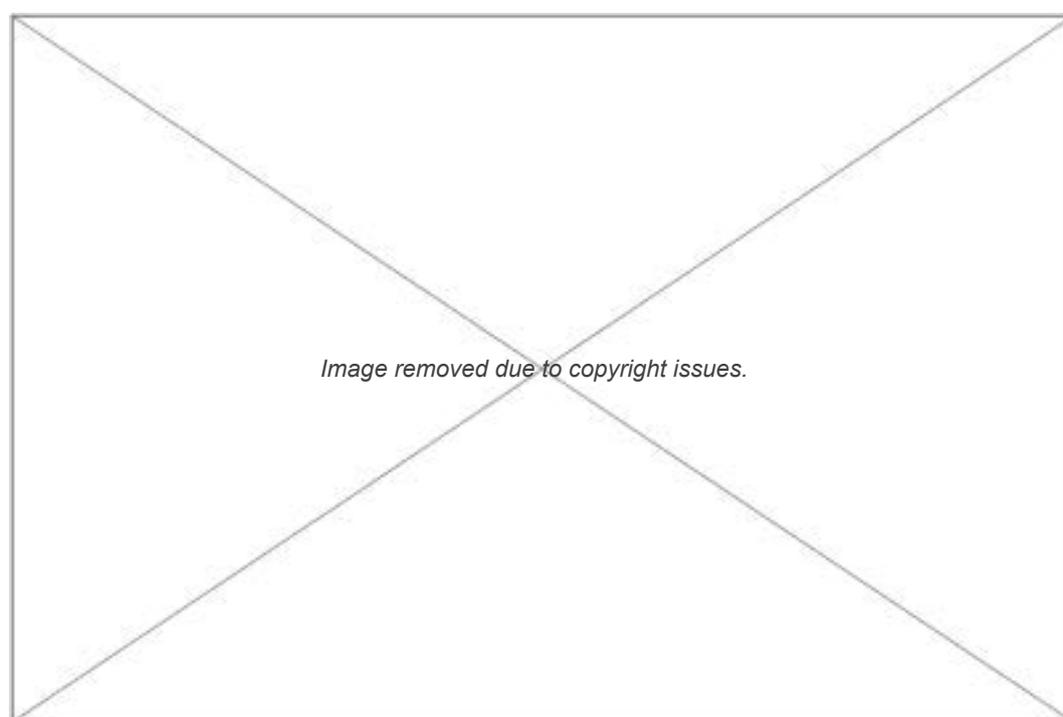
Figure 3.3-1 One of the posters produced towards freshwater conservation for the WWF 50th anniversary of achievements (WWF, 2011)

---

[67] An international non-governmental organization founded on April 29, 1961, working in the field of the biodiversity conservation, and the reduction of humanity's footprint on the environment. (WWF, 2013)

In this example, the T-shirt becomes the pun for how we wear, and wear out, our planet.  This piece of advertising taps into the personal connections and the memories of the individual that are created around the 'favourite cotton t-shirt' (WWF, 2013).  The poster reads:

> "The T-shirt needs help. Because the cotton crop it's made from absorbs thousands of litres of water. WWF is helping farmers grow thirsty crops, like cotton, rice and sugarcane, more sustainably with less water. This takes the pressure off freshwater ecosystems, benefiting people and nature [...]." (WWF, 2011)

This WWF campaign takes the idea of the tee as a medium for communication to a strategy of communication.  From a garment to declare, appeal, oppose, and engage, the T-shirt becomes a framework for discussing ideas and semantics beyond the words of the slogan.



*Image removed due to copyright issues.*
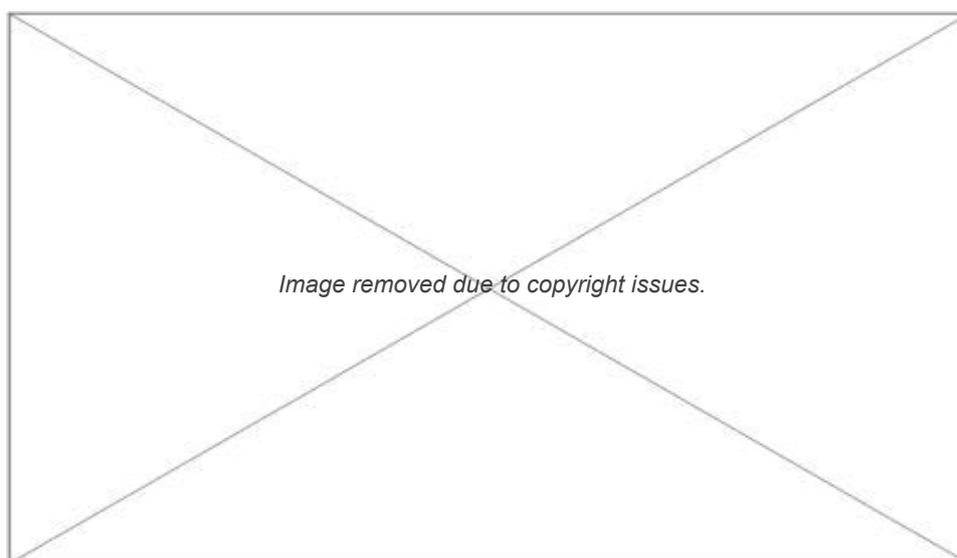
Figure 3.3-2 *The Pop-up T-shirt Factory* (2015)

The recent *Pop-up T-shirt Factory* (Figure 3.3-2 above) was a joint initiative between the Centre for Sustainable Fashion at London College of Fashion (University of the Arts London) and the University of Sheffield.

By tracing the manufacturing process of the T-shirt, the *Pop-up Factory* stimulates debate around people's understanding of the fashion industry, their own shopping habits, and relationship they develop with their clothes.

*Teespring* (2015)  is a company co-founded by Evan Stites-Clayton and Walker Williams in 2011.  The business idea was inspired by a protest T-shirt Clayton and Williams designed in order to stop the closing of their favourite bar at Brown University, USA.  In order to fund the production of a large number of T-shirts, they advertised the design online and promised to produce it when enough money had been raised.  In accomplishing the funding through this method several objectives were realised.  The message was conveyed and received successfully, and a new business model was born, i.e. payment upfront on promise to produce (Wired, 2014).

In this example the T-shirt has come more than full circle.  What started off as a protest T-shirt has turned into a viable business idea, which eliminates the cost that goes with scaling-up manufacturing models by shortening the transition from the idea phase to the product delivery.  Both Clayton and Williams claim that their company is not really about T-shirts, but *"a way of proving a hypothesis"* (Wired, 2014).  *Teespring* (2015) heralds the emergence of the T-shirt not just as a medium for the message, but as a vehicle for start-up enterprise and new funding models.

Additionally, a few cases were identified where a T-shirt has been used to propose future human relationships with materials and technologies. These include water-saving 'dry-die T-shirts' (Chua, 2012), self-cleaning T-shirts (Meinhold, 2014), phone-charging T-shirts (Meinhold, 2012), health-monitoring wellness T-shirts (Meinhold, 2011), and a concept for 3D-printed T-shirts (*The T/Shirt Issue.* 2015)  (Figure 3.3-3 overleaf).   In this way the T-shirt promises to continue its evolution in the 21$^{st}$ century.

*Image removed due to copyright issues.*
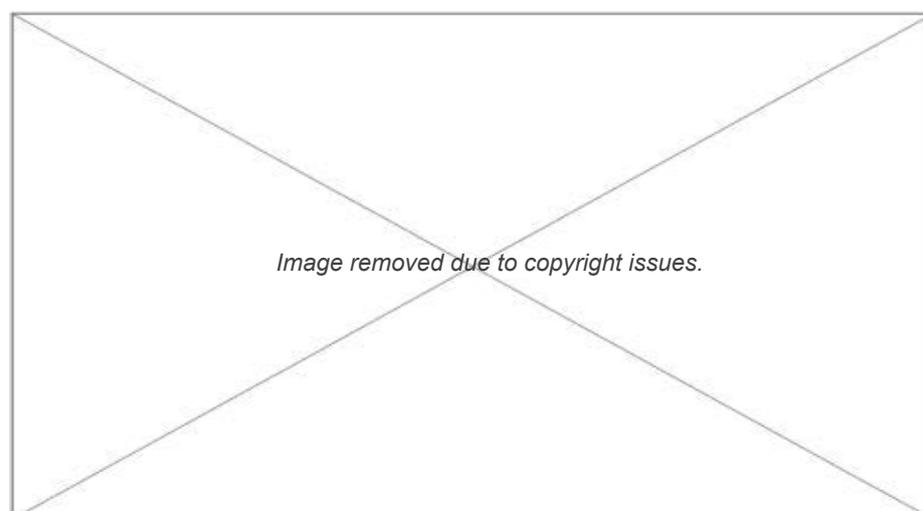
Figure 3.3-3 *The T-shirt Issue* (2008)

The examples that were discussed in Section 3.2 'The slogan tee' have demonstrated the versatility of a simple T-shirt, to campaign and draw attention to pertinent societal matters, and to inspire shifts in attitudes, beliefs and behaviours.   In its extended role, the T-shirt itself creates a platform for discussion, facilitates innovation, and scopes out market opportunities.

The specific properties of the T-shirt, i.e. it is universally worn around the globe, culturally familiar and neutral, versatile, easily customisable and replicable, make the T-shirt the most appropriate choice of a probe for this research project.

The appeal of the T-shirt as a design probe that is wearable and testable, i.e. the T-probe, also aligns with some of the collective properties of the probe approach in research (discussed in Chapter 2.3.3 'Benefits and limitations of probes', p.46).  In all of the examples provided in this chapter, the T-shirt meets some characteristics of probes:

    a)  Interactive and dialectical potential;

    b)  Personal and emotional value;

    c)  Versatility;

d) Openness;

e) Ability to transform attitudes, beliefs and values;

f) Scoping new design avenues.

Chapter 4.0 'Methodology' (p.74) will discuss the devising of a methodological approach to test the potential value of the T-shirt as a probe within the three research projects.

## 4.0   **Methodology**

*This chapter discusses the devising of a methodological framework, with a view to evaluating the potential of the T-shirt as a probe to introducing conceptual materials and evoke sensory experiences, interest and understanding amongst a diverse stakeholder[68] group ('Research aim', p.14).  The selection of research methods within the overall methodological framework is discussed in relation to the specific objectives of the three research projects, and the gathering of data from which relevant conclusions could be drawn.*

## 4.1   Formulation of the research methodology

The specific approach to employing the T-probe in this research emerged as a direct outcome of the critical review of relevant literature and design practice, within which the T-probe was conceived as an approach to introducing novel and challenging material concepts and sensory experiences (discussed in the Chapters 1.0, 2.0 and 3.0).  The key aspects that informed the development of this methodology were:

a) Establishing a practice-led research approach based on the historical and contemporary contexts of the research (Discussed in Chapter 1.2 'Context of the research' (p.3), Chapter 2.2.2 'Speculating design futures' (p.27), and Chapter 2.2.3 'Conceptual materials design' (p.32));

b) The formulation of the T-shirt as a fashion-led probe derived from the methodological field of *probology* (Discussed in Chapter 2.4

---

[68] E.g. funding bodies / academic institutions, enterprise and non-profit organisations

'Formulation of the potential format of the probe for this research
project', p.49);

c) The practical application of the T-probe as a method to advance
understanding of novel and challenging material concepts and
sensory experiences, as set out in the three discrete research
projects (Outlined in Chapter 1.5 'The selection of three discrete
research projects', p.15).

The following sections (4.1.1 : 4.1.3) deal with the above three points in
further detail.

## 4.1.1   Practice-led research

This design research project emerged within a contemporary field of design
enquiry where novel materials and sensory experiences are being explicitly
developed by designers in response to advances in science and
technology (Reviewed in Chapter 2.2.2 'Speculating design futures', p.27
and Chapter 2.2.3 'Conceptual materials design', p.32).  Despite the
societal, environmental, and potential commercial benefits which underpin
this genre of design thinking and practice, extending such ideas across
science, industry and the market, proposes distinct challenges due to
human perception (Chapter 1.2 'Context of the research', p.3).

The research focus highlighted a need to address the relatability gap that a
general public might have in relation to design propositions that are novel
to everyday perception and sensory experience.  Consideration of a more
holistic approach to the introduction and integration of currently
challenging material and sensory concepts foregrounded the methodology
for this research.

## Design- and research-mindedness

Consideration of what constitutes design-mindedness and research-mindedness introduced holism in the research methodology. In this thesis, the terms are used to denote the two distinct mind-sets (Pedgley & Wormald, 2007) that were employed by the author, in devising a methodological framework that would fulfil the scope of research:

Design-mindedness informed decisions relating to:

a) Materials and sensory stimuli to be included in each project;
b) The design activities to be carried out;
c) The method for analysing the artefacts that would be produced at the end of each study.

In the above, the knowledge base and design skill set, as well as engaging with the design intuition of the researcher (Press and Cooper, 2003; Cross, 2006) were all contributory components.

Research-mindedness, i.e. the practice of maintaining a mind-set which would enable the extraction, recording, and analysis of participant feedback in a way that is unbiased by the researcher's own design agenda, was considered valuable in bringing about design concepts as a result of a rigorous research processes.

This marked a departure from approaching this project from a purely speculative design perspective, to one that could provide research insights, thus leading to potentially new opportunities for design applications and market realisation.

From the above, the research methodology fell within the remit of practice-led research[69] (Candy, 2006), in that it aimed to fulfil the criteria of advancing knowledge within the domain of Design about the practice of *probology* in advancing human engagement with novel material concepts and sensory experiences.

By following a systematic methodology of designing the T-probe from concept to actualisation, it was anticipated that this research project would:

    i.    Advance approaches to the design and application of probes in design and research contexts;

    ii.    Scope approaches, methods, tools and processes to enable designers to collaborate with, and across, multiple disciplines and industry, to translate new concepts, to inspire and advance innovative designing, to express, and to raise awareness.

## 4.1.2  The T-probe: a fashion-led approach

The T-probe was formulated early in the research process as an approach, to elicit human engagement and incite participants to reflect upon established perceptions and attitudes (Chapter 2.0 'Probes in research and design practice', p.19):

    i.    As an interactive research technique, probes widely appear as a collection of carefully designed devices, which are used to collect inspirational, yet valuable and relevant participant data and

---

[69] Practice-led research is concerned with the nature of practice and leads to new knowledge that has operational significance for that practice [...] The primary focus of the research is to advance knowledge about practice, or to advance knowledge within practice. Such research includes practice as an integral part of its method. (Candy, 2006)

feedback from a population or a design domain (Section 2.2.1 'Cultural probes', p.21).

ii.    In relation to future designing, the review of literature provided an introduction to design probes as artefacts used to speculate human engagement with conceptual materials and emerging technologies (Chapter 2.2.2 'Speculating design futures', p.27 and Chapter 2.2.3 'Conceptual materials design', p.32).

In this way, the distinct values of the probes approach (Chapter 2.3 'Critique to the probes approach', p.42) informed the formulation of the methodological framework for employing the T-probe (Section 4.2 'Methodological framework', p.81).  It was anticipated that within such an approach new values, applications, and engagement with probes may emerge.

Chapter 3.0 'The T-shirt' (p.58) provided the rationale to the selection of the T-shirt as a broadly fashion-led probe, due to it being an established wearable communication tool addressing a plethora of challenging topics. The specific properties of the T-shirt, many of which aligned with the collective properties of design probes, i.e. its versatility, accessibility, and value as a conduit to various concepts, suggested that the T-probe may be well employed within a research framework capable of operating in a range of contexts and research settings.

## 4.1.3  Applying the T-probe in the three research projects

Applying the T-probe within three discrete research projects (Table 4.1-1 overleaf) would enable the researcher to pilot, assess, and develop the potential of the T-shirt to operate as a design probe within a range of contexts and with different participant groups (Chapter 1.5 'The selection of three discrete research projects', p.15), thus fulfilling the primary research aim.

The development of research projects that would both fulfil the aim of this research, and satisfy the objectives of an external partner, suggested that the T-probe and related methodology may find resonance and applications beyond the personal agenda.

Table 4.1-1 Discrete research projects

**Research Project (I) Fungi materials for clothing:**
*Explores perception of mould as a novel material for garment design and fabrication.*

**Research Project (II) Fashion for deafblind people:**
*Studies how a fashion experience may be introduced to a sensitive user group, i.e. people with visual and auditory impairment.*

**Research Project (III) Synthetic ingredients for fine fragrance**:
*Engages consumer understanding of synthetic ingredients in perfumery.*

Research Project (I) was a pilot study based on the researcher's personal design interest in the development and market introduction of novel bio-based materials.

Projects (II) and (III) were set up in partnerships with non-academic organisations: the charity for deafblind people *Sense* and the global company *International Flavors and Fragrances (IFF)* respectively, to further test the value of the T-probe in advancing understanding of materials and sensory experiences within contexts of social and / or market interest(s).

The three projects (Table 4.1-1 above) were selected based on the following common objectives:

a) To elicit, study and record participant sensory experience and engagement with novel and challenging material concepts and sensory experiences;

b) To enhance designer, industry, and consumer understanding;

c) To further knowledge and understanding of factors affecting public perception and engagement with novel material concepts and sensory experiences in the domains of Design (Projects (I) and (II)) and Industry (Project (III)).

From the above, the employment of the T-probe and the analysis of the findings fell within the remit of qualitative research methodology (Creswell, 2014; Tracy, 2013, Silverman, 2000), because the primary objective within each of the projects was to elicit data and feedback relating to sensory experience and perception of materials, i.e. fungi, textiles, and fragrance ingredients in the three cases respectively.

Some of the strengths of qualitative research methodology that are evident in this study are as follows (Tracy, 2013):

a) A rich and holistic research process;

b) Honouring participants' personal and subjective meanings;

c) Interpreting participants' viewpoints and stories.

The qualitative research methodology contained within it the framework and the flexibility required to support the testing of the T-probe in the three projects.

Furthermore, within the qualitative methodology, the specific methods of Questionnaire (p.87) and Observation (p.91) were chosen to elicit and record the engagements with novel material concepts and sensory experience that took place in each of the research projects.

## 4.2    Methodological framework

In order to evaluate the use of the T-shirt as a probe it was necessary to develop a methodological framework that would lend consistency to the research process, and alignment with the primary objective of each of the projects.  The devising of the methodological framework was guided by the following intentions:

a) To go beyond the current limitations of the probe approach identified in the literature, and explore the use of the T-shirt as a design probe with a balance of principles of good quality design and research-mindedness;

b) To propose a systematic approach to the design and implementation of the T-probe, from concept to actualisation;

c) To test the application of the T-shirt as a design probe in three discrete research projects, with a view to arriving at an understanding of its effectiveness, strengths and weaknesses as a research tool.

The application of the T-probe was constructed as a two-stage engagement process (Figure 4.2-1 overleaf), as follows:

i.    Stage One: participants engage with the T-shirt within a participatory workshop setting;

ii.    Stage Two: the public engages with the T-probe in a social setting.
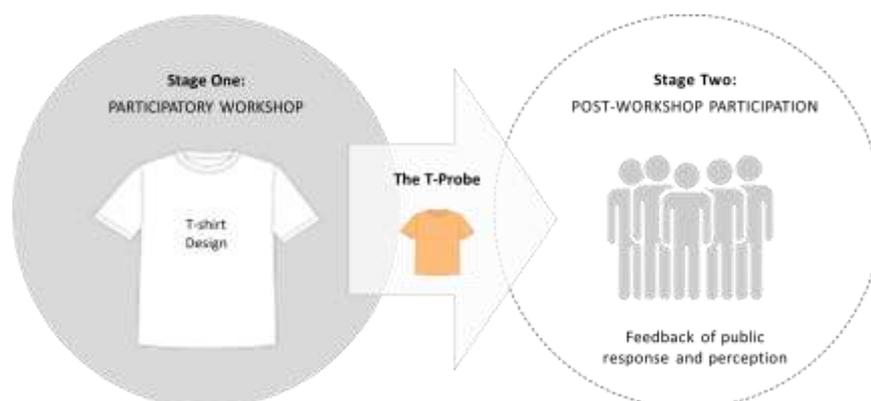
Figure 4.2-1 Methodological framework: Research Projects (I), (II), and (III)

## 4.2.1  Stage One: Participatory workshop

The participatory workshop comprised two phases (Figure 4.2-2 below), as follows:

a) Phase 1: Introduction of specific and relevant stimuli;

b) Phase 2: Facilitating research participants in designing personalised T-shirts which would act as probes during (for all three projects) and after the workshop process (for Projects (I) and (III)).
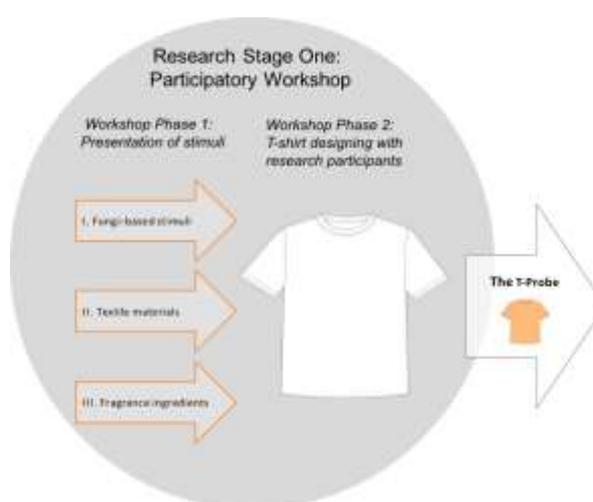


Figure 4.2-2 Workshop phases during *Research Stage One: Participatory Workshop*

a)      Workshop Phase 1: Presentation of stimuli

Relevant stimuli were introduced in each project as catalysts in the design and creation of the T-probe, i.e. fungi, textiles, and synthetic fragrance ingredients, in the three cases respectively.  The idea behind this was that the primary sensory engagement would be different in each workshop, and in its own right lead to the creation of a T-probe that was specific to the Research Project and with unique design qualities resulting from the sensory engagement[70].

The primary sensory engagement with fungi (Research Project (I)) was visual (participants were not allowed to touch however they could smell if they so wished).  The primary sensory engagement with textiles (Research Project (II)) was kinaesthetic (based on touch), and the primary sensory engagement with fragrances (Research Project (III)) was olfactory (based on smell).

The specific selection and design of the stimuli, as well as other materials used in the workshops, e.g. the workshop questionnaires, will be discussed in Chapter 5.2 (p.107), Chapter 6.2 (p. 158), and Chapter 7.2 (p. 200).

b)      Workshop Phase 2: T-shirt designing with research participants

In Phase 2, participants were invited to design a T-shirt for personal use that was specific to the material and sensory concepts explored in each project.  The objectives of involving participants in designing the T-probe were as follows:

---

[70] Stimulation of each individual sense can give rise to different like / dislike responses, depending on the type and intensity of the stimuli that are being used. (Jakob and Collier, 2014)

a) Elicit creative engagement as a direct result of the personal interactions with stimuli.

b) Evoke human interactions, attitudes and feedback;

c) Create a space for discursive feedback.

The level of participatory engagement in designing the T-shirt varied in the three projects to align with the specific intention of the T-probe in that case.  This would allow the researcher to assess, at a later stage, if similarities and differences existed between participant and public engagement with the T-probe in the three projects.

In Research Project (I) *Fungi materials for clothing*, participants were instructed to design their own T-shirt after having engaged with a series of mould-based visuals.  It was anticipated that the engagement with 'raw' perception of mould-based visuals would be creatively expressed in the design of the T-shirt.

In Research Project (II) *Fashion for people with dual sensory impairment*, the T-shirt was used as a centrepiece to the project with a view to enabling a fashion experience for the deafblind participant group.

In Research Project (III) *Synthetic ingredients for fine fragrance*, the visual design of the T-probe was standardised by the researcher prior to the workshop.  Thus participants were asked to select between a series of predefined choices based on the olfactory experience in *Workshop Phase 1*.  Personal choice was the engagement process.

## 4.2.2  Stage Two: Voluntary participation post-workshop

For Research Projects (I) and (III), it was considered that the data gathering and the research process would neatly loop back on itself by having research participants wear the T-shirts in day-to-day life settings,

and receive voluntary feedback from random public members. Thus data relating to perception and engagement of a larger population could be gathered and analysed, to determine the value of having the T-shirt as a probe within the public domain.

Participation in this public-facing component of the research was optional, and therefore the success of this stage of the project was reliant on the participant willingness to wear the T-probe in a variety of social situations in which they felt comfortable, and to actively engage in noting interactions that were triggered by the probe.

Post-workshop participation was only considered appropriate for use in Research Projects (I) and (III). In these two cases specific mechanisms, e.g. social platforms, were set up in place to record participant feedback.

Post-workshop participation was not employed in Research Project (II), because gathering public perception and response did not form part of the Project due to the sensitivity of the participant group (Chapter 6.0, p.155).

## 4.3   Methods of data collection and analysis

Within the overall methodological framework, a combination of design and research methods was chosen to gather the data effectively and conduct the three projects with adequate research rigour. Each project had to be assessed for best-fit research method capable of serving the enquiry element, with due consideration to the fulfilment of the overall research aim.

The analysis of the collected data was guided by the following intentions:

a) To evaluate participant perception and sensory experience of the material concepts explored in each case;

b) To assess the performance of the T-probe as an appropriate method fulfilling the research objective of the specific project.

The following section discusses the relevant methods of data collection and analysis that were employed within the two stages of the research process: *Stage One: Participatory workshop* (for all three projects) and *Stage Two: Voluntary participation post-workshop* (for Research Projects (I) and (III)) (presented in Section 4.2 'Methodological framework', p.81).

### 4.3.1 Methods of data collection and analysis during *Stage One: Participatory workshop*

The *Participatory workshop,* which was Stage One of the research process, was carried out in two phases: 'Workshop Phase 1: Presentation of stimuli' (p.83) and 'Workshop Phase 2: T-shirt designing with research participants' (p.83)

### a) Methods of data collection and analysis during *Workshop Phase 1: Presentation of stimuli*

The Questionnaire and Observation methods were used to record the interactions which occurred in response to the materials and stimuli presented in the three projects.

The Questionnaire was designed to elicit and record specific aspects of engagement with the stimuli presented.

Participant observation via photographic documentation in situ was used to record participant engagement that occurred naturally in

response to stimuli (for all three projects), and provided a visual narrative account[71] of the research process (Research Project (II)).

The following section provides the rationale for choosing these methods, and explains how the data was handled and relevant conclusions were drawn.  Subsequently, Chapters 5.0, 6.0, and 7.0 will expand on how the Questionnaire and Observation were applied to fulfil the specific research objectives of each project.

## Data collection method: Questionnaire

Questionnaire is a method of data collection used within social survey research (Robson, 1993) in which a list of questions is comprised by the researcher to be completed by the research participants (Denscombe, 2003; Bryman, 2012).

The questionnaire was used to extract relevant feedback of participant experience.  In the words of Denscombe (2003: 144-145):

> *"[…] each person who answers the particular questionnaire reads an identical set of questions.  This allows for consistency and precision in terms of the wording of the questions, and makes the processing of the answers easier."*

Denscombe (2003) avers that data gathered from questionnaires relies on written information given by the participant in direct response to questions

---

[71] A descriptive approach used to provide a detailed story of the events and interactions that have taken place (Robson, 1993)

asked by the researcher.  This lends itself to easy analysis and coding[72], which was a primary intention of the data gathering process in this study.

The general types of questions considered in the design of the questionnaire included open questions[73] (Denscombe, 2003), Likert scale choices[74] (Robson, 1993), and closed questions[75], e.g. Yes / No questions and multiple-choice questions (Denscombe, 2003).

> Open-ended questions were used to record subjective and personal response to the presented sensory stimuli.  Open-ended questions were particularly relevant in the case of Research Project (II) to capture the richness of the sensory experience by the participants.

> Likert scales, e.g. Like / Dislike scales, were used to provide quantifiable measures of participant response.

> Multiple-choice questions were used to attain personal associations between the presented stimuli and sensory qualities.

> Yes / No questions were used to gather data about preference.

The types of questions included within the questionnaires varied in the three research projects based on:

---

[72] Coding is a stage of data analysis used by social researchers to quantify data that has been obtained in unstructured form, i.e. by grouping the data into categories and assigning numbers to the different categories so that it could be analysed and interpreted (Bryman, 2012).

[73] Questions that allow the respondent to decide the wording and length of the answer, and the kind of matters to be raised in the answer (Denscombe, 2003)

[74] The summated rating (or Likert) scale is a type of systematic scaling technique used for attitude measurement, originally devised by Likert in the 1930s and therefore commonly referred to as Likert scale (Robson, 1993).

[75] Questions that structure the answers by allowing only answers that fit into categories that have been pre-selected by the researcher; generally used to produce quantitative data (Denscombe, 2003)

i.      The feedback of interactions, attitudes and feedback that were sought;

ii.     The objectives of each research project and the participant group.

In Projects (I) and (III) the questionnaire included all question types discussed above.  In Project (II) Likert scales and closed questions were considered inappropriate due to the sensory and cognitive impairment of the participant group[76].  The questionnaire in this case only contained simplified open-ended questions regarding participant experience of the presented sensory stimuli.

A tabular representation of this is given on the following page.

---

[76] A group of people with dual sensory impairment in combination with other cognitive and learning disabilities

Table 4.3-1 Questionnaire content in Research Projects (I), (II), and (III)

| Question type | Purpose | *Questionnaire content in Research Projects (I), (II), and (III)* | | |
| --- | --- | --- | --- | --- |
| | | Research Project (I): Fungi materials for clothing | Research Project (II): Fashion for deafblind | Research Project (III): Synthetic ingredients for fine fragrance |
| **Open-ended questions** | *To record subjective and personal response to the presented sensory stimuli, especially in the case of Research project (II) in which there was insufficient preliminary data to inform the development of closed questions* | ✓ | ✓ | ✓ |
| **Likert scales** | *To provide quantifiable measures of participant response to the presented stimuli* | ✓ | (Questions presented verbally to the participants) | ✓ |
| **Closed questions** | *To trigger specific associations of the presented stimuli with sensory qualities, e.g. colour, texture, smell, intensity, etc. (multiple-choice questions), and to ascertain shifts in attitudes and perception (Yes / No questions)* | ✓ | Considered inappropriate due to the sensitive nature of the sample group and the research setting, and therefore eliminated from the questionnaire | ✓ |

For the specific questionnaires used in Projects (I), (II), and (III), see Volume Two, Appendices 5.1.3 (p.326), 6.1.4 (p.393), and 7.1.4 (p.445) respectively.

**Procedure for analysis of participant response to the Questionnaire**

The participant responses gathered via the Questionnaire were categorised based on the nature of the data.  Qualitative data, e.g. words, and descriptions of personal experience, was gathered via open-ended questions.  The quantitative data was gathered via Likert scales and closed questions.

The qualitative data was analysed thematically (Braun and Clarke, 2006) using the following general categories:

  i.   Engagement or disengagement;
 ii.   Affinity or aversion.

In categorising the data into the above themes the researcher was guided by the objectives of each of the projects and the research findings aimed at, in order to assess the range of sensory experience, e.g. aversion to mould-based stimuli.

The quantitative data was analysed by counting the number of participant responses against each measurement or category contained in the questionnaire, with a view to arriving at a general indication of a group preference for attitudes and sensory engagement toward specific materials.

Data collection method: Participant observation

The potential of the observation method to document behaviours and attitudes in a field-based setting (Bryman, 2012) aligned with the research objectives of the three projects. The data gathered comprised photographic images. This was considered valuable in assisting the researcher to add a level of richness to understanding participant interactions.

By directly observing how research participants engaged with the individual stimuli, anomalies between participant responses gathered via the Questionnaire and actual behaviour could be detected. There was no intention to cross-check participant preferences but to add a level of research depth to the data gathering and analysis processes.

Unstructured observation[77] facilitated this research intention (Bryman, 2012).

The observation method was used across all three Research Projects.

> In Research Projects (I) and (III) this was done by requesting multimedia support from Kingston University, and instructing the photographer to take a photograph of participants engaging with the stimuli as the interactions took place. The idea behind employing a third party to capture the data was that the researcher would remain available to the participants during the workshop in case questions arose for clarification. This meant that the collection of the data was reliant on:

---

[77] Unstructured observation, in contrast to structured observation, does not involve the design of observation schedules. These are a set of rules for the observation and recording of behaviour, used to ensure that each participant's behaviour is systematically recorded so that it is possible to aggregate the behaviour of all of those in the sample in respect of each type of behaviour being recorded (Bryman, 2012).

a) Clear briefing of the multimedia staff members regarding the particular evidence the researcher was looking for;

b) The technical expertise of the multimedia team to observe and capture the data that was required (the researcher was convinced that the party fulfilled this expertise by having worked previously with the photographer during MA course);

c) Non-invasive use of suitable technology to record the data[78];

d) Participants' consent to be filmed / photographed / recorded.

In Research Project (II), the photographic data capture was done by the researcher, who was free to act as an observer between short bursts in the workshop facilitation role.  As with the instructions given to the photographer, the researcher endeavoured to include all participants in the images taken.

**Procedure for analysis of photographic evidence**

The photographic evidence of participant interaction comprised pictures taken by the photographer (Research Projects (I) and (III)) or the researcher (Research Project (II)) during the workshops.  As with the qualitative data from the Questionnaire, the photographs were thematically analysed for engagement (showing affinity or aversion) or disengagement (e.g. neutral).

In all three projects Dr Melanie Flory[79] overlooked the categorisation of participant engagement / disengagement, with the view to add rigour to the qualitative analysis, and contribute to the evaluation based on the psychology of emotion (Ekman, 2004).

---

[78] Technological failure can result in loss or partial damage of recorded data.

[79] A neuroscientist with a background in affective neuroscience (the study of how neurons behave in relation to emotions)

b)      Methods of data collection and analysis during *Workshop Phase 2: T-shirt designing with research participants*

As discussed in Section 4.2.1b) 'Workshop Phase 2: T-shirt designing with research participants' (p.83), the level of participant engagement in designing the T-shirt varied within the three projects.

In analysing the data, the researcher was looking for whether the T-shirt presented an adequate framework for participant engagement, to a lesser or greater degree, with the material and sensory concepts explored, and whether the resulting T-shirt (T-probe) that was created, was as a direct result of an engagement with the stimuli presented.

> In Research Project (I) the design of the 'mouldy' T-shirt was carried out as one-hour one-to-one appointments hosted by the researcher over a two-day period.  During the session, each participant was instructed to design a T-shirt with a preferred mould image from a gallery of 100 images that had been compiled by the researcher prior to the workshop (See Volume Two, Appendix 5.1.4, p.330).  Factors for consideration were:
>
> i.   Size and positioning of the mould image within a T-shirt template;
> ii.  Colour moderation, i.e. whether to keep, or modify the original colour of the image.
>
> Design sheets with the T-shirt template were used to record the T-shirt designs chosen by the participant, e.g. Figure 4.3-1 overleaf, with a view to producing the T-probe for the post-workshop participation stage of the research process.

Figure 4.3-1 An example of T-shirt design sheet produced by a workshop participant in Research Project (I). April, 2012

The design sheets produced by the participants were arranged in a table according to the participant number (P) and the number of T-shirts designed by each participant (T) (Volume Two, Appendix 5.3.4, p. 351).

The T-shirt designs were analysed visually by categorising them under two main themes:

  i.   T-shirt designs that were kept close to the original mould image;
  ii.  T-shirt designs that involved greater design modification by the participants, e.g. colour moderation, or re-scaling of the image.

This data set was a visual record of creative engagement with mould-based designs and the final T-probes arrived at, thus serving to provide evidence whether the T-probe fulfilled its research intention.

In Research Project (II) *Fashion for people with dual sensory impairment*, the T-shirt was used as the centrepiece to the study. This phase of the workshop was conducted over two weeks, which would allow time for both the designing and making of the T-shirts.

Each participant was asked to:

i.   Choose a design for their T-shirt by selecting between short or long sleeves, scoop or V-neck;

ii.  Develop a decorating technique, e.g. collage / painting, for the making of their T-shirt;

iii. Make the actual T-shirts with support from their communication guides and the researcher.

By asking the deafblind participant group to design a T-shirt that they would be proud to wear, e.g. by incorporating their favourite activities, and / or engaging creatively in the making of the T-shirt, the aim was to observe and record how this user group would engage in a fashion-related experience.



Figure 4.3-2 An example of T-shirt design sheet produced by a deafblind workshop participant in Research Project (II). August, 2013

Design sheets (Figure 4.3-2, p.96) were used as a method of planning the production of the actual T-shirt artefact.

Participant observation via photographic evidence in situ was the method used for documenting the design and making of the T-shirts, to provide a visual narrative of the interactions that took place.

In analysing the level of creative engagement, the T-shirts were grouped into two main categories:

i.  T-shirt designs where the creative process was led by the participant and then translated into a finished garment with the support of the communication guides and the researcher;

ii. T-shirt designs where the design process was based on input from the communication guides'[80] translation of participant feedback and creative expression.

The design and making of each T-shirt is described in Chapter 6.3.2 'Data collection and analysis, Workshop Phase 2: *T-shirt co-creation*', p.179) in order of the T-shirts that were creatively-led by the participant, followed by the ones that were creatively-led by the communication guide.  Narrative account (Robson, 1993) was considered most appropriate to develop an understanding of the interactions that took place, and unravelling each participant's individual approach to the creation of their T-shirt.

In Research Project (III) *Synthetic ingredients for fine fragrance*, the visual design of the T-probe was standardised by the researcher prior to the workshop.  Thus participants were not required to use creative

---

[80] In cases where the T-shirt designs were guide-led it was due to either the inability of the participant to express their ideas verbally or in any written or creative format

imagination in the design, but to select between a series of predefined choices (Figure 4.3-3 below).
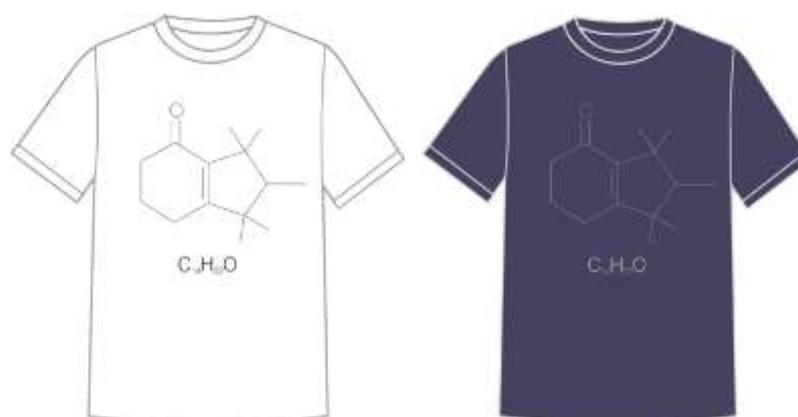


Figure 4.3-3 T-shirt design template variations, standardised by the author for Research Project (III). August, 2014

The workshop questionnaire allowed for participants to name the fragrance ingredient of their choice, which had a molecular coding that would become screen printed on the T-shirt as a design.  The colour and texture used for screen-printing the fragrance molecule on each of the T-shirts would be based on the individual participant responses to Questions No. 4 (colour association) and Question No. 5 (texture association) in relation to the ingredient they had chosen.

The data was tabulated to show the molecular coding of the fragrance ingredient, as well as the texture and colour, chosen by each participant (Volume Two, Appendix 7.3.2, p.476).

This data set required no further analysis, as it was just a production specification of the T-shirts that were to be printed and posted to the participants.

### 4.3.2 Methods of data collection and analysis during *Stage Two: Voluntary participation post-workshop*

As discussed in Section 4.2.2 'Stage Two: Voluntary participation post-workshop' (p.84), for Research Projects (I) and (III), participation in the public-facing component of the research was considered an essential component, to fulfil the scope of the research in testing the T-probe as a two-fold approach serving both design and research intentions.

Participation in the public-facing component was voluntary, and therefore the success of this stage of the project was reliant on the participant willingness to wear the probe in a variety of social situations in which they felt comfortable, and to actively engage in noting interactions that were triggered by the probe.

In Research Projects (I) and (III), where social and public engagement was recorded, the data collection involved the use social platforms, e.g. Facebook and Twitter in order to collect and collate public feedback.

However, for both projects, this data collection method proved unsuccessful due to limited engagement of the participants with the social platform, for reasons unknown to the researcher. In response to this poor feedback, the research decided to employ the Questionnaire method so as to fulfil the final stage of data gathering.

The questionnaire comprised a blend of multiple-choice and open-ended questions. There were six questions in total: five multiple-choice and one open-ended question. The multiple-choice data was quantified by counting the number of participant responses against each choice presented. The open-ended question allowed for data to be gathered about subjective public response.

See Appendices 5.1.5 (p.333) and 7.1.5 (p.448) for the feedback questionnaires used in Research Projects (I) and (III) respectively.

It was anticipated that this stage of data gathering and analysis would lend another level of rigour to the research process, by enabling the researcher to evaluate the impact of the T-shirt as a probe in the public domain for opening up discussions and feedback, which is going beyond its historical use (Chapter 3.0 'The T-shirt', p.58).

## 4.3.3 Method for research analysis: Triangulation

As the data gathered during- and post-workshop for Projects (I) and (III) was processed for analysis, it became apparent that given the small number of research participants in the study and the mix of methods used, the participant response would need to be mined for its richness.

Triangulation[81] (Denzin, 1989) was considered logical and appropriate to draw together the qualitative and quantitative findings, with a view to:

i. Providing a more holistic understanding of participant opinions and preference in relation to the material and sensory concepts explored in the two projects, and

ii. Establishing the value of the T-probe in advancing perception and engagement.

Methodological triangulation was chosen from the four types of triangulation described by Denzin (1989) because it was deemed most suitable for the following reasons:

a) The study contained both qualitative and quantitative-based methods of data gathering and analysis, i.e.

    i. Questionnaire – qualitative-based questions;

    ii. Questionnaire – quantitative-based questions;

---

[81] The use of *"multiple observers, methods, interpretive points of view, and levels and forms of empirical materials in the construction of interpretations"* (Denzin, 1989)

iii.   Analysis of photographic evidence – qualitative;

iv.   Analysis of documents such as design sheets and designed artefacts – qualitative;

b) Qualitative data that was rich in personal interpretation and responses;

c) An opportunity to further explore the data for its richness, to identify common themes, to check for rigour in the research process;

d) Small participant groups.

Wegner and Flandorfer (2011) state the benefits of methodological triangulation as follows:

a) Compensating for disadvantages of a specific method or approach;

b) Increasing the validity of the findings;

c) Broadening the understanding of the phenomenon.

Yeasmin and Rahman (2012) claim that in methodological triangulation, engagement with the data goes beyond the question of validity and can lead to widening the understanding of phenomena, and encourage and support interdisciplinary research in the future.

This aligned with the overall research aim and the objectives of the discrete research projects, i.e. to draw conclusions in relation to the potential of the T-probe to introduce conceptual materials and evoke sensory experiences, interest and understanding amongst a diverse stakeholder group.

After considering different diagrammatic representations to illustrate the results of the triangulation process, a factor space graph[82] (Figure 4.3-4)

---

[82] A graph connecting variables and factors

was chosen as most suitable, because of its visual clarity in depicting the findings in specific areas within the factor spaces[83].
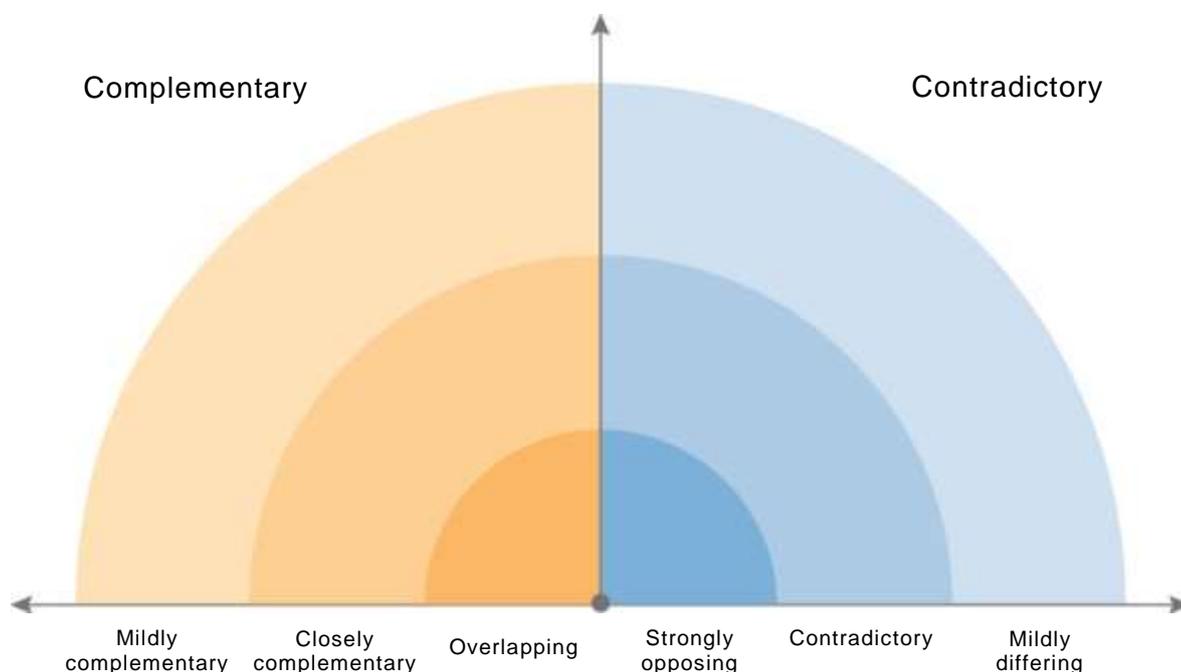


Figure 4.3-4 Factor space graph used for methodological triangulation of findings in Research Projects (I) and (III)

As shown in Figure 4.3-4 above, the data would be factored into two categories: "complementary" and "contradictory".  Complementary findings would be those where the quantitative and qualitative findings within the data sets converged, and contradictory findings would be those where the qualitative and quantitative findings displayed diversity.

_____

[83] The categorisation of the data under specific factors by the researcher after examining the qualitative and quantitative findings several times over to find one or more factors in which they related to each other

Those qualitative and quantitative findings which complemented each other are depicted in the left half of the factor space graph, and where the quantitative and qualitative results did not match, or contradicted each other, appear in the right half of the factor space graph.

The space used in the case of the complementary factor (left sector) was divided in three categorisations:

i. Overlapping: where the qualitative and quantitative results overlapped each other closely;
ii. Closely complementary: with many common factors;
iii. Mildly complementing: where the qualitative and quantitative findings had a hint of agreement without being neutral or contradictory in any way.

The space used in the case of the contradictory factor (right sector) was also divided in three categorisations:

i. Strongly opposing: constituting those findings that had no semblance or commonality at all between them;
ii. Contradictory: the middle ground where there was no opposition but a direct contradiction of the results, e.g. a qualitative finding of affinity with a quantitative finding of aversion;
iii. Mildly differing: with a hint of differing without being totally opposed or in direct contradiction between the data set findings.

Methodological triangulation was employed in the analysis of Research Projects (I) and (III) to mine the data for its richness, given the small number of research participants in the study and the mix of methods used.

In Research Project (II), the triangulation method was not considered essential because:

a) Only *Stage One: Participatory workshop* of the methodological framework was deemed appropriate for this project;

b) All of the data gathered was qualitative;

c) The narrative account of the interactions that took place provided an in-depth story of participant sensory experience and engagement via the T-probe.

# Research in Practice: Research Projects (I), (II), and (III)

*The following Chapters 5.0 (p.106), 6.0 (p.155), and 7.0 (p.198) describe how the T-probe and related methodology (Chapter 4.0, p.74) were applied in practice.*

*Each chapter begins with a reminder of the background to the project and outlines the specific challenges to sensory experience and perception of a novel material concept. This provides the rationale for employing the T-probe in that particular context.*

*The data collection and analysis for each project is dealt with by following the methodological framework discussed in Chapter 4.2 'Methodological framework' (p.81).*

*Each chapter concludes with a discussion of research outcomes and findings (Chapter 5.5 (p.151), Chapter 6.4 (p.194), and Chapter 7.5 (p.258) for the three projects respectively). In all three cases, research outcomes and findings that emerged from the data collection and analysis were two-fold:*

i. *Findings that were specific to each research project – in direct relation to the material concepts and sensory experience that were explored;*
ii. *Research-based evidence of the potential of the T-probe in advancing understanding of, and engagement with, these concepts.*

# 5.0    Research Project (I):  *Fungi materials for clothing*

*The following chapter presents how the T-probe approach was employed within Research Project (I) to explore perception of mould as a novel material for garment design and fabrication.*

*The chapter begins with a reminder of the background to the Project, thus providing the rationale for employing the T-probe in that particular context. A discussion of the specific design and research processes involved in the set-up of the research project is provided.*

*The data collection and analysis for that project is explained by following the two-stage methodological framework discussed in Chapter 4.2 (p.81). Stage One expressed itself as a Mould Perceptions workshop.  Stage Two involved participants wearing T-shirts with mould-based designs within social settings to elicit public feedback and responses.*

*The chapter concludes with a discussion of findings and outcomes that are specific to the Project, and provides a knowledge base about the value of using the common T-shirt as a probe.*

## 5.1    Background to the Project

The project was driven by the personal design interest of the researcher in the development and introduction of novel bio-based materials.  At the early stages of the research process, this expressed itself in the form of experimental design practice which explored how fungi as media may be used as a future sustainable material for fashion and textiles fabrication (Appendix 1.1 'Fungi for fashion and textiles fabrication', p.306).

As the concept of fabricating a textile from a fungus advanced in terms of materials research, the researcher began to consider how alternative, yet

obscure materials from natural origin, fungi being an example in point, could be introduced to the high-street fashion market (Chapter 1.2.1 'Launching a 'mouldy' T-shirt: design speculation', p.4).  Mould, to be converted into a durable material, would face the challenge of overturning its inherent negative associations with decay, disease and deterioration, which have been evidenced in the literature (Moss, 1987; Rachman, 2004).

This created scope for piloting the T-shirt as a probe to help connect the potential end user and industry with the concept of fungus-based artefacts and products.  In this way the project aligned well with the overall research aim of developing the potential of the T-probe as an approach to introducing novel and challenging concepts relating to materials and sensory experiences.  Further to this the project created scope to:

a) Elicit, study and record participant sensory experience and engagement with mould-based stimuli;

b) Enhance designer, industry, and consumer understanding of the potential use of fungi as a potential material for garment design and fabrication;

c) Further knowledge and understanding of factors affecting public perception and sensory engagement with novel and challenging material concepts, fungi being an example in point.

## 5.2   Study design

The Research in Practice followed the two-stage research process discussed in Chapter 4.2 'Methodological framework' (p.81).

*Stage One: Participatory workshop* expressed itself as a *Mould Perceptions* workshop involving two engagement processes:

i. Phase 1: Exploring mould via direct engagement with mould-based stimuli;

ii.    Phase 2: Creative engagement of participants to design a T-shirt using mould-based visual materials.

In *Stage Two: Voluntary participation post-workshop*, the T-shirts designed by the research participants were worn as probes within social settings, to elicit public reaction and response in relation to fungi-based garment designs.

This pilot project was designed in discussion with the multi-disciplinary PhD supervisory team[84] overlooking the research intentions and process. This involved:

a) Decisions about workshop location and recruitment procedures;
b) Preparation of materials and stimuli to be included in the workshop;
c) Design of the workshop questionnaire;
d) Requesting workshop assistance;
e) Discussion of ethical concerns.

In managing the research process, the following criteria were given due consideration in relation to Kingston University's *Guide to Good Research Practice*[85] and *Health and Safety* guidelines[86]:

---

[84] Prof Jane Harris (Design), Dr Paul Micklethwaite (Sustainability and Social Innovation), and Dr Lori Snyder (Biotechnology)

[85] Available at: http://cdn.kingston.ac.uk/documents/aboutkingstonuniversity/howtheuniversityworks/policiesandregulations/documents/research_good_practice.pdf

[86] Available at: http://www.kingston.ac.uk/aboutkingstonuniversity/howtheuniversityworks/policiesandregulations/documents/health_safety_statement.pdf

## 5.2.1 Workshop location

Stage One of the project, the *Mould Perceptions* workshop, took place in Kingston University London (Knights Park campus). The University was selected as a suitable location for this study for the following reasons:

i. The student body is of a wide demographic and spans diverse academic backgrounds;

ii. Easy access to the research location for participants, the researcher and support staff;

iii. An available research studio space which provided a range of equipment and facilities conducive to conducting a participatory workshop.

## 5.2.2 Recruitment procedures

It was hoped that there would be twelve participants in the workshop. This number was considered a manageable group size given the large practical component involved.

It was also hoped that there would be a mix of students from the Arts and from the Sciences, in order to test whether the different educational background may impact participant response to the concept of mould as potential media for design.

Recruitment procedures included:

i. Direct e-mail invitation to several BA and BSc Course Directors across Kingston University London;

ii. Research recruitment posters (See overleaf) placed at strategic engagement points within the Faculties of Art, Design & Architecture (FADA) and Science, Engineering and Computing (SEC).

Recruitment poster

The recruitment poster (Figure 5.2-1 below) was designed by the researcher and approved by the supervisory team.  The design was guided by the following intentions:

i.    Clarity of information;
ii.   An enigmatic visual image that would elicit engagement and interest across the diverse student cohort.
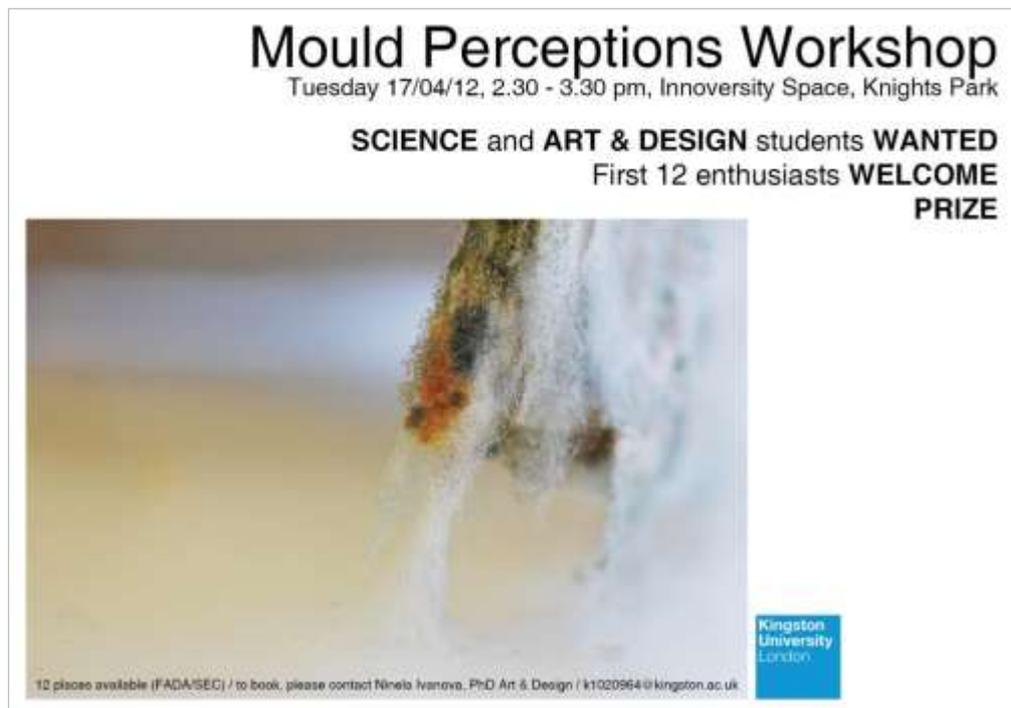
Figure 5.2-1 Research Project (I): Recruitment poster. Graphic design by the author, March 2012

## 5.2.3  Workshop participants

Ten participants responded to the recruitment procedures and were all included.  The average age of the participants was 22.5 years, with the youngest participant being 18, and the oldest being 25 years of age.  Six

participants were female with an average age of 22 years. Four participants were male with an average age of 23 years. Two participants were from the Faculty of Life Science, with one being female and one being male. Eight participants were from the Faculty of Art, Design and Architecture (FADA), with five being female and three male (Table 5.2-1 below).

Table 5.2-1 Research Project (I): Workshop participants

| Participants | No | Average age | Overall age of participants | Faculty | |
|---|---|---|---|---|---|
| | | | | Life Sciences | FADA |
| Female | 6 | 22 | 22.5 | 1 | 5 |
| Male | 4 | 23 | | 1 | 3 |

For breakdown of participant particulars, see Volume Two, Appendix 5.2, p. 334.

The ten-person response rate (80% of wished-for participation) was not considered a drawback to the study, as it showed direct engagement with the title of the poster *Mould Perceptions* workshop (Figure 5.2-1, p.110). Personal interest and curiosity were considered advantageous to participation in the research process, particularly in relation to the second stage of the methodological framework which involved wearing the designed T-probes voluntarily post-workshop.

## 5.2.4  Selection of workshop stimuli

Phase 1 of the participatory workshop involved presentation of relevant stimuli, to explore participant perception of mould via direct engagement with mould-based media, and as a consequence inform the design of a T-

shirt probe that was specific to this project.   The primary sensory engagement in this case was visual.

The stimuli used in the workshop were as follows:

    i.      Live fungi, i.e. seven specimen jars of mouldy fruit;

    ii.     Projection of visual stimuli on screen.

Live fungi: jars of mouldy fruit



Figure 5.2-2 Research Project (I): Seven specimen jars of mouldy fruit at various stages of decay, containing vine tomatoes, strawberries, pears, grapes, apples and oranges. Image courtesy of Ezzidin Alwan, April 2012

The selection of living fungi was based on previous experimentation with the type of mould that naturally decays fruit (Figure 5.2-2 above).  These stimuli were chosen to allow participants to attain perception in relation to everyday matter presented in an unusual setting (rotting fruit in a design context as opposed to a domestic one).  In a discussion with the Director of Studies this was deemed a first step to testing the project, whilst the actual fungi-based materials were being developed in the laboratory.

The second set of stimuli presented was a series of twelve pictures of mould projected on a screen.  The aim of this was to explore engagement with mould primarily through visual stimuli without other sensory engagement such as texture and smell[87].

The visual stimuli (Table 5.2-2, p.114) were divided into two groups of six images each, as follows:

Images 1-6: visuals of rotting or mouldy food in different stages of decay, photographed with a standard optical lens, or a point-and-shoot type camera;

Images 7-12: macro-images of mould on various media, chosen specifically for their more detailed representation of fungi.

---

[87] Such factors are considered triggers of disgust and fear of contamination (Rachman, 2004).

Table 5.2-2 Visual stimuli projected on screen at the *Mould Perceptions* workshop
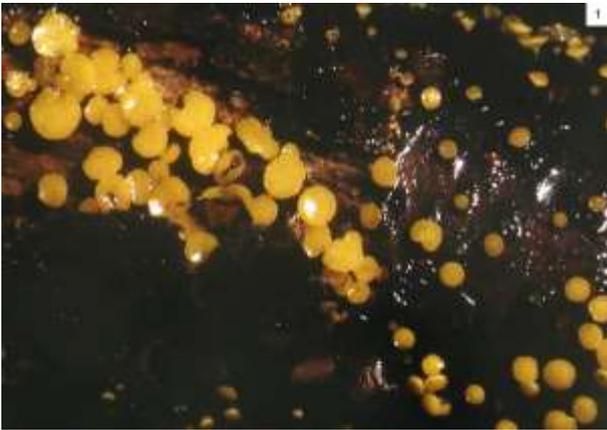
| *Images 1-6: visuals of rotting or mouldy food in different stages of decay, photographed with a standard optical lens, or a point-and-shoot type camera* | *Images 7-12: macro-images of mould on various media, chosen specifically for their more detailed representation of fungi* |
|---|---|
|  Image 1: Fungus decaying wood |  Image 7: Mould on bioplastic |
|  Image 2: Rotting meat |  Image 8: Mould on strawberry |
|  Image 3: Mouldy rice water |  Image 9: Mould on orange |
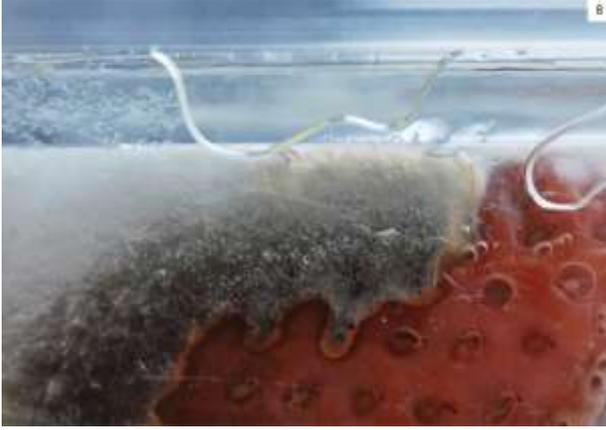
Image 4: Moldy hummus


Image 10: Mould on paper mache


Image 5: Mouldy rice pudding


Image 11: Mould on Kombucha


Image 6: Mouldy orange juice


Image 12: Mould on a piece of cake

The idea behind having two distinct groups of visual stimuli was to ascertain whether bringing greater mould detail to the naked eye would make a difference from the previous stimuli in relation to participant cognitive and sensory engagement and feedback.

In relation to designing fungi-based materials, this could provide insights and inspiration for designers in developing the material and sensory properties of novel textiles and products, in a way that resonates with the end-user / consumer, as opposed to being led by the designer's aspirations and taste.

## 5.2.5  Data collection methods

As discussed in Chapter 4.3 'Methods of data collection and analysis' (p.85), a combination of design and research methods was chosen to gather the data effectively and conduct the three projects with adequate research rigour.

A tabular representation of the methods used within each stage of this Project, and the data that was collected from the participants is given below.

Table 5.2-3 Research Project (I): Research methods and data collected

| *Project stage* | *Method and data collected* |
|---|---|
| **Stage One: *Participatory workshop*** | |
| a)  Phase 1: *Exploration of stimuli* | Questionnaire response:<br>• Quantitative<br>• Qualitative<br>Observation via photographic evidence in situ |
| b)  Phase 2: *T-shirt designing* | Design sheets |
| **Stage Two: *Voluntary participation post-workshop*** | |
| T-probe in the public domain | Participant feedback of public response |

The two main methods of recording participant sensory engagement and response were Questionnaire and Observation.  For the rationale behind choosing each specific method, refer back to Chapter 4.3 'Methods of data collection and analysis' (p.85).

## Questionnaire design

The workshop questionnaire was used to record the interactions which occurred in response to mould-based stimuli.  The design of the questionnaire was overlooked by the supervisory team to ensure that the sequence and wording of the questions would fulfil the research intentions and process.

As discussed in Chapter 4.3.1a) 'Data collection method: Questionnaire' (p.87), the types of questions included within the questionnaire were based on:

i.     The feedback of interactions, attitudes and feedback that were being sought;
ii.    The objectives of the research project and the participant group.

In this case, the questionnaire included all question types previously discussed:

*Open-ended questions* were used to record subjective and personal response to the mould-based stimuli.

*Likert scales* were used to provide quantifiable measures of participant response to the stimuli

*Closed questions* were used to trigger specific associations of the presented stimuli with sensory qualities, e.g. colour, texture, smell,

intensity, etc. (multiple-choice questions), and to ascertain shifts in attitudes and perception (Yes/No questions).

For the final version of the questionnaire used in the *Mould Perceptions* workshop, see Volume Two, Appendix 5.1.3 (p.326).

## 5.2.6  Workshop assistance and support

The workshop was led by the researcher, with an assistant to help with administrative tasks such as distribution and collection of workshop materials and questionnaires within *Workshop Phase 1: Presentation of stimuli*.

The collection of visual data for this Research Project was supported by the Multimedia Department at the University, to provide photographic evidence of participant reactions and responses.  In this way the researcher remained available to the participants during the workshop in case questions arose for clarification.  The photographer[88] was given instructions to ensure inclusion of all participants when taking the photographic evidence.

## 5.2.7  Ethics

The project involved active human participation at all stages of the research process.  Therefore, ethical clearance was sought and obtained prior to the commencement of the project, to ensure the physical and emotional wellbeing of research participants and researcher.

---

[88] Ezzidin Alwan from the Web & Multimedia department at Kingston University London

In this research project, of main ethical concern was the handling of potentially hazardous mould-based matter by the research participants. On the advice of the Biotechnology supervisor, Dr Lori Snyder, the moulds were presented in closed containers, and individuals of poor health were not allowed to take part in the workshop.

Information Sheets and Informed Consent Forms (Volume Two, Appendices 5.1 (p.321) and 5.1.2 (p.324)) were obtained from the research participants in the beginning of the workshop, to enable their participation in the research.

## 5.3 Data collection and analysis

The data collection and analysis are explained in order of the following stages, which follow the methodological framework proposed in Chapter 4.2 'Methodological framework' (p.81):

i.      Stage One: *Participatory workshop*;
ii.     Stage Two: *Voluntary participation post-workshop*.

In seeking to analyse the data gathered, the researcher was guided by the following intentions:

a) To evaluate participant perception and sensory experience of mould as a potential material for garment design and fabrication;
b) To assess the performance of the T-probe as an appropriate method to help connect the potential end user and industry with the concept of fungus-based artefacts and products.

## 5.3.1 Data collection and analysis, Stage One: *Mould Perceptions* workshop

Timetable and activities

The data collection for Stage One: *Mould Perception* workshop had two phases, which were split over three days in total.

Workshop Phase 1: *Exploration of stimuli* took place in one day with an overall duration of 40 minutes.  Specific time slots were allocated to each intended workshop activity, as follows.

Table 5.3-1 Research Project (I). Timetable *Mould Perceptions* workshop Day 1, Phase 1: *Exploration of stimuli*

| | Workshop item | Duration |
|---|---|---|
| i. | Introduction and purpose of the study | 5 mins |
| ii. | Data collection, Phase 1: Presentation of mould-based stimuli:<br>• Questionnaire<br>• Observation | 25 mins |
| iii. | Participant debriefing | 7 mins |
| iv. | Guidelines for further participation | 3 mins |
| | **Total duration:** | **40 mins** |

Workshop Phase 2: *T-shirt designing* was hosted within one-to-one appointments over a two-day period.  The length of each appointment was one hour.

a)      Data collection and analysis, Workshop Phase 1: *Exploration of stimuli*

*Mould Perceptions* workshop: Introduction and purpose of the study

The introduction to the workshop was carried out by the researcher in verbal format.  The following aspects were covered:

i.      Name and affiliation of the researcher
ii.     Purpose of the workshop
iii.    Structure of the workshop
iv.     Ethical considerations
v.      Health & Safety guidelines
vi.     Any questions from the participants arising at this stage

The researcher ensured that the Information Sheet (Volume Two, Appendix 5.1, p.321) was read and understood and requested signing of the Informed Consent form (Volume Two, Appendix 5.1.2, p.324).

Presentation of mould-based stimuli

Relevant stimuli (Section 5.2.4, p.111) were introduced to explore participant perception of mould via direct engagement with mould-based media, and as a consequence inform the design of a T-shirt probe that was specific to this project.

The Questionnaire and Observation methods were employed as data collection methods during this phase in order to record the interactions which occurred naturally in response to the materials and stimuli presented in each case.

**Participant engagement with the jars of mouldy fruit: data collection and analysis**

A questionnaire related to mould perceptions (Volume Two, Appendix 5.1.3, p.326) was handed out to the participants to enter their personal details.  Participants were informed that they would be using the questionnaire as a recording sheet of their responses in relation to each of the stimuli to be presented.

Participants were instructed to come forward with their questionnaires and engage visually with the jars of mouldy fruit (Figure 5.3-1 below).



Figure 5.3-1 Research Project (I): Participant exploring jars of mouldy fruit. Image courtesy of Ezzidin Alwan, April 2012

Participants were asked to respond to the jars of mouldy fruit in the following way:

*Please carefully examine the boxes in front of you.*

Q1. What can you see inside?

- o Colours (please specify)

  _____

- o Texture (please specify)

  _____

- o Smell (please specify)

  _____

- o Other (please specify)

  _____

Open-ended question as appearing in the workshop Questionnaire
(for full Questionnaire see Volume Two, Appendix 5.1.3, p.326)

Participant response to the above question is presented in Volume Two, Appendix 5.3.1 (p.336). The responses were arranged in tables against each participant who was assigned a participant number H_1 to H_10 (Number of participants = 10) on a random basis.

The qualitative data was coded in order to classify and categorise the data thematically under four main themes: affinity / aversion responses, sensory qualities, cognitive associations, and neutral, i.e. descriptive (Table 5.3-2 overleaf), in order to establish the general level of participant engagement and perception of the mould stimuli. This involved a flexible and reflective process by the researcher in order to capture the richness and in-depth nature of the qualitative data.

Table 5.3-2 Research Project (I): Colour-coding of participant response to the jars of mouldy fruit

| *Theme* | *Colour-Coding* |
|---|---|
| Affinity / Aversion response | ▮ (cyan) |
| Sensory qualities | ▮ (yellow) |
| Cognitive associations | ▮ (magenta) |
| Other / descriptive | ▮ (grey) |

Some pertinent responses under each of the themes are highlighted in Table 5.3-3 below to give a glimpse of the most common responses.

Table 5.3-3 Research Project (I): Most common participant responses to the jars of mouldy fruit

| *Theme* | *Participant  responses* |
|---|---|
| Affinity / Aversion response | *"interesting", "lovely", "not unpleasant", "stinky", "slightly off", "unpleasant"* |
| Sensory qualities | *"fluffy", "hairy", "dry", "smooth", "spongy", "soft", "wet", "powdery", "sweet", "liquid"* |
| Cognitive associations | *"spores", "creases", "landscapes", "swamps", "hospital", "sweet poison", "alcohol", "home"* |
| Other | Descriptive, e.g. *"familiar content, but at the same time not because of the different environment".* |

In addition to eliciting specific participant engagement with the stimuli, the questionnaire provided an opportunity to gain understanding of the level of aversion or affinity to the jars of mouldy fruit.  Participants were asked to

record their overall Like / Dislike response on a 7-point Likert-scale by means of the following question:

> Q2. Please indicate where on the scale you mostly agree in regards with the way you feel about the content of the boxes:
>
> Dislike    1      2      3      4      5      6      7      Like

Likert scale question Data Set One, as appearing in the workshop Questionnaire (for full Questionnaire see Volume Two, Appendix 5.1.3, p.326)

The data was analysed by calculating the number of participant responses against each measurement (i.e. 1-7) and then averaging it out by the number of participants who responded (See Volume Two, Appendix 5.3.1, p.336 for a tabular representation of the raw data).

Figure 5.3-2 below presents a histogram of the participant Like / Dislike responses to the jars of mouldy fruit.
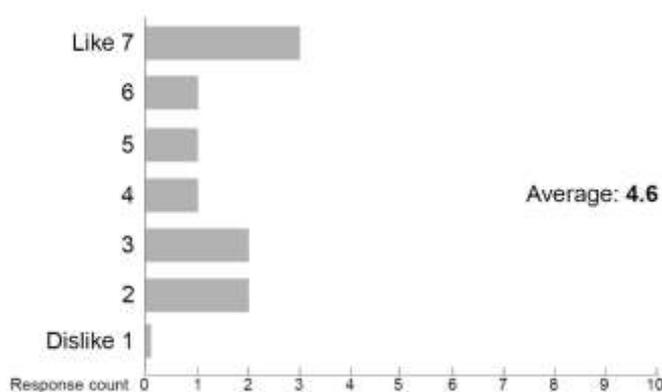


Figure 5.3-2 Research Project (I): Histogram of Like / Dislike response to jars of mouldy fruit

In analysing the Likert-scale response it became apparent to the researcher that this method of collecting information relating to participant

sensory engagement with the stimuli was valuable in indicating the subjective participant response in a measured way that can be easily understood and interpreted by the researcher and other stakeholders interested in such phenomena.

The average figure of 4.6 would indicate that participants were neither entirely averse to the stimuli, nor did they experience a high affinity to them.

Participant engagement with the jars of mouldy fruit was also observed and documented via photography in situ. This fulfilled the objective of studying and recording participant engagement with specific materials.

The observation was done by instructing the photographer to take a photograph of participants engaging with the stimuli as the interactions took place.

The participant observation data comprised sixteen photographs of participants exploring the jars of mouldy fruit, which appear in Volume Two, Appendix 5.3.1 (p.338).

The photographs were analysed by categorising them under three main themes: showing affinity, showing aversion, and neutral, i.e. participants being reflective, assessing, noting, evaluating. This was considered valuable in assisting the researcher to add a level of richness to understanding participant interactions.

Allocating the photographs to one of the four categories was based purely on the researcher's reflection and classification, basing such classification on everyday human communication. What emerged in seeking to categorise this data, however, was an awareness of potential bias, and therefore a more informed categorisation based on the psychology of emotion was sought (Ekman, 2004). With this in mind the photographs and their classification were submitted to neuroscientist Flory for discussion and verification.

There was a mismatch in opinion about Images 6, 7, 9, 11, 13, 14, 15. After discussion, the researcher and the scientist came to the mutual conclusion of accepting Flory's classification.  In all seven cases the researcher had labelled the participant response as neutral.  Flory however differed in opinion stating that in these seven cases there was obvious engagement through touch and smelling the stimuli pointing to an affinity-based response as opposed to an aversion.  She further clarified that affinity in this particular instance was a lack of rejection and aversion to the mouldy fruit, and an engagement with it in a positive way to further explore, understand, and satisfy curiosity.

An analysis of this classification categorised 7 Images under the affinity classification, 8 under the neutral classification, and 1 under the aversion classification.  Figure 5.3-3 below provides examples of images that were categorised as affinity-, neutral and aversion-based responses.



Figure 5.3-3 Research Project (I): Examples of affinity-, neutral, and aversion-based (left to right) responses to the jars of mouldy fruit. Images courtesy of Ezzidin Alwan, April 2012

With the aversion being extremely low, and the affinity and neutral being of equal scores, it was considered safe to conclude that, as in the previous two findings, participants had no strong aversion to the stimuli and veered more in the direction of positive engagement.

**Participant response to visual stimuli: data collection and analysis**

The second set of stimuli presented was a series of twelve pictures of mould projected on a screen. The aim of this was to explore engagement with mould primarily through visual stimuli without other sensory engagement such as texture and smell.

The visual stimuli were divided into two groups of six images each (Section 5.2.4 'Visual stimuli', Table 5.2-2 (p.114)).

Group 1: Images 1-6 consisted of rotting or mouldy food in different stages of decay, photographed with a standard optical lens, or a point-and-shoot type camera (See Figure 5.3-4 below for an example).



Figure 5.3-4 Research Project (I): Mould decay on food: an example of mould-based stimuli photographed with a standard optical lens. Author unknown

Group 2: Images 7-12 comprised macro-images[89] of mould on various media, chosen specifically for their more detailed representation of fungi (See Figure 5.3-5 overleaf for an example) to ascertain if there

---

[89] Where macro photography was employed to produce photographs of 'mould' larger than life size

would be a difference from the previous group in relation to participant engagement and feedback.



Figure 5.3-5 Research Project (I): Mould growth on paper: an example of mould-based stimuli photographed through a macro lens. Image taken by the author, 2011

Participants were asked to record on a Like / Dislike 7-point Likert scale the way they felt about each image. Participant response was analysed separately for the two groups of images.

The Likert-scale response was analysed by calculating the number of participant responses against each measurement (i.e. 1-7) and then averaging it out by the number of participants who responded. This was done to arrive at a general indication of the affinity-aversion rating against each image.

Table 5.3-4 overleaf presents the analysis of the Likert-scale average for Images 1-6 ranging from the highest to the lowest.

Table 5.3-4 Research Project (I): Analysis of Like / Dislike response to mould visual stimuli (Group 1: Images 1-6)

| Likert scale average | Slide No. | Slide content | Like / Dislike histogram of participant response |
|---|---|---|---|
| **5.8** | Image 4 |  Mouldy hummus |  |
| **4.8** | Image 2 |  Rotting meat |  |
| **4.2** | Image 1 |  Fungus decaying wood |  |
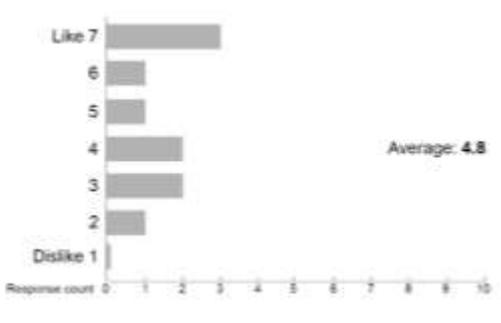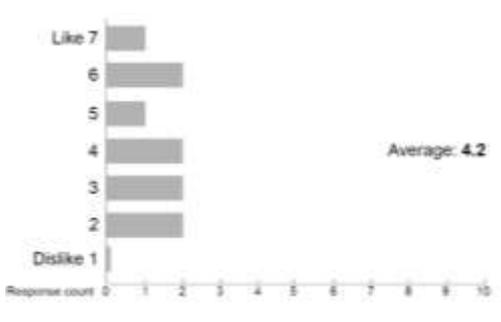
Page 1/2

130

| Likert scale average | Slide No. | Slide content | Like / Dislike histogram of participant response |
|---|---|---|---|
| **2.6** | Image 3 | Mouldy rice water |  |
| **2.2** | Image 6 | Mouldy orange juice |  |
| **1.9** | Image 5 | Mouldy rice pudding |  |
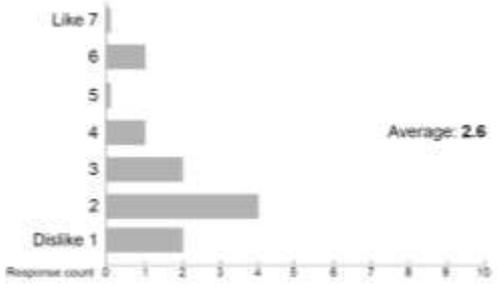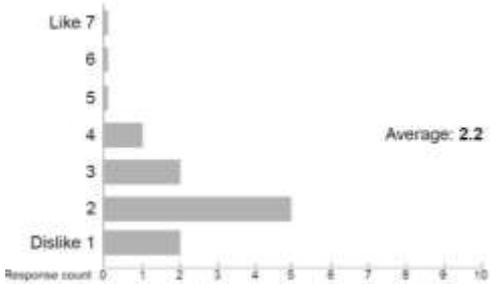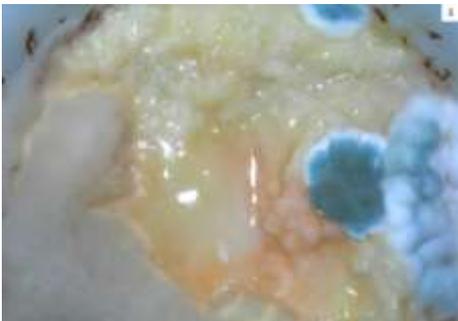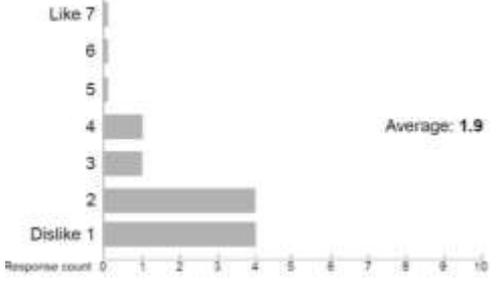
The aversion-affinity averages differed remarkably, with the highest average being 5.8 for Slide No 4 (mouldy hummus) and 1.9 for slide number 5 (mouldy rice pudding).  It was interesting to note a significant change in the averages between the first three images, which were in a close average proximity between 5.8 and 4.2, and a steep drop in the next three images with the highest being 2.6 and the lowest being 1.9.

Further examination of the averages revealed a pattern in which, as a group, participants had preference for visuals with drier rather than moist appearance.

A further averaging out of the individual averages for each slide revealed an overall Like / Dislike average of 3.6 for this set of images.  The overall average of 3.6 would seem to indicate that introducing mould-related materials in a design context lies right on the median of the Like / Dislike scale.

An interpretation by the researcher of this quantification was that pure visual interaction with the materials without engagement through touch and smell, as with the jars of mouldy fruit, resulted in participants feeling a little more removed from the stimuli than they did in the first instance.

Table 5.3-5 overleaf presents the analysis of the Likert-scale average for Images 7-12 ranging from the highest to the lowest.

Table 5.3-5 Research Project (I): Analysis of Like / Dislike response to mould visual stimuli (Group 2: Images 7-12)

| Likert scale average | Slide No. | Slide content | Like / Dislike histogram of participant response |
|---|---|---|---|
| **5.6** | Image 7 | Mould on bioplastic | Average: 5.6 |
| **5.6** | Image 12 | Mould on a piece of cake | Average: 5.6 |
| **5.5** | Image 10 | Mould on paper mache | Average: 5.5 |

| Likert scale average | Slide No. | Slide content | Like / Dislike histogram of participant response |
|---|---|---|---|
| **5.4** | Image 11 | Mould on Kombucha | Average: 5.4 |
| **5.1** | Image 9 | Mould on orange | Average: 5.1 |
| **4.6** | Image 8 | Mould on strawberry | Average: 4.6 |
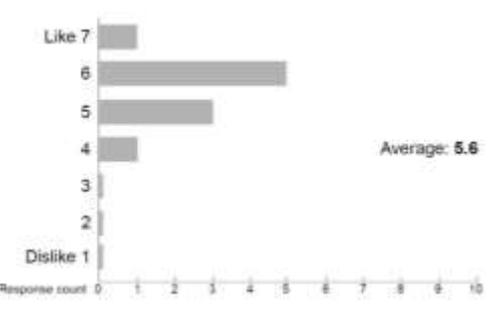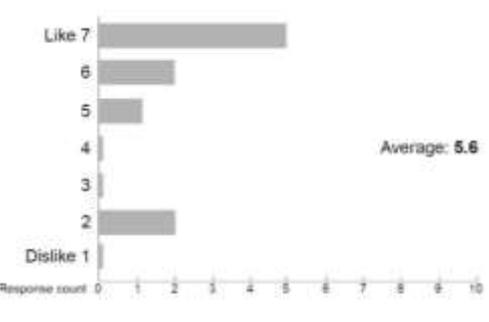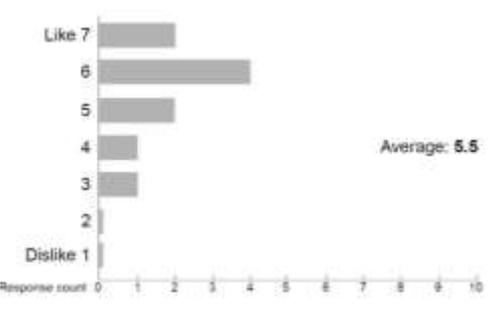
The picture that emerged from analysing participant response to Images 7-12 differed remarkably from the response to the jars and to Images 1-6. The range between the highest and lowest average sat comfortably above the median (3.5 on the 7-point Likert scale), showing a leaning toward an affinity with the images. The highest average was 5.6 and the lowest 4.6, showing just a 1-point differential between the highest and the lowest average.

From the above it could be concluded that the greater detail provided by the macro lens produced a greater interactive effect with the visual.

A secondary conclusion that was drawn was that there was a group preference for more decorative visuals with a vibrant colour palette, which was also evident later on in the T-shirt designs created in the second phase of the workshop.

Participants were further asked to note down one word they would choose to describe group 1 and group 2 of the images. As with the jars of mouldy fruit, the purpose of requesting such data was to provide the researcher with an additional data source that could ascertain if there was a link between the felt experience (word associations) and the reported experience (Likert scale).

The findings from this analysis showed that the participant response fell into three categories: aversion, affinity, and neutral, i.e. descriptive (Table 5.3-6 below).

Table 5.3-6 Research Project (I): Colour-coding of participant response to mould visuals

| *Theme* | *Colour-Coding* |
|---|---|
| Affinity | |
| Aversion | |
| Neutral, i.e. descriptive | |

Participant response to Images 1-6 is arranged in Volume Two, Appendix 5.3.3, Table A.5.3-5 (p.347) and shows a preponderance of neutral-based descriptors (6 out of 10), with definite affinity-based response in three of the participants, and an aversion-based response in one of the participants.  This was borne out by the Likert scale in which the average 3.6 is right in the middle point of 3.5.

Amongst the neutral-based descriptions of the images, words such as *"abstract"*, *"contrast"*, *"controversial"*, and *"textured"* appeared.

In the affinity category the images were perceived as *"playful"*, *"intriguing"*, and *"engaging"*.

The only aversion-based response was *"unhygienic"*.

Participant response to Images 7-12 is arranged in Volume Two, Appendix 5.3.3b), Table A.5.3-7 (p.349) and shows a preponderance of affinity-based and neutral responses (seven out of a total eight responses), and only one aversion-based response.  This was borne out by the overall average Likert scale response of 4.7, which sits well above the median.

There were four definite affinity-based responses, such as *"nicer colours and textures"*, *"interesting"*, *"colourful"*, and *"pretty"*.  Neutral based descriptions included cognitive associations, e.g. *"forest"*, *"spores, life"*, and *"powerful structures"*.  The only aversion-based response was *"off-putting"*.

Finally, participants were asked to state whether they would be interested in wearing a T-shirt design printed with any of the images which were presented.  All participants gave an affirmative response to wearing a T-shirt printed with mould images (Volume Two, Appendix 5.3.3, Table A.5.3-8, p.350).

## Participant debriefing

First the researcher asked questions to ensure that the participants had no adverse reaction to their participation in the research process.  The purpose and aim of the research were reiterated.  A general discussion on the roles of fungi and their emerging application in design followed.

The floor was then open for any other research-related questions.  No major questions ensued, except one or two about the general interest of the design industry in fungi.

Participants were reminded that they could contact the researcher at any time should they have any further questions.

## Guidelines for further participation

This led to the closing section of the workshop.

It was explained to the participants that they could voluntarily participate further in the research process, which involved designing 'mouldy' T-shirts to become test probes within the public domain.

The researcher clarified that a 'mouldy' T-shirt was a term used to describe a T-shirt that would be digitally printed with an image of mould, and not a T-shirt produced from actual living fungi.  This was aimed at opening up a discussion that considered the concept of fungi-based materials in a fashion context.

The researcher explained that the design of the T-shirt would require each participant to:

i.      Meet the researcher in an allocated studio space at the University at a time of their convenience, for a follow-up one-to-one session with a total duration of one hour;

ii.     Design a T-shirt with a mould image of their preference with guidance and support by the researcher[90];

iii.    Wear the T-shirt within a range of social situations for a duration of three months at their own will and in their own time;

iv.     Observe, record, and communicate back to the researcher any commentary and feedback that would be given by a member of the public in response to the T-shirt.

The purpose of this was to complete the sensory feedback loop from speculation to practical engagement with fungi[91] in a design setting.

No pressure or signed agreement was undertaken in relation to this process.  Participants were invited to leave their T-shirt size and contact details if they did wish to participate further in the research process.

At this stage all participants indicated that they would like to continue their participation in the research process (Volume Two, Appendix 5.2, Table A.5.3-8, p.350).

---

[90] The researcher provided support regarding the use of design software for participants without prior experience in using such programs

[91] Albeit photographic representation

b)      Data collection and analysis, Workshop Phase 2: *T-shirt designing*

The aim of getting the participants to design a 'mouldy' T-shirt of their own was to assess how they would engage creatively with mould-based designs by transposing the 'raw' engagement with mould-based visual stimuli to designing an actual garment that they would wear in social situations.

The design of the 'mouldy' T-shirt was hosted within one-to-one appointments over a two-day period.  Out of the ten, eight participants attended this phase of the participatory workshop[92].

The length of each appointment was one hour.  During this session, each participant was instructed to design one T-shirt with a preferred mould image (from a gallery of 100 images that had been compiled by the researcher prior to the workshop, see Volume Two, Appendix 5.1.4, p.330) with due consideration to:

i.      Size and positioning of the mould image within a T-shirt template;
ii.     Colour moderation, i.e. whether to keep, or modify the original colour of the image.

Design sheets with the T-shirt template were used to record the T-shirts designs by the participants with a view to producing the artefact for the post-workshop participation stage of the research (Figure 5.3-6 overleaf).

---

[92] The two other participants could not be present for the T-shirt design stage due to unforeseen circumstances.
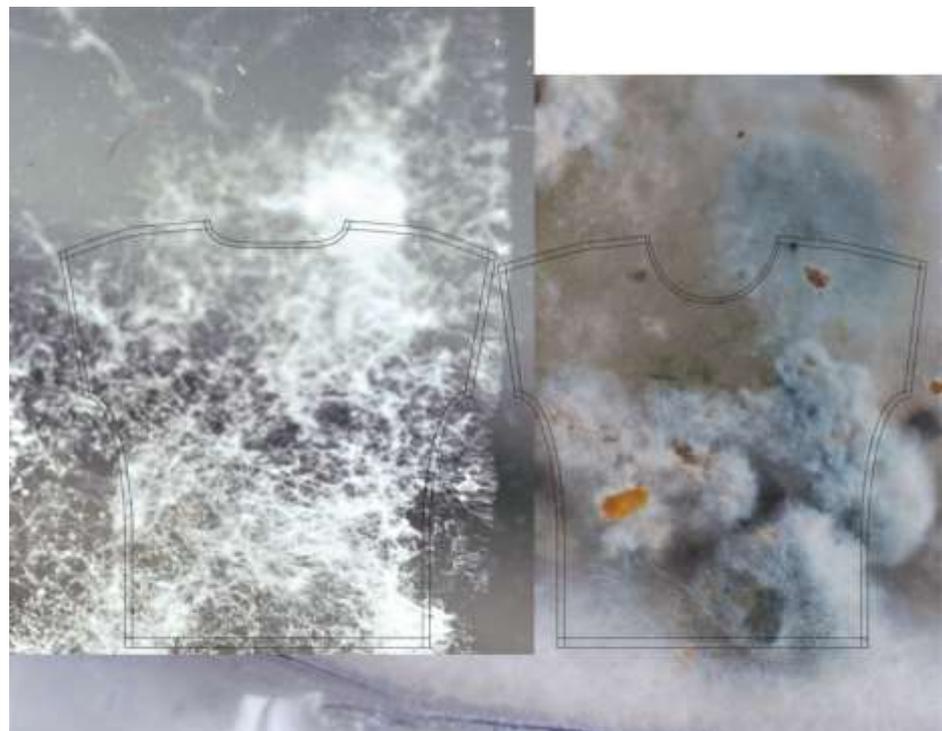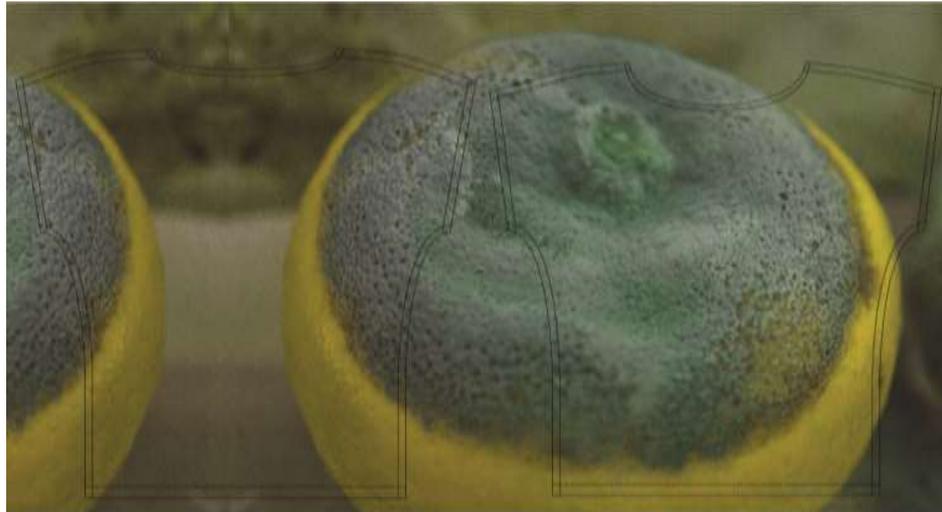
Figure 5.3-6 Research Project (I): Examples of T-shirt design templates created by participants at *Mould Perceptions* workshop Phase 2. April 2012

The researcher was pleased to note that in all eight cases participants engaged enthusiastically in the design process, with seven of the eight producing more than one design, resulting in a total of nineteen T-shirts designs (Figure 5.3-7 overleaf).

Figure 5.3-7 Research Project (I): The complete range of 'mouldy' T-shirt designs produced by research participants. April 2012

This would serve to indicate that involving participants in designing their own T-shirt elicited proactive participation and positive engagement with mould-based visuals to come up with designs with creative content.

The design sheets produced by the participants were arranged in a table according to participant number (P) and number of T-shirts designed by

participant (T), had the participant designed more than one T-shirt (Volume Two, Appendix 5.3.4, p. 351).

The data was categorised in two main themes, i.e. T-shirt design that were kept close to the original mould image, and T-shirt designs that involved greater design modification by the participants, e.g. colour moderation, or re-scaling of the image.

What became evident from seeking to analyse the T-shirt designs was that some participants had kept their designs close to the original 'mould' visuals, e.g. T-shirts P1T1, P3T1, P5T1, P6T2, P6T2, P7T1, P7T2, and P8T1 (Figure 5.3-7, p.141), but most T-shirts resulted in more abstracted imagery due to colour moderation or upscaling of the image. The preponderance of designs with greater mould detail is consistent with previous observations of participant response to the presented stimuli, in which macro images produced a greater interactive effect with the visual.

Participants were asked to choose one of their own designs for production. The T-shirts that finally went to print are shown in Figure 5.3-8 below.

| P1 | P2 | P3 | P4 |
| P5 | P6 | P7 | P8 |



Figure 5.3-8 Research Project (I): T-probes that were produced for post-workshop participation. April 2012

The design phase of this workshop was useful in showing a high level of participant engagement with mould-based visuals, in a design context.

One participant (P7, Figure 5.3-8, p.142) expressed overtly that if she were to wear a T-shirt print of mould, it had to be evident what the image represented.  The image was of a rotting tomato.  In this case (in contrast with all other designs) the scale of the printed image was approximately A4 in size and covered only part of the T-shirt front, to allow a viewer to recognise easily the mould visual.  The colours were kept true with the original photograph, and only a light blue gradient was applied around the image for design effect.  This was the strongest case that showed that the T-shirt design was as a result of direct engagement with the mould stimuli.

### 5.3.2  Data collection and analysis, Stage Two: *Post-workshop participation*

The T-shirts were produced and handed to the participants within a 30-day period (Figure 5.3-9 below).  On meeting each of the participants the researcher reminded them verbally of the guidelines for post-workshop participation (Section 5.3.1a), p.137 ('Guidelines for further participation')).



Figure 5.3-9 Research Project (I): Participants wearing  their 'mouldy' T-shirts. Images taken by the author, June 2012

The purpose of this public-facing component of the project was to gather feedback of public response to a T-shirt that had fungi-based designs. This stage was considered a logical and appropriate extrapolation of testing attitudes, by a self-selected group of participants of a larger general public that was neither self-selected, nor chosen by the researcher or the participant. This lent another level of rigour to the research process.

A Facebook page ([www.facebook.com/MouldedMind](www.facebook.com/MouldedMind)) was set up to collect this data set.

This data collection method however proved unsuccessful due to limited engagement of the participants with the social platform for reasons unknown to the researcher. The only participant report received via this platform were a couple of pictures with the T-shirts styled as part of everyday wear and worn in social contexts as shown in Figure 5.3-10 below. However, this was more an interaction with the digital platform rather that a feedback from the general public.



Figure 5.3-10 Research Project (I): A 'mouldy' T-shirt probe, worn in social situations, shared by a workshop participant via Facebook. September 2012

Feedback questionnaire of public response

After a period of six months and no further feedback, a questionnaire was compiled in order to ensure that participant feedback of public response was more in keeping with the requirement of the research purpose rather that a social-media platform.

The questionnaire comprised a blend of multiple-choice and open-ended questions.  The questions were kept simple in language and semantics so that they would be easily understandable.  This was checked with one or two colleagues and a few modifications made.

Questions that were covered in the questionnaire included:

*Q1. Are you happy with your T-shirt design?*

*Q2. How often have you worn your tee?*

*Q3. Where have you worn your T-shirt?*

*Q4. Have people reacted to your T-shirt?*

*Q5. Has your T-shirt engaged people in a conversation about fungi?*

For the complete questionnaire see Volume Two, Appendix 5.1.5 'Feedback questionnaire' (p.333).

The questionnaire was sent out via an online survey platform[93] to all eight participants who received their T-shirts.

Five of the eight participants responded.  As gathering public feedback was purely based on voluntary participation and the response being of more than fifty percent of participation, the questionnaire response was analysed and conclusions drawn.

---

[93] www.impressity.com (no longer available)

**Analysis of participant feedback of public response**

Participant response to the feedback questionnaire appears in Volume Two, Appendix 5.3.5, p.370.

The multiple-choice data was quantified by counting the number of participant responses against each choice presented.  The qualitative data was looked at for positive response to the designed T-shirts when worn in social situations.

Of the five-participant feedback, three reported being "very satisfied" with the T-shirt design, and two reported being "satisfied".  From this it was concluded that all five participants had positive response to their own T-shirts.  From workshop – to paper design – to fabric artefact, the picture that emerged was more of a positive rather than a negative response to the use of fungi as media for design creation.

All five participants reported wearing the T-shirt at least once in socially related situations (Table 5.3-7 below).

Table 5.3-7 Research Project (I): Participant response to Question No.4 *"Where have you worn your T-shirt?"*

| Question | Choice | Response count |
|---|---|---|
| **Q4. Where have you worn your T-shirt?** | At home | 3 |
| | At work | 2 |
| | In the college / university | 5 |
| | In cafes | 3 |
| | In pubs | 3 |
| | In bars | 2 |
| | At parties | 2 |
| | On holiday | 3 |
| | Other (please specify) | 0 |
| *Comments:* | | |
| at conferences and research meetings | | |
| It is now one of the main t shirts I wear | | |

For the complete data set see Volume Two, Appendix 5.3.5, p.370

From the responses to Question 6 *"What comments have been made about your T-shirt?"* it was fitting to conclude that the overall public response was in a positive vein. There was one feedback which reported neither positive nor a negative response, but a non-engagement of the public with the T-shirt. In the positive realm comments such as the following were reported:

*"I've had a lot of compliments about the t shirt."*

*"I get to tell them it's actually a pattern created by mould"*

*"Wow! What is it? Is it what it looks like?"*

*"Cool top."*

The one neutral to negative response was: *"There wasn't much comment I think people generally don't make much conversations out of t-shirts."* This response however was not a report of a comment by the public, but rather the participant reporting his / her own attitude to wearing the T-shirt.

Overall, the feedback questionnaire was useful in providing data indicating that the T-shirts were worn and well-received in the public domain.

From the above the researcher concluded that fungi-inspired designs that were recognised as fungi designs through information given by the wearer, resulted in positive engagement by those who commented.

Given the small number of participants in this data set, an extrapolation of the findings in this section to a much larger general public cannot be claimed. Nevertheless, taking the research out in the public arena to this stage had value in providing not just research rigour to the study, but also opening the door to new ways of thinking and planning for future public engagement with obscure materials for design. Additionally, the T-shirt proved its own worthiness as a probe in the public domain for opening up discussions and feedback, as opposed to activism and campaigning (Chapter 3.0 'The T-shirt, p.58).

## 5.4    Triangulation of findings

As discussed in Chapter 4.3.3 'Method for research analysis: Triangulation' (p.100), given the small number of research participants, participant response had to be mined for its richness.  Methodological triangulation (Denzin, 1989) was used as a further method of research analysis to provide a rich and holistic understanding of participant sensory experience and engagement at the different stages of the research process.

Beyond the research information that quantitative data such as Like / Dislike responses and qualitative data such as word descriptors of sensory interaction could yield, was a story of experience that was being unfolded, offering the opportunity for new learning and insights.

Table 5.4-1 overleaf summarises the qualitative (QL) and quantitative (QN) findings in the five data sets in preparation for methodological triangulation.

Table 5.4-1 Research Project (I): Summary of qualitative and quantitative findings

| Data Set | Qualitative findings | | Quantitative findings | |
|---|---|---|---|---|
| *Data Set One:* presentation of jars of mouldy fruit | QL1.1 | No adverse reactions to the live fungi stimuli | QN1 | An average 4.6 Likert-scale response on a 7-point Like / Dislike Likert scale |
| | QL1.2 | No strong aversion to the stimuli and veered more in the direction of positive engagement | | |
| *Data Set Two:* *six* mould-based visuals as appearing to the naked eye | QL2 | A preponderance of neutral based descriptions of the stimuli, e.g. *"abstract"*, *"contrast"*, *"controversial"*, and *"textured"*. | QN2 | A Remarkable 4-point difference in the affinity (5.8) and aversion (1.9) averages; A group preference for visuals with drier rather than moist appearance; An overall average of 3.6 which agrees with the preponderance of a neutral based reaction, i.e. neither a high affinity, nor a strong aversion. |
| *Data Set Three:* six macro images of mould bringing greater detail of mould to the naked eye | QL3 | A mix of affinity-based (4) and neutral (3) responses (comprising 7 out of a total 8 responses), and only 1 aversion-based response. | QN3 | The overall Likert scale average positioned comfortably above the medium (4.7); Only a 1-point differential between the highest (5.6) and lowest (4.6) response average with no aversion-based responses at all, i.e. below 3.5 median. |
| *Data Set Four:* *recording of T-shirt design on a template* | QL4 | A preponderance of designs with greater mould detail; A high level of participant engagement (displaying excitement and engagement in relation to the creative process) in designing the T-shirt | QN4 | Seven of the nine participants (N=7) producing more than one design, resulting in a total of nineteen T-shirts on paper, which related to approximately 140% over the anticipated design outcome. |
| Data Set Five: participant reporting of public response to T-shirt worn | QL5 | An overall positive public response with one neutral (neither positive, nor negative response) regarding public engagement with the T-shirt worn. | QN5 | Positive response of all five participants to the designed T-shirt artefact; All five participants reported wearing the T-shirt at least once at both professional and socially related situations. |

The triangulation exercise involved examining the qualitative and quantitative findings and then categorising the findings several times over to find one or several factors in which they related to each other.

The following factor space graph (Figure 5.4-1) represents triangulation of the findings with the evaluating criteria of "complementary" or "contradictory".
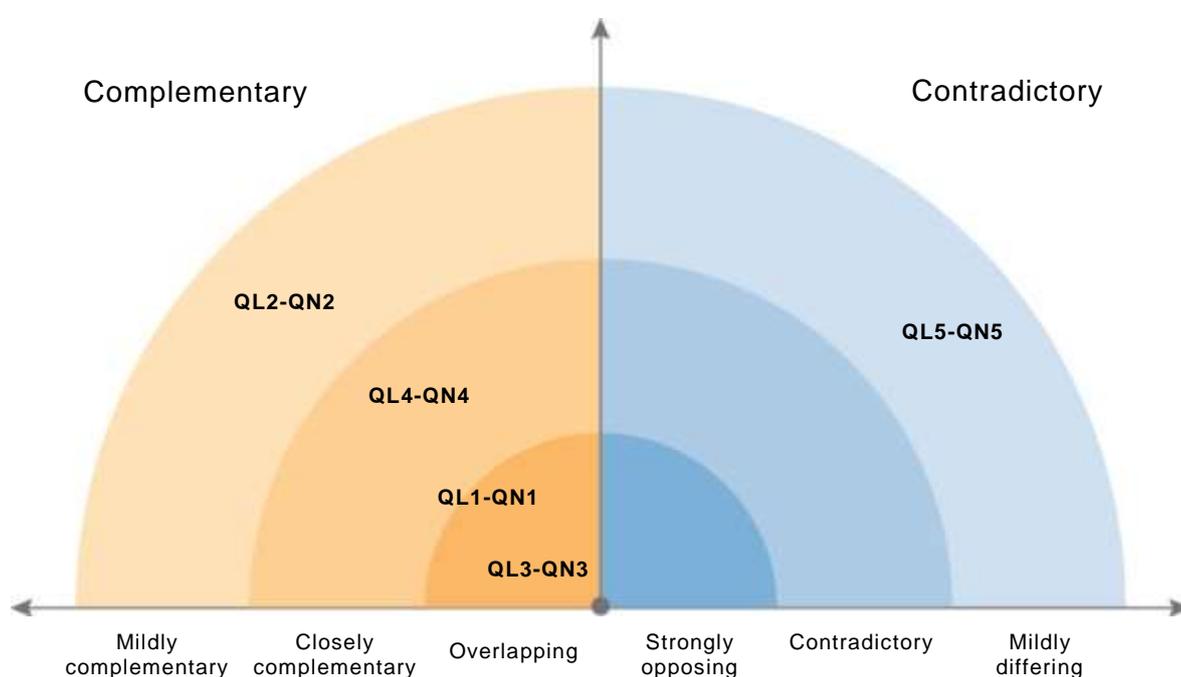


Figure 5.4-1 Research Project (I): Factor space graph of qualitative and quantitative findings

It is important to reiterate that it was not an intention of the researcher to carry out triangulation by validity, but a validity factor space graph naturally emerged because of the greater likeness of the qualitative and quantitative data, as opposed to widely divergent participant responses. The triangulation exercise was therefore useful in uncovering the consistency in following the research intent irrespective of the method that was used.

Upon plotting the findings in the graphic representation above that researcher discovered that it wasn't an exact scientific exercise. The researcher herself had to use her own perception and cognitive response to the findings to feel her way to where the likeness or the difference between the findings could be plotted in the factor space graph. On an overall basis, the likeness or the difference in the findings appear in the appropriate sector. The exact plotting of each of the readings, however, was a feeling-response exercise. Nevertheless, the graph provided a good depiction of the likeness or difference between the two data sets.

Qualitative and quantitative data together communicated a strong relationship of findings within the data sets, showing that people are friendly to fungi-based visuals and the transference of such visuals in garment design.

The contradiction between the two sets of data (as in Data Set Five) was so minimal that it was deemed appropriate to conclude that within this group of participants there was predominantly a positive response to fungi-based designs.

## 5.5    Discussion of outcomes and findings

The aim of Research Project (I) was to explore perception of mould as a novel material for garment design and fabrication. This was fulfilled by:

i.      Eliciting cognitive and sensory response to 'raw' mould-based stimuli;

ii.     Creative engagement of participants to design a T-shirt for personal use by using fungi-based visual media;

iii.    Use of the participant-designed T-shirts as probes within social settings to elicit public reaction and response in relation to fungi-based garment designs.

## 5.5.1  Research Project (I): outcomes and findings

The triangulation analysis (Section 5.4, p.148) provided scope for identifying further inferences from the data gathered during the research process.  These new inferences turned out an opportunity for enriching explanation and extrapolating further research and career-based opportunities. The inferences that were drawn are presented below.

Participant response to the stimuli presented at the *Mould Perceptions* workshop, gathered via a self-completed questionnaire and observation via photographic evidence, indicated that participants responded positively to fungi-based stimuli and were inspired to be creative and engaged in a design-workshop setting.

What emerged in the research process was that participants were actively engaged in the separate presentations of stimuli through visual and olfactory experience.  However, the engagement with visual stimuli showed greater affinity based-responses than the olfactory.

From a design perspective this bodes well regarding development of potential materials for clothing that appeal to the visual aesthetic, while toning down any olfactory intrusiveness that may be associated with the 'raw' material.

A further inference that was drawn was that the idea and the concept of using fungi-based materials in fabrication did not shock or cause aversion, however wearing fabrics involving mould or other similar challenging materials would benefit from careful consideration, evolution and introduction in the consumer marketplace.

A further development of this Project for future consideration would be to test consumer perception of material prototypes at different stages of the material development.  This was not within the scope of this research project given the timescale and resource allocated.

## 5.5.2  Role of the T-shirt as a probe in relation to Research Project (I)

Research Project (I):  *Fungi materials for clothing* created a platform for the researcher to trial the T-shirt as a probe in order to:

a) Assess how each participant would transfer the raw engagement with mould into the visual design for a T-shirt, i.e. wearing mould on a conceptual level[94];

b) Pilot the concept of wearing mould in a range of social situations by having the participants wear the 'mouldy' T-shirts in public settings;

c) Explore engagement and responses to a conceptual and obscure material, such as mould, via the everyday-relatable clothing item;

d) Assist the advance of what might be a conceptual material or sensory experience, potentially toward viable realisation and market desirability.

Whilst initially inviting participants to design their own 'mouldy' T-shirts was considered useful in testing the level of participant engagement, when the research was being conducted in practice, the creative process showed active and imaginative engagement and the ability to translate conceptual formulations into actual designs.

Although it could not be stated with certainty whether the participant design enthusiasm was driven by the stimuli of the mould visuals or by the excitement that was involved in the creative process itself, one of the factors in favour of reasonably concluding that engaging with the visuals elicited the design enthusiasm, was the high level of affinity-based responses to the stimuli.

---

[94] The researcher felt that this was an important stage in the development of mould as a fashion material as people came closer to the idea of wearing mould albeit through the imagination.

Nonetheless, the 'humble' T-shirt succeeded as a probe in providing neutral and fun ground for participants and the researcher to engage at least on a conceptual level with how one might choose to wear mould, thus opening up the space to consider obscure materials that have design viability and market desirability.

The positive engagement with the T-shirt, both within the participatory workshop as it was being designed, and in the public domain where it was worn voluntarily by the research participants, suggests that design tools and creative processes, e.g. employing the T-probe within participatory design activities, could offer high-street brands in the likes of Marks & Spencer a means of calibrating consumer perception and taste, prior to launching new products and services.

Although a small step, this was considered an important step in expanding the understanding of how the public would relate to an obscure material for fashion in a purely conceptual way – a pioneering step in opening up dialogue, research, technologies, partnerships and multi-disciplinary endeavours.

Research Projects (II) and (III) further employ the T-probe as part of participatory workshops to elicit engagement with novel material concepts and sensory experiences within contexts that are of social and / or market interest(s). The two projects were set up in partnership with external organisations: the charity for deafblind people *Sense* and the global company *International Flavors and Fragrances (IFF)* respectively.

## 6.0   Research Project (II): *Fashion for deafblind people*

*The following chapter describes Research Project (II), a collaborative project with the charity for deafblind people Sense, in which the T-probe was employed to study how a fashion experience may be introduced to people with visual and auditory impairment.*

*The chapter begins with a reminder of the background to the Project, which explains the rationale for employing the T-probe in that particular context. A discussion of the specific design and research processes involved in the set-up of the research project is provided.*

*The data collection and analysis is explained by following Stage One of the methodological framework discussed in Section 4.2 (p.81).  This expressed itself as Sense in Textiles: a participatory workshop, conducted with members of the deafblind community, within which the T-shirt was used as centrepiece to the study.*

*The chapter concludes with a discussion of the findings and outcomes specific to the Project, and expands on the use of the T-shirt as a probe to generate engagement, new knowledge, shifts in perception, and future opportunities for design and research.*

## 6.1   Background to the Project

Research Project (II) was set up and run collaboratively with *Sense*, the UK charity for the deafblind.  This was enabled by the participation of the University in the AHRC-funded skills-development programme for doctoral researchers in design practice (SKIP, 2012).  SKIP offered financial provision to assist the brokering for a limited number of PhD Design Research candidates, and provided financial outlay for time, travel, and materials.

In conversation with the Director of Studies[95] this was considered an opportunity to test the applicability of the research methodology outside of academia and within a real-world setting.

*Sense* had an interest in extending the experiential awareness of their user group, i.e. people with visual and auditory impairment who are keen to engage in fashion experiences, but are currently excluded from the high-street fashion market.  Fashion, in this case, was viewed as a foreign concept to the deafblind community, and therefore employment of the T-probe to introduce a fashion experience to this novel user group fell within the scope of the research.

An initial meeting with the Head of Research[96] and the Arts & Wellbeing Development Manager[97] at *Sense* was set up, to discuss the potential of employing the T-probe as an approach to engaging the deafblind community in a fashion-type experience.  Questions that shaped the discussion and the final articulation of the Project included:

*What are the fundamentals of life?*

*What are the things we take for granted?*

*What makes life interesting?*

*What does cognition mean beyond seeing and hearing?*

The rationale for the project was further supported by the compensation theory of sensory impairment (Lahtinen, Palmer and Ojala, 2012), which states that the loss, or severe damage, of hearing and sight would lead to an enhanced role of touch and tactile memory.  From this the researcher extrapolated that the enhanced sense of touch developed by this user

---

[95] Professor Jane Harris

[96] Dr Anna McGee

[97] Dr Nicholas Vogelpoel

group could form the basis of a more sensitive engagement with fabrics and clothing, and inadvertently fashion.

From the above, this research project aligned with the overall research aim of developing the potential of the T-probe as an approach to introducing novel and challenging concepts relating to materials and sensory experience in the following ways:

a) The primary objective was to elicit, study and record deafblind participants' sensory experience and engagement with fashion-related materials;

b) A designer aspiration to offer a fashion experience to the deafblind community and further knowledge and understanding of factors affecting their inclusion in the domain of Design;

c) An opportunity to enhance designer and industry understanding of approaches to design that are inclusive of user groups with specific sensory requirements.

Further to this, this project had the opportunity of being a true collaboration, by not only fulfilling the scope of the research, but also satisfying the objectives of *Sense* and their community group.

While there has been research in the areas of multisensory environments for people with sensory and / or cognitive disabilities, and the role of art for personal development and wellbeing (Mills and Brown, 2004; Thiele and Marsden, 2003; Vogelpoel and Gattenhoff, 2012), the literature reflects little consideration of fashion as a potential medium aimed at enabling deafblind people in the areas of personal development and engagement, such as:

a) Learning new skills;

b) Rebuilding confidence;

c) Communicating with others and making friends;

d) Communicating to others, to engender enhanced understanding of deafblindness.

The tailoring of the research methodology to this specific user group created opportunities to directly address and fulfil the above objectives.

## 6.2   Study design

The design of the study was supervised by Dr Nicholas Vogelpoel, Arts & Wellbeing Development Manager at *Sense*.  Given the sensitivity of the participant group – people with varying degrees of hearing and sight impairment, often accompanied by cognitive and / or learning impairment – the methodology had to be carefully tailored.

Only Stage One of the methodological framework (Chapter 4.2, p.81) was considered appropriate.  This expressed itself as a participatory workshop – *Sense in Textiles* – which was hosted within the Anne Wall Community Resource Centre (AWC) in London, and involved working directly with the deafblind community and members of staff.  The workshop comprised two engagement processes:

i.   Exploring a range of materials for clothing;
ii.  Engaging participants to design and make T-shirts that best express their sensory response to the materials, opinions and *"making sense of the world"*[98].

Stage Two: post-workshop participation was not employed, because gathering public perception and response did not fall within the scope of this Project.

---

[98] Making sense of the wealth of sensory information in the surrounding environment and day-to-day settings (Quinlan and Dyson, 2008).

Research Project (II) differed from Project (I) in that it required the researcher to engage in an ethnographic type of study.  In ensuring that the workshop was designed for maximum positive participant engagement, the key processes in the set-up of the study were:

Immersing oneself in the community setting prior to the start of the project;

Consideration of appropriate materials and methods involving sensitive environments and groups of people;

Sharpening empathetic and intuition capacity, whilst maintaining objectivity in the interactions with research participants and members of staff;

Maintaining a high degree in flexibility and responsiveness in running a workshop that would cater to the requirements of each participant.

A dedicated period of preparation prior to the research taking place was considered imperative, to ensure that the project fulfilled its intentions in a way that was guided by duty of care for the research participants.

## 6.2.1  Workshop location

The *Sense in Textiles* workshop was set up at the Anne Wall Community Resource Centre (AWC).  This study location was considered most suitable as the facilities were geared to accommodating the needs of deafblind people in fulfilment with the UK regulation for this population group (Sense, 2015).

## 6.2.2  Recruitment procedures

Participants were recruited from the Anne Wall Centre (AWC) user data base, the inclusion criteria being:

> *In good general health with physical, emotional and mental capacity to participate in a study of this nature.*

Given the data sensitivity and confidentiality of the research population, the participant group was selected solely by the Activities Coordinator[99] at the AWC without any input from the researcher.  In a discussion with the activities Coordinator, it became very clear that his experience and knowledge in relation to capacity of the AWC facility users to participate in this study was an expertise gained through day-to-day learning and management, unrivalled by textbook knowledge and tick-box exercises.  In this way the recruitment procedure met the Guidance for Social Care for Deafblind Children and Adults (2009)[100].

Six adults fulfilled the inclusion criteria, and were invited to participate in the project via a cover letter.  The letter was sent to their parents / legal guardians by the Activities Coordinator because all members of this participant group lacked capacity to provide Informed Consent for themselves.  The letter that was sent included the research Information Sheet for the study (Volume Two, Appendix 6.1.2, p.382) and the Informed

---

[99] John Kirkham

[100] Issued by the Department of Health for England in 2009, and re-issued in 2014. Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/388198/Care_and_Support_for_Deafblind_Children_and_Adults_Policy_Guidance_12_12_14_FINAL.pdf (Accessed: 15 June 2015)

Consent form (Volume Two, Appendix 6.1.3, p.388)[101].  Participation consent was granted in the case of all six participants.

## 6.2.3  Research participants

A six-participant group was considered a manageable group size, as each participant required one-on-one personal support given the large practical component that was involved in the study.  However, with the support of AWC staff[102], which will be discussed later in more detail ('Workshop assistance', p.162), the researcher was confident that the study would be able to fulfil its purpose and agenda.

All six participants were adults, five being female and one male. Participants had different levels of dual sensory impairment, i.e. partial or complete deafness combined with partial or complete blindness, with only one being fully deafblind.

Table 6.2-1 overleaf details the participant particulars.

---

[101] All of the users who were invited to take part in the study lacked capacity to provide Informed Consent for participation.  The letter that was sent out was worded and compiled by the Activities Coordinator.

[102] Support staff, or communication guides, provide one-on-one care, support, and interpretation to the deafblind facility users during their daily activities in the Community Resource Centre

Table 6.2-1 Research Project (II): Workshop participants

| Participant | Gender | Sensory Disability | Communication method |
|---|---|---|---|
| U_1 | Female | Partially deafblind | Speech |
| U_2 | Male | Partially deafblind | Speech, British Sign Language, gesture, facial expression and body language |
| U_3 | Female | Partially deaf / Blind | gesture, facial expression and body language |
| U_4 | Female | Partially deaf / Blind | Speech |
| U_5 | Female | Deaf / Partially sighted | British Sign Language (BSL) |
| U_6 | Female | Fully deafblind | Hand spelling |

## 6.2.4  Workshop assistance and support

As seen in Table 6.2-1 above, participants had varying degrees of visual and auditory impairment.  Therefore, six communication guides who were members of the support staff at the AWC were allocated to the participants individually in order to:

a) Facilitate the communication between the participants and the researcher;
b) Support participants in executing workshop activities;
c) Ensure the physical, emotional, and mental wellbeing of the participants during the study.

The communication guides were also presented with an Information Sheet (Volume Two, Appendix 6.1.2, p.385) and asked to sign an Informed Consent Form (Volume Two, Appendix 6.1.3, p.391) in order to enable their assistance in the study.

## 6.2.5  Selection of workshop stimuli

Stimuli that were considered appropriate for this project were a range of fabrics and textile materials.  As discussed in Chapter 4.2.1a) 'Workshop Phase 1: Presentation of stimuli' (p.83), the idea behind introducing stimuli to the research participants was that this would lead to the creation of a T-probe with unique design qualities resulting from specific sensory engagement.  In this case the sensory engagement was kinaesthetic (based on touch).

Further to this, the introduction of fashion-related stimuli created a direct opportunity to support the deafblind community group in areas of personal learning and development, by gradually building an understanding of fashion as a concept[103].

The materials were selected by the researcher with due consideration to the following factors:

a)  Structural design of the materials: woven fabrics, non-woven, i.e. knit and jersey, and decorative materials, e.g. lace, sequined, embroidered, laser-cut and etched textiles;

b)  Fibre content, i.e. the woven textiles were arranged into two groups according to their fibre content – cellulose, e.g. cotton, linen, viscose; or protein, e.g. wool and silk;

c)  Feel of the materials, where the researcher employed her design expertise and tacit knowledge of fashion and textiles with the view to compiling a diverse selection of fabrics for fashion, relatable to this user group in terms of their tactile (sensory) qualities, e.g. texture, grain, malleability.

---

[103] Mayfield (2001) proposes that given the importance of tactile stimulation to people with visual and/ or hearing impairments, every project that is aimed at learning or developing a new concept should start with something that incorporates the sense of touch.

The materials were grouped into four categories according to their fibre content (e.g. cellulose or protein) and structure (e.g. woven or knitted), as follows (Table 6.2-2 below):

Table 6.2-2 Research Project (II): List of 48 textile materials presented to the deafblind community as tactile stimuli

| Research Project (II): tactile stimuli | | | |
|---|---|---|---|
| *Category* | *Subcategory* | *No* | *Name* |
| Group 1: Cellulose fabrics | Cotton | 1 | Cotton muslin |
| | | 2 | Cotton poplin |
| | | 3 | Cotton organdie |
| | | 4 | Cotton |
| | | 5 | Stretch cotton |
| | | 6 | Organic cotton |
| | | 7 | Cotton denim |
| | | 8 | Heavy duty cotton denim |
| | | 9 | Cotton velvet |
| | Linen | 10 | Linen 1 |
| | | 11 | Linen 2 |
| | Manmade | 12 | Viscose |
| Group 2: Protein fabrics | Wool | 13 | Cold wool suiting |
| | | 14 | Mixed wool |
| | | 15 | Tweed |
| | Silk | 16 | Organza |
| | | 17 | Crepe chiffon |
| | | 18 | Sandwashed silk |
| | | 19 | Taffeta |
| | | 20 | Satin |
| | | 21 | Silk shantung |
| | | 22 | Silk velvet |
| | | 23 | Duchess satin |

| Research Project (II): tactile stimuli | | |
|---|---|---|
| *Category* | *No* | *Name* |
| Group 3:<br>Knit and jersey textiles | 24 | Cotton jersey |
| | 25 | Sweatshirt jersey |
| | 26 | Silk jersey |
| | 27 | Acetate jersey |
| | 28 | Polyester jersey |
| | 29 | Woollen knit |
| | 30 | Polyester knit |
| Group 4:<br>Decorative materials | 31 | Silver mesh |
| | 32 | Tulle |
| | 33 | Lace |
| | 34 | Metallic organza |
| | 35 | Paper lame |
| | 36 | Sequined jersey |
| | 37 | Foil print on jersey |
| | 38 | 3D puff print on jersey |
| | 39 | 3D puff print on muslin |
| | 40 | 3D puff print on cotton |
| | 41 | Ajur jersey |
| | 42 | Laser cut jersey |
| | 43 | Polyester devoré |
| | 44 | Lightweight machine embroidery on cotton |
| | 45 | Heavyweight machine embroidery on cotton |
| | 46 | Etched suedette |
| | 47 | Suedette |
| | 48 | Felt |

All selected materials were standardised to an A4 size (21 / 29.7 cm), which was considered an appropriate and manageable format for handling by the participants.

## 6.2.6  Data collection methods

As discussed in Chapter 4.3 'Methods of data collection and analysis' (p.85), within the overall methodological framework, the Questionnaire and Observation methods were used to record the interactions which occurred in response to the materials and stimuli presented in the three projects.

### Questionnaire design

The questionnaire in this study differed from the one used in Project (I). Likert scales and Closed questions were considered inappropriate due to the sensory and cognitive impairment of the participant group[104].  The questionnaire in this case only contained simplified Open-ended questions regarding participant experience of the presented sensory stimuli, which were communicated verbally, or through other appropriate methods[105], to the research participants by the members of staff.

Therefore, while eliciting information about sensory experience, the questionnaire was in actuality a reporting of the participant experience by the communication guide (Volume Two, Appendix 6.1.4, p.393).

---

[104] A group of people with dual sensory impairment in combination with other cognitive and learning disabilities

[105] E.g. British Sign Language (BSL) and spelling on the hand (See Table 6.2-1, p.162 for details on the communication methods that were appropriate for each participant)

Observation via photographic evidence in situ

Participant observation via photographic evidence in situ was the preferred method used for data gathering in this project.  The method was used to document the two engagement processes of the workshop: participant sensory response to textile stimuli (i) and the co-creation of T-shirts with research participants (ii).

In Research Project (II), the photographic data capture was done by the researcher, who was free to act as an observer between short bursts of workshop facilitation role.  As with the instructions given to the photographer in Project (I), the researcher endeavoured to include all participants in the images taken.  This helped create a visual narrative of the interactions that took place.

## 6.2.7  Ethics

In Research Project (II), ethics was of primary importance to the project, due to the sensitive nature of the deafblind participant group, who had varying degrees of hearing and sight loss, as well as other learning or cognitive impairment.  Therefore, on this occasion, ethical clearance was explicitly granted by *Sense.*  (A copy of the original ethics form submitted to *Sense* is located in Volume Two, Appendix 6.1.1, p.373).

This was a useful process as it allowed for all health and wellbeing concerns to be addressed and incorporated in the design of the workshop.  For instance, in exploring the broad range of sensory-stimulating textile materials, the communication guides who supported the project, were instructed to terminate the exercise in the case of any physical or emotional discomfort arising in the participants from the textile exploration.

As discussed in Section 6.2.2, p.161 ('Research participants') and p.162 ('Workshop assistance') ethical clearance was sought and obtained prior to

the commencement of the project, to ensure the physical and emotional wellbeing of research participants, participating members of staff, and the researcher.

A Recording Agreement was also signed, in which the parents or guardians of the participants and the participating staff members gave permission for the data to be captured via photographs, and be used for analysis and other dissemination purposes related to the research.

## 6.3    Data collection and analysis

The data collection and analysis follows the structure of the *Sense in Textiles* participatory workshop.

In seeking to analyse the data gathered, the researcher was guided by the following intentions:

a) To elicit, study and record deafblind participants' sensory experience and engagement with fashion-related materials;
b) To assess the performance of the T-probe as an appropriate method to enable a fashion experience for the deafblind community group.

Timetable and activities

The workshop comprised two main phases which were in keeping with the methodological framework.  Phase 1 was presentation of textile stimuli, and Phase 2 involved participants creating their T-shirt designs.

However, given the levels of sensory and cognitive ability in the participant group, all workshop activities had to be paced over a five-week period.

The workshop comprised four activities:

1) Introduction;
2) Exploration of stimuli;
3) T-shirt co-creation;
4) Participant debriefing.

A timetable detailing the time allocated to each activity is presented below.

Table 6.3-1 Research Project (II): Schedule of data collection

| | Workshop activities | Week | Duration |
|---|---|---|---|
| 1) | Introduction and purpose of the study presented to staff members; Introduction of the researcher to participants | Week 1 | 1 hour over afternoon tea |
| 2) | Data collection, Workshop Phase 1: Presentation of 48 textile stimuli: <br> • Questionnaire – recorded feedback of participant response to stimuli; <br> • Observation – photographs taken in situ | Week 2 | 2 x 3-hour workshops with 3 participants in each |
| 3) | Data collection Workshop Phase 2[106]: T-shirt co-creation <br> • Design sheets <br> • Observation – photographs taken in situ | Week 3 | 2 x 3-hour workshops with 3 participants in each (T-shirt design workshop) |
| | | Week 4 | 2 x 3-hour workshops with 3 participants in each (T-shirt production) |
| 4) | Participant debriefing | Week 5 | 1 hour over afternoon tea |
| | | **Total duration:** | **20 hours over 5 weeks** |

---

[106] Data collection and analysis, Workshop Phase 2: *T-shirt co-creation* was delivered over two weeks which allowed time for both designing and making the T-shirt.

On the advice of the communication support staff, the six participant group was divided into two groups of three each. The workshop was delivered to Groups One and Two on different days during the same week.

The introduction to the workshop was delivered by the researcher in verbal format to the members of support staff. The aim of this introduction was to ensure that support staff understood the need for clear communication, maintaining of rigorous ethical standards, ensuring health and safety of the participants which was of prime importance, and to invite any questions that they might have.

In the Introduction the following aspects were covered:

- i.     Name and affiliation of the researcher
- ii.    Purpose of the workshop
- iii.   Structure of the workshop
- iv.    Communication and activity support required on behalf of the members of staff
- v.     Ethical considerations
- vi.    Health & Safety guidelines
- vii.   Any questions from the staff members arising at this stage

As the research remit of the study could not be grasped by this user group, aspects of the workshop that directly required engagement were addressed instead. Participants were informed that they would be engaging in a series of creative activities and working towards the design and making of a personal T-shirt (Mayfield, 2001), thus making the T-shirt the centrepiece

of the Project.  In keeping with the approach of making the needs of the deafblind user group as important as the fulfilment of the research purpose, it was decided that the researcher be introduced to the participants in an informal setting over tea and biscuits.

### 6.3.1  Data collection and analysis, Workshop Phase 1: *Exploration of stimuli*

Phase 1 of the workshop entailed presentation of 48 textile materials that could be used to create clothing (Section 6.2.5 'Selection of workshop stimuli', Table 6.2-2, p.164).  The materials were presented to each participant individually.
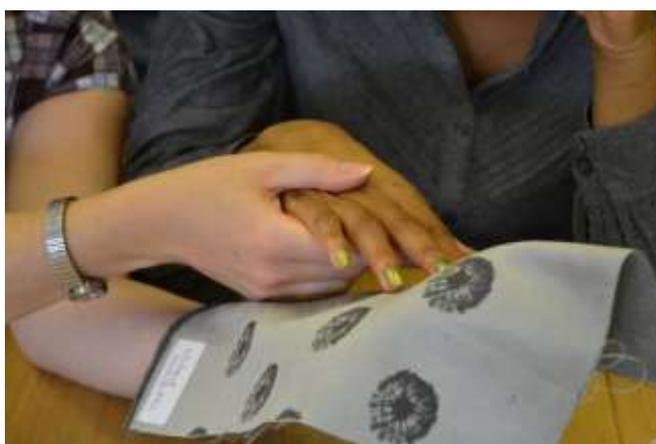


Figure 6.3-1 Research Project (II): Deafblind participant exploring an etched textile material. Image taken by the author, August 2013

The members of support staff, i.e. communication guides, were instructed to:

i.      Present the materials one-by-one to the participants, to feel and explore (Figure 6.3-1 above);

ii.     Note down on the questionnaire reporting sheet (Volume Two, Appendix 6.1.4, p.393) any participant response, e.g. overt expression of affinity or aversion;

iii.    Terminate the exercise in the case of any physical or emotional discomfort arising from the textile exploration (Volume Two, Appendix 6.1.1 Ethics form, p.373).

Participant feedback of sensory experience and cognitive response to the 48 textile materials was collected via:

a) A questionnaire which was used by the communication guides to record participant response to the stimuli;

b) Observation via photography in situ, which was done by the researcher at random intervals as the interactions took place.

Given the range of sensory and cognitive ability within the participant group, the exploration of stimuli gave rise to diverse responses.  An example in point was a participant who refused to touch the materials with her hands, but still participated by exploring the textiles through her feet (Figure 6.3-2 below).  This was done on the advice of her communication guide who observed that in this case the participant kept dropping the textiles.  On being presented the textiles to her feet, she showed immediate engagement.



Figure 6.3-2 Research Project (II): Deafblind participant exploring knitted textiles through her feet. Image taken by the author, August 2013

The above example illustrates that reading, interpreting, and documenting participant response was reliant on the expertise of the communication guide in being able to identify and ascertain the sensory responses made by the participants.  Such readings and assessment relied heavily on the one-on-one relationships the communication guides had built with the participants[107].  An example of a completed recording sheet of participant engagement is presented in Volume Two, Appendix 6.2.1a), Figure A.6.2-1 & Figure A.6.2-1 (pp.396-397).

## **Analysis of reported feedback of participant response to the stimuli gathered via the Questionnaire**

Participant response to the stimuli, as recorded in the feedback sheets, was arranged in a table format against each textile material (No. of materials = 48) (Volume Two, Appendix 6.2.1, Table A.6.2-2, p.398).  The table was ordered from highest to lowest number of participant responses to the textile materials, ranging from six responses (6 = total number of participants, i.e. all participants engaged) to no responses reported in one of the cases.

A review of this table revealed that some materials elicited more engagement than others. For example, in the case of twelve specific textile materials (No. 13, 14, 15, 16, 27, 28, 29, 31, 33, 34, 43, 47) five out of the six participants showed active sensory and cognitive engagement. Likewise, in response to nine other fabrics (No. 9, 12, 17, 18, 21, 22, 37, 39, 45) three participants demonstrated high engagement.  There was only one textile that did not elicit any notable participant engagement (No. 6 organic cotton).

---

[107] Every communication guide had been carefully chosen because they had a carer / support-staff relationship with the participants in the study.

Of design interest were the specific types of materials that elicited greater participant engagement.  These included:

a) Stretchy materials, e.g. jerseys, or knitted fabrics – which could be considered familiar everyday clothing textiles and from which this user group would seem to derive comfort[108];

b) Wools and tweeds with hairy texture;

c) Decorative fabrics, e.g. tulle, lace, silver mesh, sequined fabrics and jersey printed with puff binder (Figure 6.3-3 below).



Figure 6.3-3 Research Project (II): Participant exploring jersey material printed with puff binder. Image taken by the author, August 2013

It is also interesting to note that organic cotton, which may be considered a preferred choice of material by an ethically and sustainability conscious consumer, elicited no participant engagement in the deafblind user group.

---

[108] The commentary is based on the researcher's own observations on the type of clothing that was worn by facility users at the Anne Wall Centre.  Ethnographic observation was not part of the methodology employed in this specific study however, the designer mindset of the researcher easily picked up on such point of engagement with day-to-day dressing.

From this, the researcher speculated that the textile interactions that occurred in this deafblind group, and the expressed preference towards specific materials, may have been based on sensory responses exhibited in their purest form, unbiased by trends, market offering and advertising.

Participant response was further analysed thematically by categorising the feedback of engagement into five main themes:

i. Showing affinity;
ii. Showing aversion;
iii. Showing sensory experience;
iv. Showing cognitive response;
v. Showing neutrality, i.e. unable to assess whether the response was an expression of affinity / aversion.

Table 6.3-2 below presents the colour-coding that was used for categorising the data under each theme.

Table 6.3-2 Research Project (II): Colour-coding of participant response to 48 textile materials

| *Theme* | *Colour-Coding* |
|---|---|
| Showing affinity | |
| Showing aversion | |
| Showing sensory experience | |
| Showing cognitive response | |
| Showing neutrality, i.e. unable to assess whether the response was an expression of affinity / aversion | |

The data was then further tabulated into the respective five categorisations in order to observe similarities between participant responses if any (Volume Two, Appendix 6.2.1, Table A.6.2-3, p.402).

A summary of the findings is presented in the pie chart below (Figure 6.3-4), and illustrates that participant response to the textile materials displayed greater affinity than any of the other categorisations (99 out of a total number of 214 reported responses).
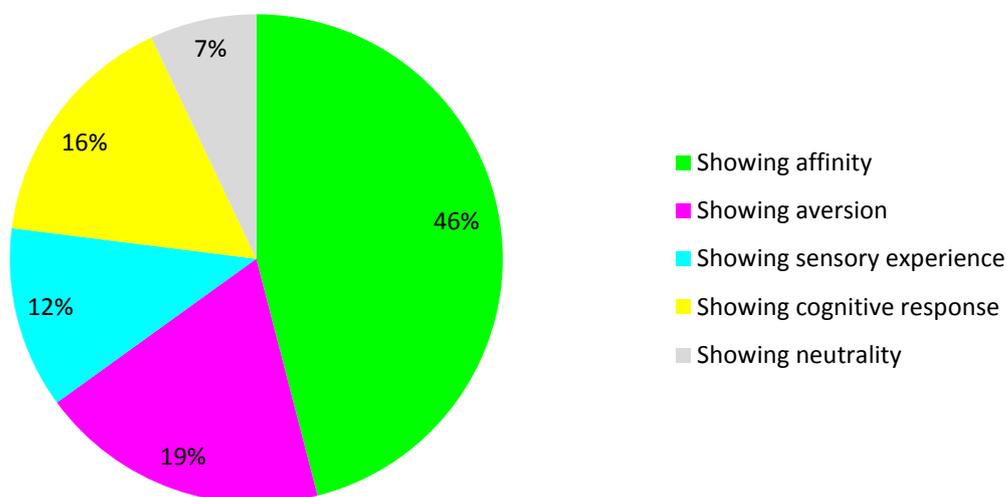


Figure 6.3-4 Research Project (II): Participant responses to 48 textile materials

Closer examination of the content under each of the categories revealed that participant sensory experience involved kinaesthetic, visual and auditory responses, as well as purely cognitive associations, e.g. "funky".

This serves to demonstrate that sensory impairment, even in cases where other learning disabilities are present, does not preclude processing of sensate experience by the participant.  Engaging with the materials via

texture, colour, and sound, continues to provide a powerful platform of sensory and cognitive engagement with tactile stimuli in the deafblind user group.

## Analysis of photographic evidence of participant engagement with the stimuli

The interactions that took place were documented via photography by the researcher, who was free to act as an observer between short bursts of workshop facilitation role.

The participant observation data comprised 44 photographs of participants exploring the textile materials, taken by the researcher as the interactions took place (Volume Two, Appendix 6.2.1, p.401).  The photographs were categorised under two main themes:

  i.  Engagement, i.e. showing affinity or showing aversion-based responses;
  ii. Non-engagement, i.e. showing neutral or no response.

As with Project (I), the categorisation of the data was discussed and verified with neuroscientist Flory, to provide a more informed choice based on the psychology of emotion (Ekman, 2004).

There was only one mismatch in opinion regarding Image 8, where the researcher had labelled the images as "non-engagement".  Flory, however, stated that the facial expression in the photograph was pointing towards an engagement rather than non-engagement, illustrating cognitive assessment and processing, prior to making an overt expression of response.

An analysis of this classification categorised 41 images under the "engagement: classification, and only 3 images under "non-engagement",

demonstrating a high-level of engagement response to the textile materials.

In examining further the specific types of engagement that took place, overt affinity to the fabrics was expressed in 11 images, and aversion in only one case. Other types of engagement that were observed included a high level of kinaesthetic response in 25 images (Figure 6.3-5 below), as well as olfactory sensory response in two cases (Figure 6.3-6 below).



Figure 6.3-5 Research Project (II): Deafblind participant exploring decorative fabrics. Images taken by the author, August 2013



Figure 6.3-6 Research Project (II): Deafblind participant smelling etched suedette material. Images taken by the author, August 2013

## 6.3.2 Data collection and analysis, Workshop Phase 2: *T-shirt co-creation*

In Research Project (II) *Fashion for people with dual sensory impairment*, the T-shirt became the centrepiece to the project by enabling a fashion experience for the deafblind user group. Design sheets were used as a method of planning the production of the actual T-shirt artefacts.

The aim of this phase was to observe and record how deafblind participants would engage in a fashion-related experience, by asking them to design a personal T-shirt that they would be proud to wear, e.g. by incorporating their favourite activities, and / or engaging creatively in the making of the T-shirt, which was described by a communication guide as a participant's own way of *"making sense of the world"*.

This phase of the workshop was conducted over two weeks, which allowed time for both designing and making the T-shirt.

Each participant was asked to:

i. Choose a design for their T-shirt, e.g. by selecting between short or long sleeves, scoop or V-neck;

ii. Develop a decorating technique for the making of their T-shirt;

iii. Make the actual T-shirts with technical support from their communication guides and the researcher.

In this way complete freedom of self-expression was given to the participants. Five of the six participants actively engaged in this phase of the workshop and created their T-shirts by using textile markers, crayons, paints, appliqué, or transfer prints. Examples are provided overleaf.

Figure 6.3-7 Research Project (II): Deafblind participant designing his T-shirt on the template provided. Image taken by the author, August 2013



Figure 6.3-8 Research Project (II): Deafblind participant making textile collage for her T-shirt. Image taken by the author, August 2013



Figure 6.3-9 Research Project (II): Deafblind participant creating a print on her T-shirt using crayons. Image taken by the author, August 2013

The communication guides were reminded to act solely as facilitators in the making process, refraining from prompting and / or leading the creative and design choices of the participants.

First participants were asked to create the design for their T-shirt. Design sheets were used as a method of planning the production of the actual T-shirt artefacts. Participants were asked to express their preference for length of sleeves, collar line, T-shirt colour, creative techniques and materials chosen.

Providing each of these options to the participants had dual purpose:

i. To enable a fashion experience in which the customer selects a garment based on similar criteria;

ii. To provide full creative decision-making capacity to the participants – one of the main learning objectives at the Community Centre.

The design sheets that were produced were scanned and appear in Volume Two, Appendix 6.2.2 Data Set Two: T-shirt design sheets, p.427.

The designs were grouped into two main categories:

i. T-shirt designs where the creative process was led by the participant and then translated into a finished garment with the support of the communication guides and the researcher;

ii. T-shirt designs where the design process was based on communication guide[109]'s translation of participant feedback and creative expression.

---

[109] in cases where the T-shirt designs were guide-led it was due to either the inability of the participant to express their ideas verbally or in any written or creative format

Table 6.3-3 below presents the categorisation of the T-shirt designs under the two themes.

Table 6.3-3 Research Project (II): Categorisation of T-shirt designs according to level of participant engagement in the design and making processes

| T-shirt designs that were creatively-led by the participant | | T-shirt designs that were an interpretation of participant feedback by the communication guide | |
| --- | --- | --- | --- |
| *Participant No.* | *Design approach* | *Participant No.* | *Design approach* |
| U_1 | Creative self-expression of participant through drawing / painting | U_6 | Interpretation of participant taste |
| U_2 | | | |
| U_5 | | | |
| U_4 | Creative direction of participant to communication guide | U_3 | Interpretation of participant sensory feedback |

The design and making of each T-shirt is described in order of the T-shirts that were creatively-led by the participant, followed by the ones that were an interpretation of participant feedback by the communication guide.

As explained in Chapter 4.3.1b) (p.97), narrative account was considered most appropriate to develop an understanding of the interactions that took place and unravel each participant's individual approach to the creation of their T-shirt.

## T-shirt designs that were creatively-led by the participant

Participants No. 1, 2 and 5 were partially sighted and therefore able to engage actively both in the design and making sessions for their T-shirts. All three participants had overtly expressed artistic preferences, e.g.

drawing and painting, and it made sense therefore to provide them with white cotton T-shirts[110] and textile media to work directly onto the T-shirts.

## Participant No. 1

Participant No. 1 (U_1) chose textile paint as creative medium. She developed a special technique of painting / stamping which involved using both her hand and her elbow to develop the T-shirt print (Figure 6.3-10 below).



Figure 6.3-10 Research Project (II): Participant No. 1 painting her T-shirt. Image taken by the author, August 2013

According to communication guides such activity could be interpreted as developing a positive body image, as she would normally try to conceal the fact that her left arm had been amputated.

---

[110] Bespoke T-shirt patterns had been produced by the researcher for each participant, which allowed for each component of the T-shirt, i.e. front, back and sleeves, to be provided separately, to enable ease of handling. The T-shirts were sewn together at the end of the workshop by the researcher.

The researcher speculated that in this and similar cases, carefully-considered design expressed through fashion garments, could be used as a teaching mechanism to develop proprioceptive sensitivities, self-awareness, and self-appreciation.

Figure 6.3-11 below shows the participant receiving her finalised T-shirt.



Figure 6.3-11 Research Project (II): Participant No. 1 with her T-shirt. Image taken by the author, August 2013

**Participant No. 2**

Participant No. 2 (U_2) used textile markers to draw directly onto his T-shirt, and transfer the design he had created himself on the T-shirt template (Volume Two, Appendix 6.2.2 'T-shirt design, Participant No. 2 (U_2)', p. p.428) onto the actual garment.  This creative technique was chosen because the participant enjoyed drawing and demonstrated a preference for crayons and markers due to mobility restrictions of his free-hand.

The communication guide assisting participant No. 2 explained that it was a personal challenge for him to sustain attention on a specific task for long periods of time, except for when he was drawing.  His dedication to creating an artwork until it was considered finished reminded everyone of Jackson Pollock's expressionist approach to painting[111].

The participant's drawings often comprised lines and shapes of different colours, which could appear very similar to an observer, but the participant was always able to explain what the drawings represented.

Communication guides informed that all of his artwork was greatly commended by his parents and displayed on the walls at home.  Therefore, transfer prints of the participant's previous drawings were used to spell his full name onto the sleeves of the T-shirt (Figure 6.3-12 below). On this occasion, the T-shirt became a medium for asserting self-identity, self-appreciation, and pride.



Figure 6.3-12 Research Project (II): Participant No. 2 creating his T-shirt. Images taken by the author, August 2013

---

[111] An American painter and pioneer of the abstract expressionist movement (1912-1956) (Tate, 2015d))

**Participant No. 4**

Participant No. 4 was fully blind and partially deaf.  Even though she was not able to complete a T-shirt design template herself, she provided very detailed and clear direction to her communication guide regarding the T-shirt that she wanted to make and wear.

She selected fabrics from the textile materials explored at the previous stage of the workshop to incorporate in her design.  The design also included images of her favourite shows and characters, lyrics of songs she liked, and photos of her and her family.  The participant provided further creative direction in relation to the positioning and colour palette of each print.  (See Volume Two, Appendix 6.2.2 'T-shirt design, Participant No. 4 (U_4)', p.431).

The T-shirt was produced by the participant with the support of her communication guide (Figure 6.3-13 below).



Figure 6.3-13 Research Project (II): Participant No. 4 making her T-shirt. Images taken by the author, August 2013

Figure 6.3-14 below shows the participant wearing her T-shirt at a fashion show that was organised within the *Anne Wall Centre* at the conclusion of the project (See further Participant debriefing, p.240).



Figure 6.3-14 Research Project (II): Participant No. 4 wearing her T-shirt. Image taken by the author, August 2013

In this case the T-shirt became a medium for communicating identity, individuality and ownership during the various creative processes in the design phase.

**Participant No. 5**

Participant No. 5 (U_5) chose textile crayons for her designs. What was interesting to note was how she adapted her style of drawing to the behaviour of the T-shirt jersey, which was different to the paper media she was accustomed to draw on. The participant gradually built up the image for her T-shirt with consistent colour marks by using all available crayons in the box (Figure 6.3-15 overleaf).
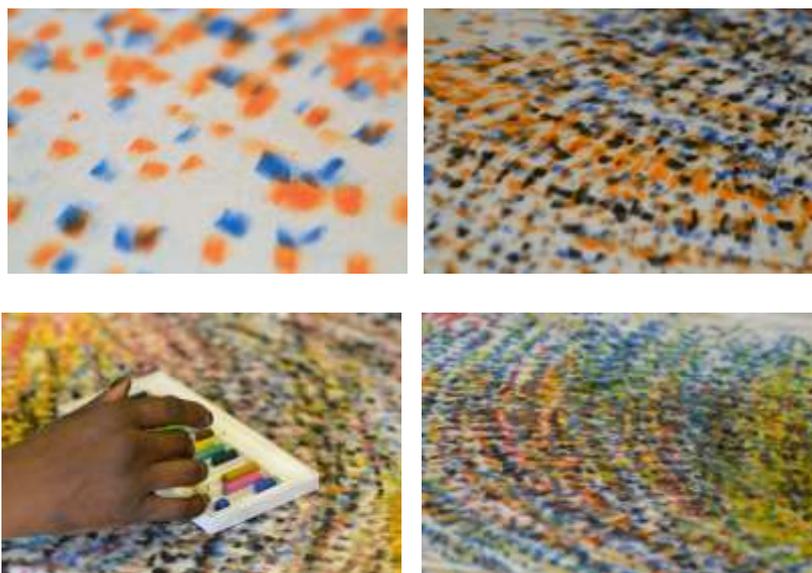
Figure 6.3-15 Research Project (II): Participant No. 5 creating her T-shirt print. Images taken by the author, August 2013

The T-shirt that was produced is illustrated in Figure 6.3-16 below.
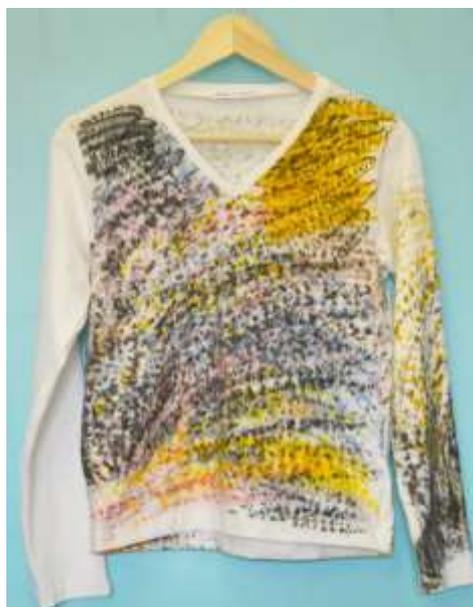


Figure 6.3-16 Research Project (II): Completed T-shirt produced by participant No. 5 using textile crayons. Image taken by the author, August 2013

Upon presenting publically the project after it was complete (Ivanova, 2014; Ivanova, 2015), the T-shirt produced by participant No. 5 attracted the greatest audience response and commentary with enquires as to whether the design was available for sale.

The researcher considered how artefacts such as the 'humble' T-shirt, produced by communities of people that are considered 'disabled' and therefore live in a certain isolation from society, could begin to expand perception of what it means to self-express and create.

The T-shirt above is an example that disability may well be in the eye of the beholder, and not experienced as a "disability" by those who are differently-abled, who engage through one sensory-perceptive route, or another, with the richness of life and inner sense of wellness.

T-shirt designs that were an interpretation of participant feedback by the communication guide

## Participant No. 3

Participant No. 3, who was partially deaf and fully blind, used her feet to explore the range of textile materials and mediate sensory feedback during Phase 1 of the Workshop.

In this case the T-shirt was created by printing photographs of the participant's experience (Figure 6.3-17 overleaf). These images exhibited the participant's engagement process and in so doing, illustrated the otherwise generally hidden character and expressive nature of the participant.

Figure 6.3-17 Research Project (II): Participant No. 3's T-shirt printed with images of the participant exploring textiles through her feet. Image taken by the author, August 2013

**Participant No. 6**

Participant No. 6 was the only fully deafblind participant, and therefore was unable to communicate a design for her T-shirt.  Based on observation of her preference for specific textile materials and creative techniques, her communication guide proposed a T-shirt design process that would be a positively engaging experience for the participant.

The participant tore pieces of paper-sized cotton material into strips of fabric, which she then collaged onto the T-shirt with the support of her communication guide (Figure 6.3-18 overleaf).

Figure 6.3-18 Research Project (II): Participant No. 6's T-shirt design incorporating textile appliqué. Images taken by the author, August 2013

The individualised creative processes unique to participants No. 3 and No. 6 in the context of this study, suggest that the artefacts produced via the methods outlined, could in themselves become probes in the public domain, raising awareness of the wider nature of sensory engagement, and how creativity-based activities in a fashion context may be beneficial to less visible communities.

Participant debriefing

A week after the workshop a debriefing session was hosted with the participants and members of staff at an informal tea and cookies session.

In the first section the researcher checked-in with the support staff to ascertain that participants were well, and that no adverse reactions had occurred as a direct result of their participation in the research process.

The completed T-shirts were given to each participant to wear whenever they wanted.

This was followed by a general discussion about the creative processes and materials involved in the workshop.

The floor was open for questions, which led to a discussion regarding where and how studies like this could be expanded upon and be taken forward.

Members of staff were reminded that they, as well as the parents / guardians of the participants, could contact the researcher at any time should they have any further questions.

A PR officer from *Sense* was present at the debrief session for the workshop to interview the participants, members of staff and the researcher, regarding their involvement in the process.  This resulted in a press release detailing the outcomes of the study (Volume Two, Appendix 6.3, p.435), which was published on *Sense*'s website[112].

Unplanned by the researcher, but presenting a very satisfying closure to this study, was *Sense* hosting a fashion show where the participants could showcase their T-shirts to members of staff and facility users at the *Anne Wall Centre* who had not been included in the study (Figure 6.3-19 overleaf).  The fashion show highlighted the role of the T-shirt as a method of connecting this participant group to a fashion experience.

---

[112] Available at: https://www.sense.org.uk/content/sense-textiles-–-fashion-show-deafblind-people (Accessed: 15 October 2015)

Figure 6.3-19 Research Project (II): Deafblind participants wearing their T-shirts, accompanied by members of staff and the researcher, at the fashion show hosted at the *Anne Wall Community Resource Centre.* Images courtesy of the Anne Wall Centre, September 2013

## 6.4  Discussion of outcomes and findings

### 6.4.1 Research Project (II): outcomes and findings

The aim of Research Project (II) was to study the potential experience fashion by people with visual and auditory impairment.  The Project used the T-shirt as a centrepiece for the study to create a framework for:

i.      Eliciting participant interaction with textile materials for clothing;

ii.     Documenting the methods of engagement of deafblind people in a creative fashion experience.

Overall, participants responded positively to the presented textiles by displaying diverse individual and unexpected responses, given the range of sensory and cognitive ability within the participant group.

Materials with specific kinaesthetic properties, e.g. jerseys, knitted fabrics, wools and textured decorative textiles, elicited greater engagement and an affinity-based response.

Other sensory experiences of the stimuli included visual (colour of the materials), olfactory (smell of the fabric), and auditory (sounds, e.g. scrunching and squeaking) responses.

Furthermore, some of the participants engaged cognitively by either expressing verbal associations, or direct sensory engagement with the fabrics communicating familiarity with the fabrics, e.g. wrapping around their wrist or feeling the fabric through different parts of the body, e.g. feet, elbow, etc.

It could be concluded that sensory impairment, even in cases where other learning disabilities are present, does not preclude processing of sensate experience.  Engaging with the texture, colour, and sound of the fabrics

through sensory and cognitive experience, transports this user group into the realm of fashion.

The findings suggest that the deafblind community may benefit and gain pleasure from a fully considered type of fashion experience.  This invites deliberation by designers and other stakeholders, e.g. scientists and commercial brands, to consider research and development of methodologies, designs, products, and services for user groups such as this one.

A shorter term consideration for the immediate future is to formulate and answer questions around the idea that design outcomes that emerge from designing for people with specific sensory requirements can have an impact on how fashion is perceived and consumed by the wider community.

## 6.4.2  Role of the T-shirt as a probe in relation to Research Project (II)

Table 6.4-1 overleaf presents the T-shirt outcomes of the research engagement with the deafblind community at the Anne Wall Centre.

Table 6.4-1 Research Project (II): T-shirt designs co-created with deafblind research participants. Images taken by the author, August 2013

Participant No. 1



Participant No. 2



Participant No. 3



Participant No. 4



Participant No. 5



Participant No.6

In this study each T-shirt provided insights into:

i.      The creative processes and levels of engagement expressed by deafblind participants;

ii.     The type of participant engagement, e.g. artistic creativity, personal self-expression and sensory engagement.

From the above observations, three separate roles of the T-shirt as a probe emerged within Project (II).

To the research participants, the T-shirt provided a medium to explore, express, assert and communicate.

To members of support staff and *Sense*, the study and subsequent fashion show at the AWC indicated that staff and *Sense* were engaged in the development of creative experiences that were beneficial on a personal level (for deafblind community members), professional (for the members of staff), and global (for *Sense* as a charity in enabling understanding of deafblindness in the public domain). (See further Volume Two, Appendix 6.4 'Feedback response received from Nic Vogelpoel, Head of Arts & Wellbeing at *Sense*', p.437.)

To the researcher, the T-shirt brought the value and the power of a well-considered probe in engaging user groups, communicating concept and processes, creating new knowledge, and developing new learning that may shift perception and thinking within the wider design community.

The following Chapter 7.0 'Research Project (III): *Synthetic ingredients for fine fragrance*' further determines the application of the T-probe alongside more traditional research, innovation, communication, education, and marketing techniques.

# 7.0 Research Project (III): *Synthetic ingredients for fine fragrance*

*The following chapter describes how the T-probe approach was employed within Research Project (III), a project set-up in partnership with the global company International Flavors & Fragrances (IFF), with the view to engaging consumer understanding of synthetic ingredients in perfumery.*

*The chapter begins with a reminder of the background to the Project, thus providing the rationale for employing the T-probe in that particular context. A discussion of the specific design and research processes involved in the set-up of the research project is provided.*

*The data collection and analysis for that project is explained by following the two-stage methodological framework discussed in Section 4.2 (p.81). Stage One expressed itself as The Scented Tee workshop. Stage Two involved participants wearing T-shirts with fragrance-inspired designs within social settings to elicit public feedback and responses from a larger population.*

*The chapter concludes with a discussion of the findings and outcomes that were specific to the Project, and further establishes the value of the T-probe in bridging industry objectives and consumer markets.*

## 7.1 Background to the Project

The Project emerged in in conversations with the marketing team of the *International Flavors and Fragrances (IFF)* which were aimed at identifying an area of research interest within which the T-probe approach could be

tested. *IFF* recognised that selling synthetic fragrance ingredients[113] to their industry clients presented a challenge due to pertinent negative associations with the notion of 'synthetic'.

Despite the unique selling points of perfumers' synthetic creations, a challenge arises when relating such fragrance ingredients to industry clients, and in addition consumers. Generally, 'natural' is considered more desirable as it feels familiar and instinctively closer to human wellbeing. 'Synthetic' on the other hand, in this particular context, is viewed as 'chemical' and therefore inferior to natural ingredients. This echoes the earlier narrative in this thesis, pertaining to the introduction of synthetic materials to broader fashion and textile markets at the beginning of the 20th century (Section 1.2.2 'Nylon: the manmade revolution', p.6).

In an attempt to make synthetically-formulated fragrances more appealing to corporate clients, figurative language is often used in marketing strategies to trigger familiar associations. The chemical origin of the ingredient is hidden, and the name of the molecule will rarely be present on the label of the final product. For instance, CASHMERAN®[114] is a term specifically created to denote the synthetic scent accord $C_{14}H_{22}O$, to evoke the natural characteristics of cashmere fabric, such as its luxurious feel and powdery, velvety texture.

This created scope for employing the T-shirt to advance consumer understanding of synthetic ingredients in perfumery, thus fulfilling the

---

[113] Synthetic fragrance ingredients are created as chemical molecules by perfumers in the laboratory, and are used in the perfume industry to add and enhance the range of natural ingredients, e.g. rose and lavender oils. The process of synthesising fragrance ingredients through chemical processes allows for technical, environmental and human factors to be integrated in the scent molecule while it is being created. In this way, synthetic fragrance ingredients are created in a way to provide a unique scent structure, opportunities for fragrance innovation, and a competitive edge to IFF's clients, often global brands and fashion houses.

[114] An *IFF* exclusive creation

overall research aim of advancing engagement with challenging concepts of materials and related sensory experience.

Further to this, the project created scope to:

a) Elicit, study and record participant sensory experience of synthetic fragrance ingredients;

b) Further the knowledge and understanding of factors affecting public perception and sensory engagement with fragrances;

c) Enhance industry understanding of the value of using the T-probe to connect with their customer and client base, alongside traditional research, marketing and outreach approaches.

## 7.2    Study design

The Research in Practice followed the two-stage research process discussed in Chapter 4.2 'Methodological framework' (p.81).

*Stage One: Participatory workshop* expressed itself as *The Scented Tee* workshop, which was aimed at:

i.    Advancing consumer understanding of the value of synthetic fragrance ingredients in perfumery via a sensory exploration of specific fragrance ingredients;

ii.    Developing the T-shirt as a probe to evoke new thinking around olfactory design, materials, processes, development and marketing.

In *Stage Two: Voluntary participation post-workshop*, T-shirts with fragrance-inspired designs were worn as probes within social settings, to elicit public interest and engagement with synthetically formulated fragrance ingredients.

The design of *The Scented Tee* workshop was overlooked by Delphine de Swardt[115] and Dr Céline Manetta[116], to ensure that the project was rigorous in its research intentions and process.  This involved:

a) Decisions about workshop location and recruitment procedures;
b) Preparation of materials and stimuli to be included in the workshop;
c) Design of the workshop questionnaire;
d) Requesting workshop assistance;
e) Discussion of ethical concerns.

## 7.2.1  Workshop location

Similarly to Research Project (I), *The Scented Tee* workshop was hosted at Kingston University London (Knights Park campus), with all due considerations to health, safety and ethical guidelines, as carried out for Project (I) (Chapter 5.2.1 'Workshop location', p.109).

## 7.2.2  Recruitment procedures

Recruitment procedures were kept consistent and rigorous as with Research Project (I) (Chapter 5.2.2 'Recruitment procedures', p.109). Participants were recruited from the wide Kingston University's demographic via a research poster which was displayed at various locations at the University campus (Figure 7.2-1, p.202).

As discussed in Chapter 4.2.1a) 'Workshop Phase 1: Presentation of stimuli' (p.83), the sensory engagement varied in each of the Research

---

[115] Marketing Manager Fine Fragrance at *IFF Neuilly*

[116] Consumer Science Research Fellow at *IFF Neuilly*

Projects.  In the case of Project (III) the primary sensory engagement was olfactory.  Therefore, an inclusion criterion for participation was:

*Good general health and self-reported normal sense of smell.*

## Recruitment poster

The recruitment poster (Figure 7.2-1 below) was designed by the researcher and approved by the supervisory team.  The design was guided by the following intentions:

i.   Clarity of information;
ii.  An enigmatic visual image that would elicit engagement and interest across the diverse student cohort.



Figure 7.2-1 Research Project (III): Recruitment poster. Graphic design by the author, August 2014

## 7.2.3  Research participants

As with Project (I) it was hoped that there would be twelve participants in the workshop, which was considered a manageable group size for this type of participatory workshop.

Nine participants responded to the recruitment poster, which comprised 75% of the aimed-for participation.  All participants fulfilled the inclusion criteria and were therefore included in the study.

Table 7.2-1 below presents a summary of participant demographics.  For a breakdown of participant particulars, see Volume Two, Appendix 7.2 'Participant data: Research Project (III)' (p.449).

Table 7.2-1 Research Project (III): Workshop participants

| Participants | No | Academic background | | | Nationality | | Average age | Overall average age of participants |
|---|---|---|---|---|---|---|---|---|
| | | Science | Arts & Design | Other | British | Other | | |
| Female | 7 | 2 | 4 | 1 | 3 | 4 | 33.2 | 32.4 |
| Male | 2 | 1 | - | 1 | 2 | 0 | 30 | |

The average age of the participants was 32.4 years, with the youngest participant being 22, and the oldest participants being 40 years of age. Seven participants were female, with an average age of 33 years.  Two participants were male, with an average age of 30 years.

Five participants were British, of which three were female and two were male, with the remaining four declaring background as other.  The exact country of origin appears in Volume Two, Appendix 7.2 (p.449).

Three participants, two female and one male, were from Science background.  Four female participants were from the Art & Design disciplines.  One male had identified himself as a researcher, and one female had preferred not to state.

Nationality was taken with the idea that cultural background and ethnicity may have a bearing on olfactory interpretation (Herz, 2008), however on looking at the data sets the researcher realised that this type of exercise would be a number-crunching exercise[117] that did not fall within the remit of the study.

## 7.2.4 Selection of workshop stimuli

Phase 1 of the participatory workshop involved presentation of relevant stimuli, to explore participant sensory engagement with synthetic fragrance ingredients, and as a consequence inform the design of a T-shirt probe that was specific to this project. The primary sensory engagement in this case was olfactory.

Ten synthetic ingredients were selected from IFF's *Perfumer's Compendium*[118]. The *Compendium* comprises ten emotional scent categories: Air, Contrasted, Intimate, Exhilarating, High tech, Nature, Opulent, and Mystical (Figure 7.2-2 overleaf).

---

[117] Extensive manipulation of numerical data

[118] The *Compendium* is IFF's catalogue of in-house-produced synthetic fragrance ingredients.

Figure 7.2-2 Research Project (III): Description of the emotional scent categories in IFF's Perfumer's Compendium

Upon request by the researcher, *IFF* provided one ingredient from each category for exploration by the participants at the workshop.

Table 7.2-2 overleaf details the ten synthetic ingredients that were selected and supplied by *IFF* prior to the workshop.

Table 7.2-2 Research Project (III): Fragrance ingredients selected for the workshop from IFF's *Perfumer's Compendium*

| | Scent**Emotions**<sup>TM</sup> category | *Ingredient* | Odour family | *Olfactory Description* |
|---|---|---|---|---|
| 1 | AIR | **MARITIMA** | Fresh | Fresh, powerful, clean, marine, air, ocean breeze |
| 2 | CONTRASTED | **KOAVONE** | Woody | Woody, balsamic, pine, floral, violet, amber, aldehydic, pine needle |
| 3 | INTIMATE | **ISO E SUPER** | Woody | Smooth, woody, amber, velvet, fullness, strength, floral, intimate, contrasted |
| 4 | EXHILARATING | **FRUCTONE** | Fruity | Fruity, exotic, pineapple, strawberry, apple-like, woody, sweet pine, exhilarating |
| 5 | HIGH TECH | **GALBASCONE** | Green | Green, fresh, earthy, ozonic, pineapple, high tech |
| 6 | NATURE | **OXASPIRANE** | Herbal | Herbal, minty, powerful, nature, cedarleaf, lavendaceous, pine |
| 7 | OPULENT | **HEXALON** | Fruity | Fruity, woody, pineapple, natural, oily, waxy, opulent |
| 8 | MYSTICAL | **CASHMERAN** | Animalic | Diffusive, spicy, musk-like, floral, powdery, velvet, aromatic, apple, earthy, woody, red fruit, pine, mystical |
| 9 | PRIMITIVE | **AMBRINOL** | Amber | Elegant, aged, natural, amber, tobacco, leathery, oceanic, seaweed, warm, animalic, musky, dry, primitive |
| 10 | TASTY | **BICYCLONONALACTONE** | Powdery | Powdery, tonca, almond, vanilla, coumarin, hay, coconut, sweet, tasty |

## 7.2.5  Data collection methods

As in the previous two projects, Research Project (III) followed the overall methodological framework discussed in Chapter 4.2 (p.81).

A tabular representation of the methods used within each stage of this Project, and the data that was collected from the participants is given below.

Table 7.2-3 Research Project (III): Research methods and data collected

| Research stage | Method and Data collected |
|---|---|
| a)  **Participatory workshop** | Questionnaire response:<br>• Quantitative<br>• Qualitative<br>Photographic evidence in situ |
| b)  **Voluntary participation post-workshop** | Participant feedback of public response |

The two main methods of data collection were Questionnaire and Observation.  For the rationale behind choosing each specific method, refer back to Chapter 4.3 'Methods of data collection and analysis' (p.85).

### Questionnaire design

The fragrance ingredient questionnaire comprised nine questions relating to the following information:

i.  Question No. 1 (Q1): Subjective association with the presented fragrance.  This was only a primer questions to engage participants with the practice of smelling and giving feedback;

ii.     Question No. 2 (Q2): Rating the fragrance ingredient on 5-point Like / Dislike and Foreign / Familiar Likert scales, aimed at arriving at the average affinity / aversion and familiar / foreign responses to each fragrance ingredient;

iii.    Question No. 3 (Q3): Sensory response to each ingredient in relation to qualities such as intensity, brightness, temperature, balance, etc. which are used in the perfume industry to describe fragrances.  This was asked with a view to testing whether there were common perceptions within the participant group relating to specific fragrance ingredients.

Questions No. 4-6 recorded participant cross-modal sensory experience of the fragrances, by translating the olfactory experience into colour (Question No. 4), texture (Question No. 5) and font (Question No.6). These questions were formulated based on a personal interest of the researcher in the new and emerging field of cross-sensory perception (synaesthesia[119]).

iv.     Question No. 4 (Q4): Colour association with the fragrance ingredient;

v.      Question No. 5 (Q5): Texture association with the fragrance ingredient;

vi.     Question No. 6 (Q6): Typographic association with the fragrance ingredient;

Questions No.7-8 were compiled with a view to comparing the findings with the Likert-scale responses in order to identify patterns that might exist within the data.

---

[119] Synaesthesia is often described as a joining of the senses.  Sensations in one modality, e.g. hearing, produce sensations in another modality, e.g. colour, as well as its own.  Synaesthetic experiences are often driven by symbolic rather than sensory representations, such as letters, numbers and words. (UK Synaesthesia Association, 2014)

vii.    Question No. 7 (Q7): Best-liked fragrance from the selection of ingredients;

viii.    Question No. 8 (Q8): Least-liked fragrance from the selection of ingredients;

ix.    Question No. 9 (Q9) involved a simple Yes / No response in relation to participant ability to identify a fragrance as synthetic or natural and was quantified for the number of Yeses and Nos.

A 36-colour chart, a range of textile materials, and an 18-fonts chart were provided to the research participants with the questionnaire, to enable answering Questions 4–6 above.

## Colour chart

The colour chart (Figure 7.2-3 overleaf) was compiled by the researcher based on the Process colour wheel (Ormiston and Robinson, 2007). Additional colours were selected from the *Colour Source Book* (Anderson Feisner and Reed, 2014).

Figure 7.2-3 Research Project (III): Workshop Colour chart. Compiled by the author, August 2014

**<u>Textile materials</u>**

Figure 7.2-4 below illustrates the textile materials that were presented at the workshop.  Five materials were from natural origin (Materials No. 1, 4, 6, 8 and 9 below), and five were synthetic or manmade (No. 2, 3, 5, 7 and 10).  These were selected by the researcher based on the olfactory descriptions of the ten emotional scent categories in IFF's *Perfumer's Compendium* (as described in Figure 7.2-2, p.205), with a view to providing a range of different-feeling materials and textures.



Figure 7.2-4 Research Project (III): Workshop Textile materials as presented at the Workshop. Image courtesy of Ezzidin Alwan, September 2014

Table 7.2-4 overleaf details the selection of the materials according to the olfactory descriptions of the emotional scent categories of the *Compendium.*

Table 7.2-4 Research Project (III): Selection of textile materials according to emotional scent categories as described in IFF's *Perfumer's Compendium*. Compiled by the author, August 2014

| Textile material | | ScentEmotions$^{TM}$ category | Olfactory description |
|---|---|---|---|
| No.1 | Silk chiffon | AIR | Fresh, powerful, clean, marine, air, ocean breeze |
| No.2 | Overall-sequined jersey | EXHILARATING | Fruity, exotic, pineapple, strawberry, apple-like, woody, sweet pine, exhilarating |
| No.3 | Metallic organza | HIGH TECH | Green, fresh, earthy, ozonic, pineapple, high tech |
| No.4 | Organic cotton | MYSTICAL | Diffusive, spicy, musk-like, floral, powdery, velvet, aromatic, apple, earthy, woody, red fruit, pine, mystical |
| No.5 | Polyester jersey | OPULENT | Fruity, woody, pineapple, natural, oily, waxy, opulent |
| No.6 | Silk velvet | INTIMATE | Smooth, woody, amber, velvet, fullness, strength, floral, intimate, contrasted |
| No.7 | Cotton jersey screen-printed with 3D puff-binder paint | TASTY | Powdery, tonca, almond, vanilla, coumarin, hay, coconut, sweet, tasty |
| No.8 | Denim (stiff) | PRIMITIVE | Elegant, aged, natural, amber, tobacco, leathery, oceanic, seaweed, warm, animalic, musky, dry, primitive |
| No.9 | Cotton twill | NATURE | Herbal, minty, powerful, nature, cedarleaf, lavendaceous, pine |
| No.10 | Suedette | CONTRASTED | Woody, balsamic, pine, floral, violet, amber, aldehydic, pine needle |

## **Fonts chart**

The fonts that were included in the fonts chart were selected by graphic designer George Newton from Kingston University London in response to a brief given by the researcher, to choose fonts that resonated with the

emotional scent categories from IFF's *Perfumer's Compendium* (Figure 7.2-5 below).  The word *Scent* was used to present the range of types, in order to minimise any potential bias in visual perception.

Figure 7.2-5 Research Project (III): Workshop Fonts chart. Compiled by graphic designer George Newton on commission by the researcher, August 2014

## 7.2.6  Workshop assistance and support

As in Research Project (I) the workshop was supported by:

i.       An assistant to help with administrative tasks, e.g. distribution and collection of questionnaire and workshop materials;

ii.      The multi-media team[120] to facilitate the collection of photographic evidence from the workshop.

Additionally, a fragrance consultant[121] was invited to provide a mini knowledge base session on the language and the finer points of handling fragrance.  Providing this introduction to participants was included in order to provide a background from which participant to engage with the language of fragrance, the kind of materials used in fragrance, and the techniques for smelling and clearing out olfactory traces when moving from one fragrance to the next.

## 7.2.7  Ethics

As with the previous two projects, ethical clearance was sought and obtained prior to the commencement of the project, to ensure the physical and emotional wellbeing of research participants and researcher.

In Research Project (III), of main ethical concern was participants handling fragrance ingredients of chemical origin.

The fragrances used in the workshop were selected and provided by *IFF* with due consideration of being handled by members of the public outside of the laboratory. Safety Data Sheets were enclosed.

---

[120] Led by Ezzidin Alwan

[121] Nick Gilbert – perfume writer, evaluator, consultant and project manager. See further http://www.nickrgilbert.com/

Additionally, the involvement of a fragrance expert in the introductory session to this workshop, to explain the techniques for smelling and clearing out olfactory traces when moving from one fragrance to the next, ensured the safe handling of the fragrance ingredients.

## 7.3    Data collection and analysis

The data analysis for Research Project (III) is explained in order of the following stages which follow the methodological framework proposed in Chapter 4.2, Figure 4.2-1 (p.82):

  i.    Stage One: *The Scented Tee* workshop;

  ii.    Stage Two: Voluntary participation post-workshop.

In seeking to analyse the data gathered, the researcher was guided by the following intentions:

a) To evaluate participant sensory and cognitive experience of the fragrance ingredients;

b) To assess the performance of the T-probe as an appropriate method that would help connect the consumer with the concept of synthetic ingredients in perfumery.

## 7.3.1 Data collection and analysis, Stage One: *The Scented Tee* workshop

Timetable and activities

Stage One comprised two main phases of data collection.  Phase 1 involved exploration of ten synthetic fragrance ingredients as stimuli.  Phase 2 was the T-shirt design component of the project.

Both phases of the workshop took place in one day.  The total duration of the workshop was two hours.  The following is the workshop timetable detailing the time allocated for each intended activity.

Table 7.3-1 Research Project (III): Workshop timetable

| | *Research Project (III): Workshop timetable* | *Duration* |
|---|---|---|
| i. | Introduction and purpose of the study | 10 mins |
| ii. | Data collection and analysis, Phase 1: Presentation of stimuli:<br>• Questionnaire<br>• Observation – photographs taken in situ | 90 mins |
| iii. | Participant debriefing | 5 mins |
| iv. | Guidelines for further participation | 5 mins |
| v. | Data collection and analysis, Phase 2: T-shirt designs for post-workshop participation | 10 mins |
| | **Total duration:** | **2 hours** |

The Scented Tee workshop: Introduction and purpose of the study

The introduction to the workshop was carried out jointly by the researcher and the fragrance consultant.

The researcher covered the following areas:

i.      Name and affiliation of the researcher;
ii.     Name and affiliation of the fragrance consultant;
iii.    Purpose of the workshop;
iv.     Structure of the workshop;
v.      Reiterating of ethical considerations;
vi.     Health & Safety guidelines.

Any questions from the participants arising at this stage were addressed. Participants were asked to read through the Information Sheet (Volume Two, Appendix 7.1.1, p.439), sign and hand in the Informed Consent Form (Volume Two, Appendix 7.1.2, p.441).

The fragrance consultant introduced the following topics in relation to fragrances:

i.      Language of fragrance, i.e. how we talk about smells;
        A fragrance was provided as an example at this point for participants to smell and discuss.
ii.     Natural and synthetic raw materials used in fragrance;
iii.    Techniques for smelling fragrances.

See Volume Two, Appendix 7.1.3, p. 443 for content of the fragrance introduction above.

The Questionnaire (Volume Two, Appendix 7.1.4, p.445) was handed out at this stage and participants were asked to fill in Task 1 of the Questionnaire which was personal details.

Data collection and analysis, Phase 1: Presentation of stimuli

This phase began with an introduction of the workshop stimuli, which were ten synthetic fragrance ingredients.  The selected fragrance ingredients were sprayed and presented one by one onto numbered, uniform paper smell strips (Figure 7.3-1 below), to trigger an olfactory sensory response. Participants were not informed at this point in time that all ingredients were synthetic, and not natural, in order to avoid participant bias.  This decision was informed by the formulation of the Research Project (Section 7.1, p.198), where 'natural' fragrances are generally perceived as better, as they are familiar and instinctively closer to human concerns, and 'synthetics' are viewed as being negative, 'chemical' and therefore inferior in quality.



Figure 7.3-1 Research Project (III): Fragrance ingredients being sprayed and presented onto uniform smell strips. Images courtesy of Ezzidin Alwan, September 2014

Participant feedback of sensory exploration and cognitive response to the ten synthetic fragrance ingredients presented during the workshop was gathered via a questionnaire that had a mix of qualitative and quantitative-

based questions and observation of sensory response via photographic evidence in situ.

Participants were asked to smell each ingredient (Figure 7.3-2 below) and to fill in the corresponding sheet of the questionnaire.  A separate recording sheet per ingredient was included in the questionnaire to facilitate data collection and subsequent analysis. (See Volume Two, Appendix 7.1.4, p.445 for design of the questionnaire).



Figure 7.3-2 Research Project (III): Participants exploring fragrance ingredients. Images courtesy of Ezzidin Alwan, September 2014

**Analysis of participant responses to the workshop questionnaire**

*What follows is a summary table of the findings from participant responses to the workshop questionnaire, and a more detailed account of the analysis of the data gathered is provided in the section afterward (pp.221-238).*

Table 7.3-2 Research Project (III): Summary of findings from the workshop questionnaire

| Question | Findings |
|---|---|
| *Question No. 1 (Q1):* <br><br> *Subjective associations with the presented fragrance* | A primer question to engage participants with the practice of smelling and giving feedback |
| *Question No. 2 (Q2):* <br><br> *Rating the fragrance ingredient on 5-point Like / Dislike and Foreign / Familiar Likert scales* | No overall participant aversion to the fragrance ingredients; <br><br> Overall, none of the ingredients appeared foreign; <br><br> No statistical correlation could be claimed between Familiar and Affinity (Like), and Foreign and Aversion (Dislike), or any other coupling of the categories. |
| *Question No. 3 (Q3):* <br><br> *Sensory response to each ingredient in relation to qualities such as intensity, brightness, temperature, balance, etc. which are used in the perfume industry to describe fragrances* | Greater dispersion of participant response to complex olfactory categories, e.g. intensity, balance, balance, etc., as opposed to dichotomous categories such as Like / Dislike and Familiar / Foreign; |
| *Question No. 4 (Q4):* <br><br> *Colour association with the fragrance ingredient* | Overall, no difficulty to making cross-modal associations between the fragrance ingredients and colour; <br><br> Some fragrances elicited more similar colour associations than others. |
| *Question No. 5 (Q5):* <br><br> *Texture association with the fragrance ingredient* | Greater affinity to associating fragrance with texture, providing sensory, i.e. tactile, as well as cognitive responses; <br><br> Human tendency to relate to materials and experiences in ways that have meaning for themselves over and above any instruction that is given, i.e. associations elicited by individual sensory experience, are strong, personal, individualistic, and cannot be diluted by any influences of a group setting or experience. |

Page 1/2

| Question | Findings |
|---|---|
| *Question No. 6 (Q6):*<br><br>*Typographic association with the fragrance ingredient.* | No psychological block of associating fragrance with font, despite this being an unusual exercise; closer clustering and much less dispersion of participant response around some fonts than others, in comparison to cross-modal colour response; |
| *Question No. 7 (Q7):*<br><br>*Best-liked fragrance from the selection of ingredients;* | A greater participant engagement (beyond one response required) with fragrances that were sensory pleasing (affinity-based response). |
| *Question No. 8 (Q8):*<br><br>*Least-liked fragrance from the selection of ingredients* | Some fragrances are experienced collectively with definite, certain aversion; sensory agreement could far surpass intellectual classification of the materials for industrial purposes. |
| *Question No. 9 (Q9):*<br><br>*Ability to identify the synthetic and the natural ingredients in the presented selection* | 50-50% split between participants who categorised olfactory (sensory) stimuli between synthetic and natural, and those who didn't. |

Page 2/2

*Analysis of participant responses to Question No. 1 (Immediate associations with the fragrance ingredients)*

Question No. 1 looked for immediate subjective associations with the presented fragrances. This was only a primer questions to engage participants with the practice of smelling and giving feedback, and it was therefore not included in the data analysis.  Interested parties can see a tabulation of this data in Volume Two, Appendix 7.3.1, Table A.7.3-9, p.457.

*Analysis of participant responses to Question No. 2 (Likert scale response): quantitative analysis and findings*

Participants were asked to record their overall Like / Dislike and Familiar / Foreign response in relation to each fragrance ingredient on 5-point Likert scales as follows:

| *Q2. Please indicate where on the scale you mostly agree in regards with the way you feel about this fragrance ingredient:* | | | | | | |
|---|---|---|---|---|---|---|
| Dislike | 1 | 2 | 3 | 4 | 5 | Like |
| Foreign | 1 | 2 | 3 | 4 | 5 | Familiar |

Likert scale question as appearing in the workshop Questionnaire (for full Questionnaire see Volume Two, Appendix 7.1.4, p.445)

The raw data is presented in Volume Two, Appendix a) Table A.7.3-2 and Table A.7.3-3, p. 451.

The Like / Dislike and Familiar / Foreign responses were tabulated and then averaged out against each fragrance, by calculating the number of responses against each Likert number (1-5) and then averaging it out by the overall number of responses against Like / Dislike and Familiar / Foreign.  This was done to arrive at the average affinity / aversion and familiar / foreign responses to the respective fragrance ingredients.

Table 7.3-3 overleaf presents an average of the Likert-scale responses in the order of highest to the lowest for each ingredient, the highest being Like or Familiar, and the lowest being Dislike or Foreign.

Table 7.3-3 Research Project (III): Analysis of Likert scale response to the fragrance ingredients

| Like / Dislike participant response | | | Familiar / Foreign participant response | | |
|---|---|---|---|---|---|
| Likert-scale average | Ingredient No. | Fragrance ingredient | Likert-scale average | Ingredient No. | Fragrance ingredient |
| 4.4 | 2 | KOAVONE | 4.8 | 2 | KOAVONE |
| 4.1 | 3 | ISO E SUPER | 4.4 | 10 | BICYCLONONALACTONE |
| 4.0 | 7 | HEXALON | 4.3 | 4 | FRUCTONE |
| 3.9 | 8 | CASHMERAN | 3.9 | 9 | AMBRINOL |
| 3.9 | 10 | BICYCLONONALACTONE | 3.8 | 1 | MARITIMA |
| 3.3 | 4 | FRUCTONE | 3.4 | 3 | ISO E SUPER |
| 3.3 | 6 | OXASPIRANE | 3.4 | 5 | GALBASCONE |
| 2.9 | 1 | MARITIMA | 3.4 | 6 | OXASPIRANE |
| 2.3 | 5 | GALBASCONE | 3.3 | 8 | CASHMERAN |
| 2.0 | 9 | AMBRINOL | 3.1 | 7 | HEXALON |
| **Overall Likert average = 3.4** | | | **Overall Likert average = 3.8** | | |

From the above it can be observed that the Like / Dislike averages differed remarkably (2.4 differential i.e. 48% difference), with the lowest average being 2.0 (Ingredient No. 9 AMBRINOL – amber, musk) and the highest being 4.4 (Ingredient No. 2 KOAVONE – wood, pine).

The individual fragrance averages were further averaged out by dividing the sum total by 10 (i.e. number of ingredients), to arrive at an overall Like / Dislike average of 3.4, showing a just above average affinity to the fragrance ingredients.

From the above the researcher concluded that overall, participants had no aversion to the fragrance ingredients.

The highest familiar average was 4.8 (Ingredient No. 2 KOAVONE– wood, pine), and the lowest 3.1 (Ingredient No. 7 HEXALON – fruity, waxy).  This shows a 1.7 differential on a 5-point Likert scale, representing a Familiar / Foreign dispersion of 34%, which is a little less than the Like / Dislike dispersion.

The second averaging out by the number 10 resulted in an overall average of 3.8, which is 1 point above the Likert median. As with the overall Like / Dislike average above, the researcher concluded that overall, none of the ingredients appeared foreign.

The close overall averages of 3.4 (Like / Dislike) and 3.8 (Familiar / Foreign) led to a question whether there was a correlation between the two categories. A graphic representation was considered an appropriate method to assess such correlation, if any (Figure 7.3-3 below).

*Research Project (III): Graphic represenation of Likert-scale response to the ten fragrance ingredients*
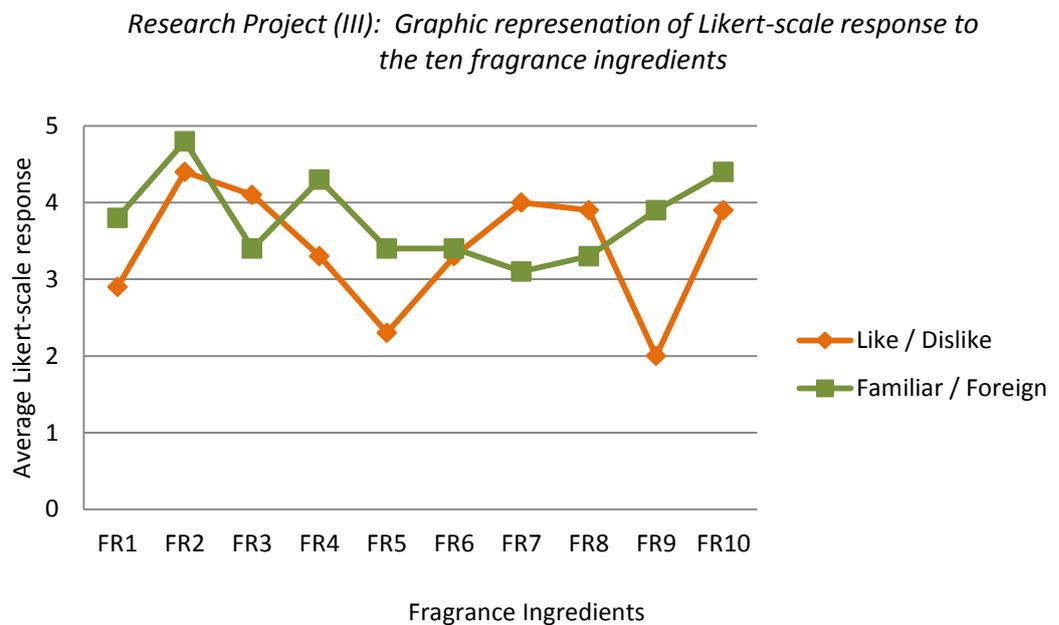


Figure 7.3-3 Research Project (III): Graphic representation of participant Likert-scale response to the ten fragrance ingredients

Plotting a graph of the averages was a useful exercise as it showed that responses of Like / Dislike and Familiar / Foreign were closely linked. However, no such statistical correlation could be claimed for Familiar – Affinity (Like), and Foreign – Aversion (Dislike), or any other coupling of the categories.

*Analysis of participant responses to Question No. 3 (Sensory qualities of the presented ingredients): quantitative analysis and findings*

Question No. 3 was a multiple choice question relating to a word descriptor that best corresponded with the fragrance that had just been presented, as follows:

| Q3. For each category, please select a word descriptor that best corresponds with the fragrance you have been presented: | | | | |
|---|---|---|---|---|
| *Olfactory category* | *Sub-categories: sensory qualities* | | | |
| **Intensity** | Delicate | Moderate | | Powerful |
| **Brightness** | Dark | Shadowy | Hazy | Bright | Luminous |
| **Pitch** | High | Low | | |
| **Tone** | Flat | Sharp | | |
| **Temperature** | Cold | Warm | | |
| **Balance** | Dominating | Even | | Weak |
| **Character** | Simple | Moderate | | Complex |

Multiple-choice question No.3 as appearing in the workshop Questionnaire (for full Questionnaire see Volume Two, Appendix 7.1.4, p.445)

The raw data is presented in Volume Two, Appendix a) Table A.7.3-5, p.453.

Participant response was analysed for each ingredient by counting the number of specific responses under each major olfactory category, e.g. temperature.  For example, under the temperature category for Ingredient No.1 MARITIMA (marine, fresh), there were 6 responses of cold and 3 of warm.  This was done with a view to testing whether there were common perceptions within the participant group relating to specific fragrance ingredients.

Table 7.3-4  overleaf presents a collation of the data in order of the highest to lowest number of responses (given in brackets).

Table 7.3-4 Research Project (III): Tabulation of fragrance ingredients according to olfactory categories

| Intensity | | |
|---|---|---|
| *Delicate* | *Moderate* | *Powerful* |
| No 3 ISO E SUPER (8)<br>No 7 HEXALON (5)<br>No 1 MARITIMA (4) | No 8 CASHMERAN (5) | No 9 AMBRINOL (9)<br>No 2 KOAVONE (8)<br>No 4 FRUCTONE (6)<br>No 5 GALBASCONE (6) |
| | No 6 OXASPIRANE (4 / 4)<br>No 10 BICYCLONONALACTONE (3 / 3) | |

| Brightness | | | | |
|---|---|---|---|---|
| *Dark* | *Shadowy* | *Hazy* | *Bright* | *Luminous* |
| No 9 AMBRINOL (6) | No 5 GALBASCONE (4)<br>No 10 BICYCLONONALACTONE (4) | No 7 HEXALON (5)<br>No 3 ISO E SUPER (4)<br>No 1 MARITIMA (3)<br>No 6 OXASPIRANE (3) | No 2 KOAVONE (4)<br>No 4 FRUCTONE (4)<br>No 8 CASHMERAN (3) | |

| Pitch | |
|---|---|
| *High* | *Low* |
| No 2 KOAVONE (8)<br>No 4 FRUCTONE (8)<br>No 6 OXASPIRANE (7)<br>No 9 AMBRINOL (6)<br>No 5 GALBASCONE (5)<br>No 8 CASHMERAN (5) | No 3 ISO E SUPER (6)<br>No 7 HEXALON (6)<br>No 10 BICYCLONONALACTONE (5) |
| No 1 MARITIMA (4 / 4) | |

| Tone | |
|---|---|
| *Flat* | *Sharp* |
| No 3 ISO E SUPER (6) | No 2 KOAVONE (8)<br>No 4 FRUCTONE (7)<br>No 1 MARITIMA (6)<br>No 5 GALBASCONE (6)<br>No 6 OXASPIRANE (6)<br>No 8 CASHMERAN (5)<br>No 9 AMBRINOL (5)<br>No 10 BICYCLONONALACTONE (5) |
| No 7 HEXALON (4 / 4) | |

Page 1/2

| Temperature | |
|---|---|
| *Cold* | *Warm* |
| No 2 KOAVONE (7)<br>No 1 MARITIMA (6)<br>No 3 ISO E SUPER (6)<br>No 6 OXASPIRANE (4) | No 10 BICYCLONONALACTONE (7)<br>No 4 FRUCTONE (6)<br>No 5 GALBASCONE (6)<br>No 7 HEXALON (6)<br>No 9 AMBRINOL (6)<br>No 8 CASHMERAN (5) |

| Balance | | |
|---|---|---|
| *Dominating* | *Even* | *Weak* |
| No 9 AMBRINOL (9)<br>No 2 KOAVONE (7)<br>No 5 GALBASCONE (6)<br>No 6 OXASPIRANE (6)<br>No 1 MARITIMA (5)<br>No 4 FRUCTONE (5) | No 7 HEXALON (7)<br>No 3 ISO E SUPER (5)<br>No 8 CASHMERAN (5) | |
| No 10 BICYCLONONALACTONE (4 / 4) | | |

| Character | | |
|---|---|---|
| *Simple* | *Moderate* | *Complex* |
| No 7 HEXALON (5)<br>No 6 OXASPIRANE (4) | No 2 KOAVONE (5)<br>No 4 FRUCTONE (5)<br>No 1 MARITIMA (4)<br>No 10 BICYCLONONALACTONE (4) | No 8 CASHMERAN (6)<br>No 3 ISO E SUPER (4)<br>No 5 GALBASCONE (4)<br>No 9 AMBRINOL (4) |

From the above table no specific or strong patterns were decipherable in relation to group experience of a specific fragrance ingredient, with a mild exception being the oflactory category 'Tone', in which case eight of the ten ingredients were perceived as being *sharp* (with Ingredient No 2 KOAVONE – woody, pine, being the *sharpest*), only one ingredient as being *flat* (Ingredient No 3 ISO E SUPER – woody, amber), and one ingredeint was perceived as moderate (Ingredient No 7 HEXALON – fruity, waxy).

From this the researcher concluded that in cases where the oflactory experience requried to be coded into preset categories that were complex, e.g. intensity, balance, balance, etc., as opposed to dichotomous categories such as Like / Dislike and Familiar / Foreign, responses showed a greater dispersion when more choices were proposed. This could be due

to the more complex cognitive and sensory interactons involved in perception, as opposed to the reporting of immediate visceral responses and associations (Herz, 2008).

*Analysis of participant responses to Question No. 4 (Colour associations): quantitative analysis and findings*

Participants were asked to associate each fragrance ingredient with a colour from a 36-colour chart (Section 7.2.5, Figure 7.2-3, p.210), as follows:

> *Q4. Based on the Colours chart provided, please select a colour that best describes your perception of the presented fragrance:*

Multiple-choice question No.4 as appearing in the workshop Questionnaire (for full Questionnaire see Volume Two, Appendix 7.1.4, p.445)

The raw data was first tabulated as appearing in Volume Two, Appendix a) Table A.7.3-6 (p.454), and a summary of the colour choices against each ingredient was then made and appears in Figure 7.3-4 overleaf, with a view to revealing similar patterns or like-minded choices, if any, in the responses.

Figure 7.3-4 Research Project (III): Visual analysis of subjective colour-scent associations

The findings from examining Figure 7.3-4 were:

Scent-colour associations for the most part varied from participant to participant against each ingredient. However, there was a notable colour spectrum commonality for four of the ingredients. Ingredient No. 1 (MARITIMA) showed a colour preponderance of the yellow-green tonality, Ingredient No. 4 (FRUCTONE) showed a preponderance of

magenta-red tonality, and Ingredients No. 3 (ISO E SUPER) and No. 7 (HEXALON) could easily fall within a pastel range of colours.

The researcher concluded that some fragrances lent themselves more easily to collective experience of cross-modal associations. For example, Ingredient No. 1 MARITIMA which could be construed as "fresh, breezy, light"[122,] elicited response in the yellow-green tonality, Ingredient No. 4 FRUCTONE – "exotic and exhilarating" – elicited a preponderance of magenta, and Ingredient No. 7 HEXALON, construed as "natural", elicited associations with pastel tones.

A larger number of ingredients, however, had greater colour associations ranging between warm and cold colours, dark and light shades, and saturated and pastel tones.

The researcher concluded that overall, participants had no difficulty in making cross-modal associations between the fragrance ingredients and colour. Furthermore, it was clear that some fragrances elicited more similar colour associations than others.

No further conclusions were drawn from this data set, as the number of participant responses was deemed too small to arrive at conclusions about scent-colour cross patterns relating to gender, culture, or background.

---

[122] Olfactory description of the fragrance ingredient as appearing in IFF's Perfumer's Compendium (Section 7.2.4 'Selection of workshop stimuli', Figure 7.2-2, p.205)

*Analysis of participant responses to Question No. 5 (Texture associations): qualitative analysis and findings*

Participants were asked to associate each fragrance ingredient with a texture from a range of ten textile materials that were presented in the workshop (Section 7.2.5, Figure 7.2-4, p.211) with a view to eliciting a cross-modal (sensory) tactile experience of the fragrance, as follows:

> *Q5. Based on the Materials provided, please select a texture that best describes your perception of the presented fragrance:*

Multiple-choice question No.5 as appearing in the workshop Questionnaire (for full Questionnaire see Volume Two, Appendix 7.1.4, p.445)

It was interesting to note that seven out of the nine participants ignored the instruction to identify the fabric that closely matched the sensory experience, and went straight on to provide word-texture associations, instead.  This may be an indication of the human tendency to relate to materials and experiences in ways that have meaning to themselves (Bult, de Wijk and Hummel, 2007; Jakob and Collier, 2014), and to ignore instruction that is given.

Inadvertently, the work of translating the fabric association to a texture association, which was an undertaking by the researcher, was done directly by the participants.  This proved a good learning experience for the researcher regarding olfactory stimuli, the felt experience (Jakob and Collier, 2014), and the personal conclusions that are arranged cognitively and then reported.

The scent-texture responses were thematically categorised into four main categories: "natural associations", "synthetic associations", "sensory qualities" and "cognitive associations", as these four components formed the central pillars of the Project (Volume Two, Appendix b), p.456)

Table 7.3-5 below present the colour-coding that was used for categorising the data under each theme.

Table 7.3-5 Research Project (III): Colour-coding of subjective scent-texture associations

| Theme | Colour-Coding |
|---|---|
| Natural associations | |
| Synthetic associations | |
| Sensory qualities | |
| Cognitive associations | |
| Other / descriptive | |

Table 7.3-6 overleaf plots the participant scent-texture associations into the respective four categorisations.  Some of the responses appear in more than one category because they easily fit both categorisations.

Table 7.3-6 Research Project (III): Classification of subjective scent-texture associations

| Natural associations | Synthetic associations | Sensory qualities | | Cognitive associations |
|---|---|---|---|---|
| 1 Chiffon | 10 Suedette | Airy | Sharp | Alcohol |
| 1 Chiffon | 10 Suedette | Airy | Sharp | Alluring |
| 1 Chiffon | 10 Suedette | Cold | Sharp | Bark |
| 1 Chiffon | 2 Sequins | Cold | Silk | Bubbly |
| 1 Chiffon | 2 Sequins | Cold | Silky | Chainmail |
| 1 Chiffon | 3 Metallic organza | Cool | Silky | Cheap |
| 4 Organic cotton | 3 Metallic organza | Cool | Silky | Cheap |
| 6 Velvet | 3 Metallic organza | Cottony | Silky | Cheap |
| 6 Velvet | 3 Metallic organza | Crispy | Slimy | Cheap |
| 8 Denim | 7 Puff-printed jersey | Crispy | Slippery | Chic |
| 8 Denim | 7 Puff-printed jersey | Crispy | Smooth | Comfort |
| 9 Cotton twill | 7 Puff-printed jersey | Crispy | Smooth | Detailed |
| Bark | Alcohol | Crispy | Soft | Detailed |
| Brushed cotton | Chainmail | Delicate | Soft | Dirty |
| Cotton | Elastic | Dense | Soft | Elastic |
| Gauze | Knife | Dense | Soft | Elastic |
| Jeans | Metallic | Dry | Soft | Expensive |
| Jeans | Metallic | Dry | Soft | Fish-scale |
| Natural | Metallic | Dry | Soft | Fishy |
| Sawdust | Needle | Dry | Soft | Fishy |
| Velvet | Plastic | Faint | Soft | Fishy |
| Velvet | Rubbery | Fluid | Soft | Flat |
| Velvet | Rubbery | Fluid | Soft | Husky |
| Velvet | Rubbery | Jagged | Soft | Intense |
| Velvet | Synthetic | Light | Solid | Jeans |
| Wood | Synthetic | Light | Sticky | Jeans |
| | Synthetic | Liquid | Sticky | Knife |
| | Synthetic | Liquid | Thick | Luxurious |
| | Synthetic | Liquid | Thick | Plastic |
| | Synthetic | Milky | Thin | Sand-paper |
| | Synthetic | Powder | Tough | Sawdust |
| | Synthetic | Powdery | Transparent | Seductive |
| | Synthetic | Powdery | Velvety | Shimmer |
| | Synthetic | Powdery | Velvety | Simple |
| | | Powdery | Velvety | Sophisticated |
| | | Powdery | Velvety | Stretched |
| | | Powdery | Watery | Stretchy |
| | | Rigid | Wet | Textured |
| | | Rough | Wet | Unsophisticated |
| | | Rough | White | Voluptuous |
| | | Rough | Woody | Vomit |
| | | Rounded | Woody | Weary |
| | | Sand- papery | Woolly | Womanlike |
| | | | | Wood |

**Other / descriptive**

In between soft and rough

From the above tabular representation of the texture-descriptor it became clear that individuals experienced olfactory stimuli very personally and had strong associations that could not be influenced by a group setting or experience.

*Analysis of participant responses to Question No. 6 (Font associations): quantitative analysis and findings*

Participants were asked to associate each fragrance ingredient with a font from an 18-fonts chart (Section 7.2.5, Figure 7.2-5, p.213), as follows:

> *Q6. Based on the Fonts chart provided, please select a font that best describes your perception of the presented fragrance:*

Multiple-choice question No.6 as appearing in the workshop Questionnaire (for full Questionnaire see Volume Two, Appendix 7.1.4, p.445)

As with Question No. 4, the raw data was tabulated showing the fonts chosen by each participant against each fragrance (Volume Two, Appendix a), Table A.7.3-7, p.455).

Reviewing this table revealed that some fonts appeared more often than others.  Table 7.3-7 overleaf was compiled to summarise the total number of font associations against each fragrance ingredient in the order of most to least chosen fonts.

Table 7.3-7 Research Project (III): Response count of subjective scent-font associations

| Code [123] | Name | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Response count |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| B:1 | American Typewriter Condensed | 5 | | 2 | | 1 | | 1 | 1 | | 1 | **11** |
| B:4 | **Helvetica Black** | | 1 | | 1 | 3 | | | 1 | 2 | 1 | **9** |
| B:3 | **Cooper Black** | | 3 | | 2 | | | | | 1 | 2 | **8** |
| A:5 | COPPERPLATE | 1 | | | | 2 | 3 | 1 | 1 | | | **8** |
| C:1 | Alexa | 2 | | 3 | | | | 1 | | 1 | 1 | **8** |
| A:2 | Baskerville Italic | | | 1 | | 1 | 3 | 1 | 1 | | | **7** |
| B:2 | BEBAS | | 2 | | 1 | | | 1 | | 1 | 1 | **6** |
| C:6 | Papyrus | 1 | 1 | | | | 1 | | 1 | | 2 | **6** |
| A:6 | OCR A Std | 1 | | | 1 | | 1 | | 1 | 1 | | **5** |
| A:1 | Aktiv Grotesk | | 1 | | 3 | | | | | | | **4** |
| C:5 | **Marker Felt** | | 1 | | 1 | | | | | 1 | 1 | **4** |
| C:2 | Blueprint | | | 1 | | | | 2 | | | 1 | **4** |
| B:5 | InaiMathi | | 1 | | 1 | | | | | 1 | | **3** |
| A:3 | Caslon | | | 1 | | | | 1 | 1 | | | **3** |
| B:6 | Onyx | | | | | | | 1 | | 1 | 1 | **3** |
| C:3 | Gill Sans | | | 1 | | | 1 | | 1 | | | **3** |
| C:4 | Times New Roman | | | | | 1 | | | 1 | | | **2** |
| A:4 | Arial | | | | | | | 1 | | | | **1** |

[123] See Section 7.2.5, Figure 7.2-5 (p.213) for a complete Fonts chart.

An analysis of the responses revealed that, unlike the cross-modal colour response, in the scent-font association there was closer clustering and much less dispersion of participant response around some fonts than others.  For example, in three cases eight participants chose the same font to describe the selection of fragrance ingredients, and in another four cases three participants chose the same font.  This clustering could be a reflection of the number of font choices given to the participants (only 18), as opposed to the colour choices (a table of 36 colours).

Additionally, the table revealed some responses above median, i.e. 3-5 participants chose the same font for a particular ingredient.  For example, Ingredient No.1 MARITIMA (marine, fresh) was associated five times with American Typewriter Condensed.  Whilst there were some patterns emerging, the researcher was not able to draw any conclusions about why that particular scent inspired the cross-modal association, because as yet, there is no literature relating to such cross-modal associations between typography and olfactory association.

In conclusion, the researcher maintained that even though it was unusual to ask participant to associate fragrance with font, participants did not experience a psychological block to the exercise.

In finalising this phase of the workshop, participants were asked whether they had a favourite or a least favourite ingredient (Questions No.7-8). This was done with a view to comparing the findings with the Likert-scale responses in order to identify potential patterns within the data.

*Analysis of participant responses to Questions No. 7-8 ('Best' and 'least' liked fragrance ingredients): quantitative analysis and findings*

Participant response to Questions No. 7 and 8 was analysed by counting the number of participant responses against each fragrance ingredient that was selected as best or least liked (Volume Two, Appendix a) Table A.7.3-4, p.452).

The findings from the analysis are presented in Table 7.3-8 below. The fragrance ingredients were arranged from the highest to the lowest number of participant responses (given in bracket) under the two categories 'best liked' (Question No. 7) and 'least liked' (Question No.8).

Table 7.3-8 Research Project (III): Analysis of Questions No. 7-8 'Best' and 'least' liked fragrance ingredients

| Q7. Which of the presented ingredients do you like best? | Q8. Which of the presented ingredients do you like least? |
|---|---|
| Ingredient No 3 ISO E SUPER (4) | Ingredient No 9 AMBRNOL (6) |
| Ingredient No 4 FRUCTONE (3) | Ingredient No 1 MARITIMA (1) |
| Ingredient No 8 CASHMERAN (3) | Ingredient No 2 KOAVONE (1) |
| Ingredient No 10 BICYCLONONALACTONE (3) | |
| Ingredient No 2 KOAVONE (2) | |
| Ingredient No 7 HEXALON (2) | |
| Ingredient No 1 MARITIMA (1) | |
| **Total number of participant responses = 18** | **Total number of participant responses = 8** |

What could be concluded from the above analysis was that half of the participants had selected more than one fragrance ingredient as their 'best liked' (Question No. 7), resulting in a total of 18 responses from a

participant group of nine.  In the case of identifying 'least liked' fragrances (Question No. 8) eight of the nine participants responded, seven of which selected the same ingredient (No. 9 AMBRINOL) as 'least liked'.  This showed that the sensory experience of the fragrances was more affinity-based.

Table 7.3-8 also shows that in the category of "least liked" fragrance there was a cluster (6 out of 9) of participant response against Ingredient No. 9 (AMBRINOL) supporting the view that there are some fragrances that human beings collectively have a definite, certain aversion to (Herz, 2008). What is interesting to note is that while in branding and marketing this fragrance was defined as *"elegant, aged, natural, amber"*, all participant responses related this fragrance to filth and body waste, showing sensory agreement far surpassing intellectual classification of the material for industrial purposes.

**Observation of participant response via photographic evidence**

The exploration of stimuli was animated and naturally gave rise to discussions between participants and with the researcher.   Participant engagement with the fragrance ingredients was observed and documented via photography in situ.

As with Research Project (I), support staff had been employed from the University to assist with the data capture.  This was done by instructing the photographer[124] to take a photograph of participants as they were engaging with the stimuli.

---

[124] Ezzidin Alwan

The data comprised thirty photographs of participants exploring the ten fragrance ingredients (Volume Two, Appendix c), p. 461) with the view to capturing overt expressions of aversion or affinity to the stimuli.

In analysing the photographic evidence, the following classification was compiled by the researcher in keeping with the Project:

    i.      Showing affinity

    ii.     Showing aversion

    iii.    Neutral – response that was unidentifiable as affinity or aversion.

Each photograph was allocated under one classification by the researcher. As with Project (I), the categorisation of the data was discussed and verified with neuroscientist Flory, to provide a more informed choice based on the psychology of emotion.

There was a mismatch in opinion about Images 8 and 20, where the researcher had labelled both images as "showing aversion". Flory, however, differed in opinion stating that there was no overt expression of aversion in the photographs, but rather an assessment and an evaluation of the fragrance ingredients taking place, prior to making a choice of affinity or aversion. After discussion, the researcher and the scientist came to the mutual conclusion of accepting Flory's classification.

An analysis of this classification categorised 14 Images under the affinity classification, 14 under the neutral classification, and 2 under the aversion classification (Figure 7.3-5 overleaf). With the aversion being extremely low, and the affinity and neutral being of equal scores, it was considered safe to conclude that, as in the previous two findings, participants had no strong aversion to the fragrance ingredients, and by and large veered in the direction of positive engagement, e.g. curiosity, interest, and exploring (Ekman, 2004).

Figure 7.3-5 Research Project (III): Examples of affinity, neutral, and aversion-based responses (left to right) to the fragrance ingredients. Images courtesy of Ezzidin Alwan, September 2014

## Participant debriefing

First the researcher asked questions to ensure that the participants had no adverse reactions to the fragrances given the chemical nature of the stimuli.

The purpose of the workshop was reiterated.  The researcher inquired if the participants had been able to identify which of the presented ingredients were natural and which were synthetic (Question No. 9).

There was about 50-50 % split between participants who categorised olfactory (sensory) stimuli between synthetic and natural, and those who didn't (Table 7.3-9 overleaf).

Table 7.3-9 Research Project (III): Quantification of Yes / No response to Question No. 9 *"Could you identify the natural from the synthetic ingredients?"*

| Choice | Participant response count |
|--------|---------------------------|
| Yes | 5 |
| No | 4 |

At this point it was revealed that all the fragrance ingredients used in the workshop were in fact synthetic, and a presentation slide revealing their molecular coding was shown, as in Figure 7.3-6 below.
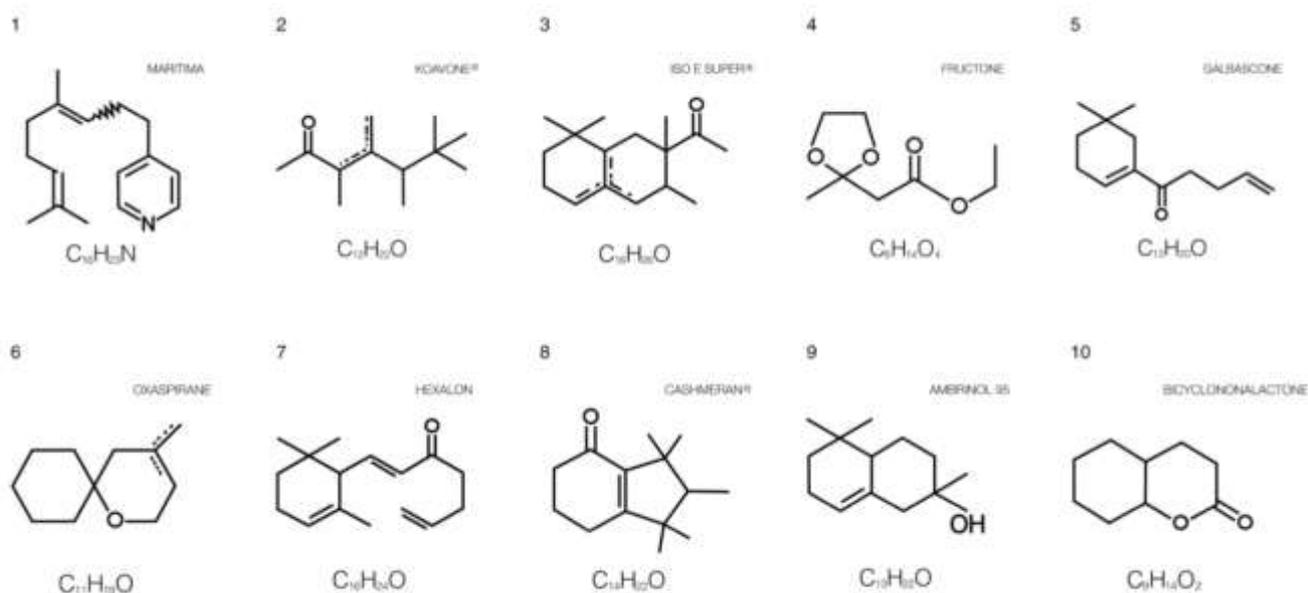


Figure 7.3-6 Research Project (III): Molecule symbols and formulas of the fragrance ingredients used as workshop stimuli

Whilst some participants reported surprise, there was no negative feedback.

What ensued was a positive and lively discussion around the popular preference for natural ingredients, the value of synthetic fragrance ingredients, and factors that affect our perception and choice of fragrance.

The floor was then open for any other research-related questions.  No major questions ensued, except one or two enquiries about specific ingredients that had been presented at the workshop.

Participants were reminded that they could contact the researcher at any time should they have any further questions.

## Guidelines for further participation

It was explained to the participants that they could voluntarily participate post-workshop with the aim of testing whether the T-shirt could operate as a probe in engaging interest towards 'synthetic' fragrance in the public domain.

The researcher explained that each participant would be asked to:

i.      Contribute to the design of a line of T-shirts by choosing one synthetic fragrance ingredient as the basis for their design;

ii.     Wear the T-shirt with the design of their chosen molecule within a range of social situations for a duration of three months post-workshop at their own will and in their own time;

iii.    Observe, record, and feedback to the researcher any suggestions or commentary by the public in response to the T-shirt probe.

No binding agreement was undertaken in relation to this phase of the research.  All participants agreed to participate voluntarily post-workshop.

Data collection and analysis, Phase 2: T-shirt designs

In Research Project (III), the visual design of the T-shirt (a series of synthetic fragrance molecules) was standardised by the researcher prior to the workshop (Figure 7.3-7 below).
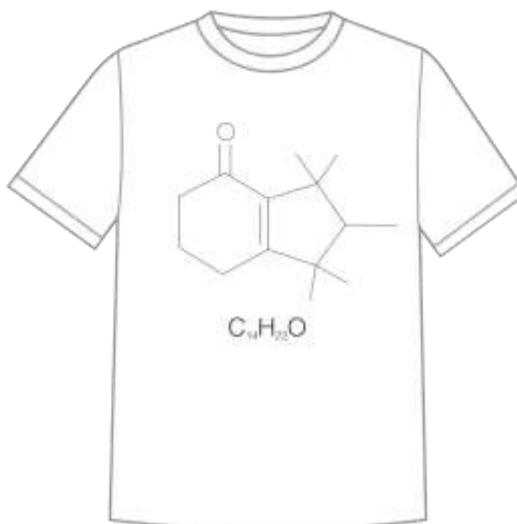


Figure 7.3-7 Research Project (III): T-shirt design template, standardised by the researcher. August 2014

This design choice was considered best fit for testing the Research Project as the printed image was enigmatic (molecule and code) and engaging, to generate interest and discussion within social situations.

Thus participants were not required to use creative imagination in the design, but to select between a series of predefined choices based on the olfactory experience. Personal choice was the engagement process, which involved participants selecting one fragrance ingredient molecule to be printed on their T-shirt.

In this way the research process differed from Research Projects (I) and (II), where creative freedom was given to research participants in the creation of their T-shirts.

This design method was chosen in order to ensure that the probe was focused specifically on fulfilling the intention of the Research Project, and was not confounded by random or subjective design inclinations of the participants.

This allowed the researcher to assess, at a later stage, if similarities and differences existed between participant and public response and interaction with the T-probes that were designed in Projects (I) and (III)[125].

On the final page of the questionnaire participants recorded the fragrance ingredient of their choice.  It was explained that the colour and texture for the T-shirt print would be generated from that data of cross-modal sensory perception gathered via the questionnaire.

A design option was provided to the participants to choose whether they wanted to have a white T-shirt with the graphic printed in colour, or a coloured T-shirt with the graphic printed in white, as illustrated in Figure 7.3-8 overleaf.

---

[125] T-shirt design in Project (I) allowed for more freedom of expression and creativity in the design process as opposed to Project (III) in which the design process entailed choosing details from a given chart.
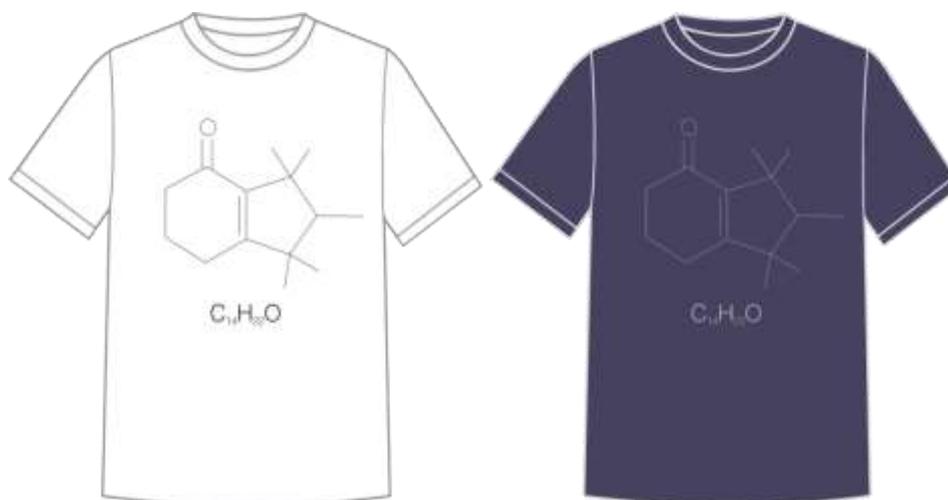
Figure 7.3-8  Research Project (III): T-shirt design template variations, standardised by the researcher. August 2014

Before closing the workshop, participants were asked to leave the following details:

i.      Their T-shirt size;
ii.     Postal address to receive their printed T-shirt;
iii.    Their preferred social platform, to report data collected post-workshop.

The raw data is arranged in Volume Two, Appendix 7.3.2 'Data Set Two: T-shirt designs', Table A.7.3-10 (p.476).  The data was tabulated to show participant choice of fragrance, molecular coding, size, and their preference of white or coloured tee.  No actual data analysis was required, as this just represented the production specification of the T-shirts that were to be printed and posted to the participants.

In relation to the screen printing of the T-shirt, the researcher formulated a pro forma (Table 7.3-10 overleaf), to show the respective colour and texture for each design, which were informed by participant responses to Question

No. 4 (colour association) and Question No. 5 (texture association) from the workshop questionnaire.

Table 7.3-10 Research Project (III): Screen printing pro forma for T-shirt designs

| Parti cipa nt | Chosen ingredient | Molecular code | Size | Colour[126] | Colour applied to molecule symbol or the T-shirt background | Texture[127] |
|---|---|---|---|---|---|---|
| P_1 | Ingredient No 8 CASHMERAN | $C_?H_?O$ | Male XL | F6: bronze | molecule | - |
| P_2 | Ingredient No 3 ISO E SUPER | $C_?H_?O$ | Female L | D6/E4 | molecule | 1 chiffon |
| P_3 | Ingredient No 10 BICYCLONONALACTONE | $C_?H_?O_2$ | Female S | E4 | T-shirt | Silky, liquid, soft |
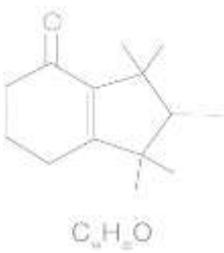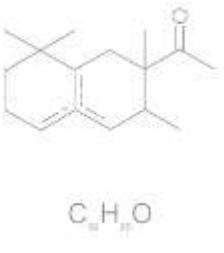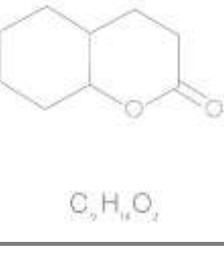
Page 1/3

<hr>

[126] See Section 7.2.5, Figure 7.2-3 (p.210) for the complete Colour chart.

[127] See Volume Two, Appendix 7.3.1b) Table A.7.3-8 Research Project (III) (p.456) for the complete data set.

| Participant | Chosen ingredient | Molecular code | Size | Colour | Colour applied to molecule symbol or the T-shirt background | Texture |
|---|---|---|---|---|---|---|
| P_4 | Ingredient No 7 HEXALON | $C_nH_nO$ | Female XS | 1C+C4 | molecule | Soft, sharp, alcohol |
| P_5 | Ingredient No 3 ISO E SUPER | $C_nH_nO$ | Female M | C4 | molecule | velvety |
| P_6 | Ingredient No 8 CASHMERAN | $C_nH_nO$ | Female L | F1 | T-shirt | Soft and cold |
| P_7 | Ingredient No 8 CASHMERAN | $C_nH_nO$ | Male M | B4 | molecule | Cotton, soft, brushed cotton |

| Participant | Chosen ingredient | Molecular code | Size | Colour | Colour applied to molecule symbol or the T-shirt background | Texture |
|---|---|---|---|---|---|---|
| P_8 | Ingredient No 4 FRUCTONE | $C_8H_{14}O_4$ | Female M | C4 | T-shirt | Soft, wet |
| P_9 | Ingredient No 4 FRUCTONE | $C_8H_{14}O_4$ | Female L | C1 | T-shirt | Synthetic, rubbery, solid |
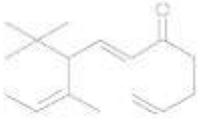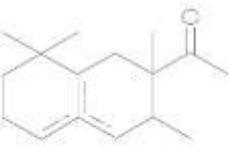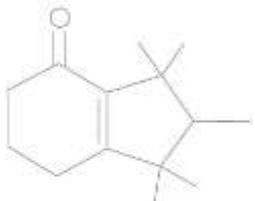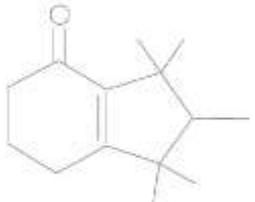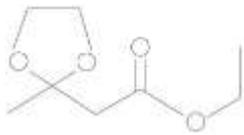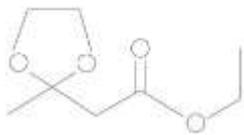
The colour question (No. 4) informed the colour of the printed image, or the colour of the T-shirt (in which case the molecule was printed in opaque white).

The texture association question (No. 5) informed the screen printing technique. The following printing materials were used in relation to specific cognitive associations given by the participants:

i.  Opaque pigments in the respective colour, to create a smooth, flat print: used when associations such as "chiffon", "soft", "sharp", and "cold" were given in response to the fragrance ingredient;

ii.  Puff binder coloured with the respective pigment, to give a 3D raised and powdery feel of the print: applied when associations such as "velvety", "brushed cotton", "rubbery", and "solid" were used.

iii.    Foil transfer:  used when word associations such as "silky", "liquid", and "wet" were given, and in the case of the colour reference being "F6: bronze".

Figure 7.3-9 below illustrates the designs that were generated from the data of participant sensory engagement and response to the ingredients gathered via Questionnaire.
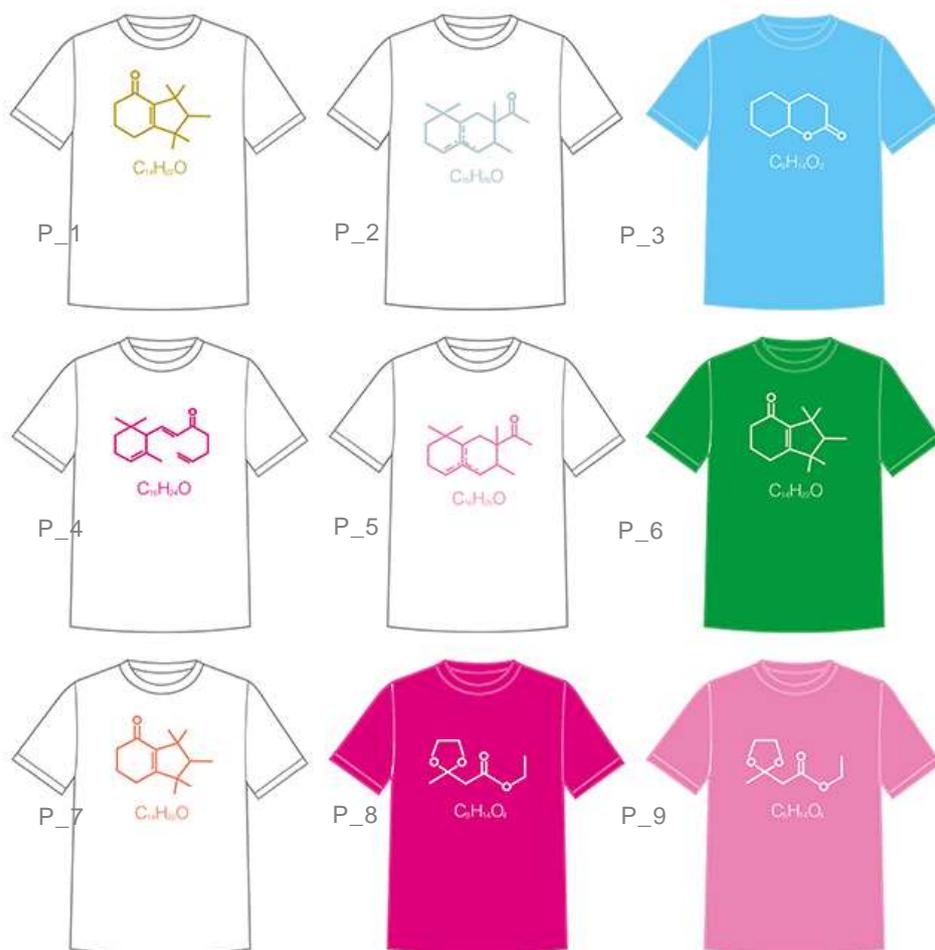


Figure 7.3-9 Research Project (III): T-shirt probes, selected by the workshop participants, featuring the synthetic ingredients CASHMERAN, ISO E SUPER, BICYCLONONALACTONE, HEXALON, and FRUCTONE

Even though no analysis of the T-shirt designs was intended, as the design template was standardised by the researcher prior to the Workshop, Figure 7.3-9 above clearly illustrates a group preference for five of the ten ingredients.  These ingredients align with participant responses to Question No. 7 from the Questionnaire *"Which of the presented ingredients do you like best?"* (Table 7.3-8, p. 237).

This served to indicate that the T-probes created in Research Project (III) were as a result of the sensory exploration of the fragrance ingredients.

## 7.3.2  Stage Two: *Post-workshop participation*

The T-shirts were produced and delivered to the participants, either in person or via post.  A set of labels (Figure 7.3-10 below) was attached to each T-shirt containing details about the symbol that was printed on the T-shirt and instructions about how to participate in engaging public reaction and feedback.



Figure 7.3-10 Research project (III): T-shirt labels designed by the researcher. October 2014

A list of social media platforms, that were set up for participants to gather feedback, was included and participants were instructed to choose the one that they felt most comfortable with[128].

From the above data collection channels, only one of the research participants shared a couple of twitter posts over a nine-month period post-workshop, as follows:

> *"Just serving as a reminder that everything is a chemical and natural vs synthetic is a pointless debate. #thescentedtee"*

> *"Most interestingly were the people who didn't believe there were "chemicals" in perfumes. Engaged people on that. #thescentedtee"*

These posts indicated that the T-shirt was fulfilling its role as a probe through public engagement and discussion that was in relation to the Project. However, as the twitter feedback was minimal, the questionnaire method was considered in an attempt to incite participants to more regular and better detailed feedback.

## Feedback questionnaire and data analysis

The feedback questionnaire (Appendix 7.1.5, p.448) mirrored the questions asked in Project (I). The five multiple-choice and one open-ended question were as follows:

---

[128] Twitter: @TheScentedTee;

Facebook: www.facebook.com/groups/869362549748082/;

A website: http://thescentedtee.co.uk/, was also created to enable collation of feedback data, as well as providing a reference point to the research participants post-workshop.

*Q1. How satisfied were you with the design of your tee?*

*Q2. How often have you worn your T-shirt?*

*Q3. Where have you worn your T-shirt?*

*Q4. Have people reacted to your T-shirt?*

*Q5. Has your T-shirt engaged people in a conversation?*

*Q6. If 'Yes' to Q5 above, what discussions took place?*

The questionnaire was sent out via an online survey platform[129] nine months after receipt of the T-shirt to all nine participants in the project. This elicited greater response than the twitter platform. Seven of the nine participants responded.

Questions No. 1-5 (multiple-choice) were quantitative and were analysed by counting the number of participant responses against each choice presented (Appendix 7.3.3a), Table A.7.3-11, p.478).

Of the seven-participant feedback, four reported being "very satisfied" with the T-shirt design, two reported being "satisfied", and one reported being "neither satisfied nor dissatisfied". As there were no "dissatisfied" or "very dissatisfied" responses, the researcher felt positively hopeful that participants were wearing their T-shirts in social settings, as instructed.

All seven participants reported wearing the T-shirt at least once within socially related situations, as can be observed from Table 7.3-11 overleaf.

---

[129] *SurveyMonkey*. Available at: https://www.surveymonkey.com/ (Accessed: 15 October 2015)

Table 7.3-11 Research Project (III): Participant response to Question No. 3 *"Where have you worn your T-shirt?"*

| Question | Choice | Response count |
|---|---|---|
| **Q3. Where have you worn your T-shirt?** | At home | 5 |
| | At work | 2 |
| | In the college / university | 0 |
| | In cafes / pubs / bars / restaurants / clubs | 3 |
| | In the gym | 3 |
| | For business | 0 |
| | At parties | 0 |
| | On holiday | 3 |
| | Other (please specify) | 2 |
| *Comments:* | | |
| "In the park" x2 | | |

From the above it can be seen that the T-shirt was worn on 18 separate occasions by seven participants, which averaged out to each participant wearing the T-shirt at least twice over a nine-month period. Taking into account that six out of those nine months were autumn-winter months, the researcher considered the wearing rate to be positive.

This was further supported by photographs sent in by the participants (Figure 7.3-11 overleaf) of themselves wearing the T-shirts within everyday situations.

Figure 7.3-11 Research Project (III): Participants wearing their T-shirts within social situations, e.g. at work and in the park. June 2015

Question 6 *"What comments have been made about your tee?"* comprised the qualitative aspect of the feedback questionnaire response, and looked for affinity / aversion public responses to the designed T-shirts when worn in social situations (Volume Two, Appendix 7.3.3b), p.480).

From the responses it was fitting to conclude that there was an overall positive public response, showing curiosity and engagement with the T-shirts, indicating that the enigmatic image (molecule and code) did serve as a probe to generate interest, discussion, raise questions and awareness of synthetic fragrance within social situations.  The following is an excerpt of some of the comments that were reported:

> *"I was asked what the molecule was on my shirt."*

> *"I was able to explain that it was Cashmeran, and its use in perfumery."*

> *"This surprised a few people who didn't realise "chemicals" were used in perfumes."*

> *"What is it? Does the t-shirt smell like that?"*

There were also a few neutral or unrelated responses to the T-shirt, e.g. one expressing a participant's own attitude towards wearing the T-shirt, and one stating that no specific discussion took place.  Such responses were considered non-evaluative for the purpose of testing this project.

Some commentary indicated that the chemical formula became the focus of social engagement, as opposed to the fragrance ingredient which was the intention of the probe.  Overall, participant feedback post-workshop was useful in indicating that the T-shirts were worn and well-received in the public domain.  As with Project (I), given the small number of participant responses, an extrapolation of the findings in this section to a larger general public could not be ascertained.

## 7.4 Triangulation of findings

Whilst the above section provided the analysis of the various data sets collected, there was a feeling that this was not the complete story.  It was felt that there was a dimension that was missing from the findings arrived at so far.  This led to considering methodological triangulation (Chapter 4.3.3, p.100) as a means of mining the data for further richness.  It was felt that new learning and application in design infrastructure, innovation and development could be expanded by taking the data analysis this one step further.

Table 7.4-1overleaf summarises the qualitative (QL) and quantitative (QN) findings in respect of the Project, and to evaluate whether there were commonalities or differences within the two data sets.

Table 7.4-1 Research Project (III): Summary of qualitative and quantitative findings

| Data Set | Findings | |
|---|---|---|
| **Data Set One***: participant response to presentation of 10 synthetic fragrance ingredients* | Qualitative findings | |
| | QL1.1 | Greater affinity to associating fragrance with texture, providing sensory, i.e. tactile, as well as cognitive responses; Human tendency to relate to materials and experiences in ways that have meaning for themselves over and above any instruction that is given, i.e. associations elicited by individual sensory experience, are strong, personal, individualistic, and unconfined by instructions from the researcher. |
| | QL1.2 | No strong aversion to the fragrance ingredients and by and large veered in the direction of positive engagement, e.g. curiosity, interest, and exploring. |
| | Quantitative findings | |
| | QN1.1 | No sensory or cognitive aversion overall to the fragrance ingredients; Overall none of the ingredients appeared foreign; No statistical correlation could be claimed between Familiar and Affinity (Like), and Foreign and Aversion (Dislike), or any other coupling of the categories; |
| | QN1.2 | Greater dispersion of participant response to complex olfactory categories, e.g. intensity, balance, balance, etc., as opposed to dichotomous categories such as Like / Dislike and Familiar / Foreign; |
| | QN1.3 | Overall no difficulty to making cross-modal associations between the fragrance ingredients and colour; Some fragrances lent themselves more easily to collective experience of cross-modal associations with colour; |
| | QN1.4 | No psychological block of associating fragrance with font, despite this being an unusual exercise; closer clustering and much less dispersion of participant response around some fonts than others, in comparison to cross-modal colour response; |
| | QN1.5 | A greater participant engagement (beyond one response required) with fragrances that were sensory pleasing (affinity-based response). Some fragrances are experienced collectively with definite, certain aversion; sensory agreement could far surpass intellectual classification of the materials for industrial purposes. |
| | QN1.6 | 50-50 % split between participants who cognitively categorised olfactory (sensory) stimuli between synthetic and natural, and those who didn't. |
| **Data Set Three:** participant reporting of public response to T-shirt worn | Qualitative findings | |
| | QL2 | An overall positive public response, showing curiosity and engagement with the T-shirts. |
| | Quantitative findings | |
| | QN2 | An overall positive response of participants to the designed T-shirt artefact; All six participants wearing the T-shirt at least once at both professional and socially related situations. |

The triangulation exercise involved examining the qualitative and quantitative findings and then categorising the findings several times over to find one or several factors in which they related to each other.

Eyeballing the table above showed that qualitative and quantitative findings were largely corroborating within the separate Data Sets. This has been illustrated in the factor space graph showed in Figure 7.4-1 below, where the triangulation method was employed to enhance interpretation and credibility to the inferences drawn by the researcher.
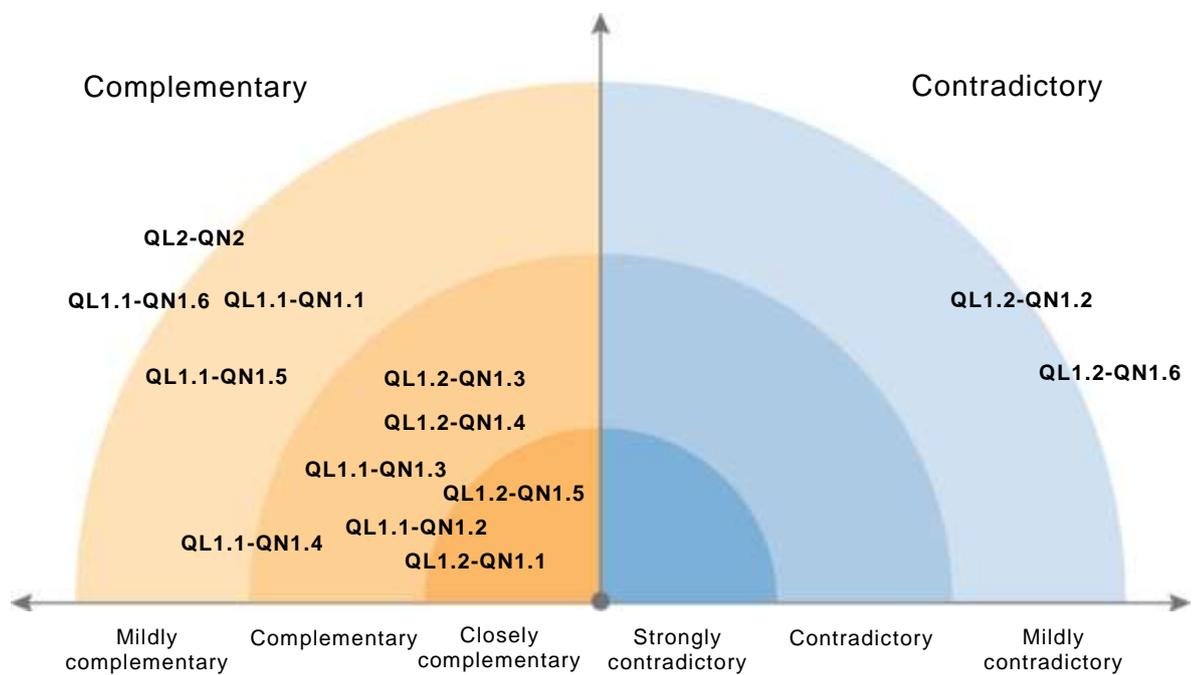


Figure 7.4-1 Research Project (III): Factor space graph of qualitative and quantitative findings

The graph represents triangulation between qualitative (QL) and quantitative (QN) findings within Data Set One and Data Set Tree. It was not logical to look for complementarity and contradiction between the two data sets because each one was a result of testing different aspects of the Project.

This exercise illustrated a strong complementary relationship between the qualitative and quantitative findings from the Questionnaire, Observation and Feedback of public response to the T-probe post-workshop, indicating that overall, people positively engaged with the fragrance ingredients.   This not only corroborates the separate findings that were derived from an analysis of each of the data sets, but indicates that whether data were gathered qualitatively and / or quantitatively in a matter of sensory perception and cognitive associations with olfactory stimuli, participant responses were reportedly consistent.

The mild contradiction that did emerge in Data Set One indicated a mild contradiction in participant responses when presented with more olfactory choices that they were required to evaluate either cognitively, or sensorially, or both.

## 7.5    Discussion of outcomes and findings

### 7.5.1  Research Project (III): outcomes and findings

The aim of Research Project (III) was to test consumer engagement with synthetic fragrance ingredients.  This was fulfilled by:

i.      Eliciting cognitive and sensory response to ten synthetic fragrance ingredients;

ii.     Participants wearing the T-shirts printed with scent molecule designs, to assess whether the T-shirt acted as the probe it was intended to be in the public domain.

Further to the triangulation described in Section 7.4 (p.255), a non-graphic methodological triangulation was carried out in consultation with neuroscientist Flory.  This entailed re-reading the findings several times over to identify aspects of cognition and cross-modal sensory perception

that were not picked up by the factor space triangulation exercise.  The following inferences were drawn:

Participants were open to sensory and cognitive engagement with fragrance ingredients irrespective of whether the ingredients presented were of natural or synthetic origin, familiar or foreign, pleasant or unpleasant.

Participants experienced no difficulty in associating fragrances across the olfactory-vision sensory modalities.  Associating fragrance with texture, however, elicited a cross-sensory response and greater emotional and memory-saturated cognitive responses[130].

A collective affinity and / or aversion response to specific fragrances was observed in the participant group, indicating that despite the sense of smell being closely linked to individual experience, memory and emotion (Ekman, 2004), certain fragrances are universally perceived as pleasant and potentially safe, or unpleasant and potentially harmful, e.g. the smell of a baby and the smell of decay respectively.  Variables within the research itself may have accounted for this, e.g. communication between participants.  All odours are molecules, and the ability to describe a scent in words is in part a human ability to recognise familiar or dissimilar aromas that may or may not be safe.

## 7.5.2  Role of the T-shirt as a probe in relation to Research Project (III)

In Research Project (III) the T-shirt was implemented as a design probe to advance understanding of synthetic fragrance ingredients and their use in

---

[130] Flory proposed that this closer link between the two senses (olfactory and tactile), albeit being a finding from a very small participant group, could be developed in conjunction with neuroscience-based proprioceptive laboratories (Bensmaia, 2015) who work with mathematical models of cross-modal sensory perception with the view to building neuroprosthetics for specific brain impairment.

olfactory design, processes, and marketing. The project was set up in partnership with the company *International Flavors & Fragrances*. This created an opportunity to consider the use of design probes such as the T-shirt in bridging industry objectives with consumer markets.

There was a slight iteration in the research process for Project (III) in relation to the design of the T-probe, which required less creative engagement on behalf of the participants. This allowed the researcher to ensure that the probe was focused specifically on fulfilling the intention of the Research Project, and to test for similarities and differences between public response and interaction between the T-shirt probes that were designed in Research Project (I) and the current Project being discussed.

Although there was less opportunity for individual creative and artistic expression and engagement in developing the T-shirts for Project (III), as opposed to the level of engagement in Projects (I) and (II), it emerged that participant and public response to the designed T-shirt probes was consistently positive.

In some cases, it appeared that the engagement in Project (III) was largely with the molecular symbol rather than what it stood for.

Nevertheless, the use of the T-shirt as a probe to elicit discussion regarding synthetic fragrance ingredients had value in providing research rigour to the study, while also paving the way for the employment of design methods and tools in olfactory design, development, and marketing.

This provided new insights for the design of probes in the future, where a probe can be anything, but it would be the designer's job to consider and align all aspects of aesthetic, technologies and other components, to be integrous with the research or project purpose and intentions.

# 8.0   Conclusion

*This chapter traces the research journey and discusses the research findings in relation to real world applications.  It outlines how the research aim and objectives have been addressed, and summarises how the T-probe has evolved as an approach to advance participant understanding of novel and challenging material concepts and sensory experiences.  The contribution to knowledge is clearly stated.  The chapter concludes with a critique of the research, opportunities for further research, recommendations for future work, and the author's personal vision.*

## 8.1   Evolution of the research project

The research project emerged from a personal interest in the development of novel bio-based materials in design, particularly fungi as potential media for garment design and fabrication (Chapter 1.1, p.1).  In pursuing partnerships to actualise fungi-based textile forms (Appendix 1.1, p. 306), questions emerged about how an obscure material such as this would be potentially perceived and received by the high-street consumer (Chapter 1.2.1, p.4).  Fungi, in the mind of the general public, have established negative connotations due to associations with mould and decay.

In exploring concepts leading to negative perception of novel materials, the literature review revealed a story relating to resistance to the introduction of nylon in the beginning of the twentieth century (Chapter 1.2.2 'Nylon: the manmade revolution', p.6).  The public acceptance of nylon as an everyday material was a lengthy process due to the poor tactile, visual and behavioural qualities of the early synthetic materials.

The idea of a test probe emerged as an approach to making novel and conceptual materials tangible, communicable and acceptable to users and

consumers, alongside any further development processes in the chain of realisation.

A specific probe was required that would test response to material and sensory concepts that in some way engaged with the body.  The probe had to be usable and wearable, simple and neutral, culturally familiar, yet versatile and customisable, and capable of operating within a range of social situations.

The 'humble' T-shirt, which is worn universally around the globe and has been successfully implemented as a powerful bridging mechanism addressing a variety of challenging topics, fulfilled the criteria of wearability and testability.

From the above the research aim was formulated as follows:

Copy of Table 1.4-1 Research aim (p.14)

> Pilot, assess, and develop the potential of the T-shirt to operate as a design probe in introducing novel and challenging concepts relating to materials and sensory experiences.

The following research objectives were derived directly from the research aim:

Copy of Table 1.4-2 Research objectives (p.15)

<div style="border:2px solid orange; padding:1em;">

1) Explore how design probes have evolved as an approach to scoping out new design and market opportunities (Chapter 2.0 'Probes in research and design practice', p.17)

2) Review the potential of the T-shirt to operate as an interface to enhance engagement with materials and sensory experiences (Chapter 3.0 'The T-shirt', p.58)

3) Design a methodological framework to test the use of the T-shirt as a probe (Chapter 4.0 'Methodology', p.74)

4) Explore the value of the T-shirt as a probe within a variety of challenging contexts (Chapter 5.0 (p.106), Chapter 6.0 (p.155) and Chapter 7.0 (p.198))

</div>

Chapter 2.0 'Probes in research and design practice' (p.17) scoped out the evolving field of *probology*, and established the use of probes as an interactive research technique (i.e. cultural probes), as well as an outcome of design practice (e.g. speculative design). The appeal of the probe for this research lay within the following collective properties of probes (Chapter 2.3.3 'Benefits and limitations of probes', p.46):

a) Their interactive and dialectical potential as 'scaffolds for creativity';
b) The versatility of probes in addressing current or future situations;
c) The careful designing of the probe to allow for open processes, e.g. intuition, interpretation, and co-creation;
d) Their ability to transform attitudes, beliefs and values;
e) The value of the personal, idiosyncratic nature of data that is returned;
f) The unfolding of new design avenues.

Chapter 3.0 'The T-shirt' (p.58) provided examples highlighting the value of the T-shirt as an instrument, indeed even a forum for communication and education. The rationale for selecting the T-shirt as a wearable design probe was based on its specific properties, i.e. it's universally worn around the globe, culturally familiar and neutral, versatile, easily customisable, and replicable.

The main focus in devising the methodology (Chapter 4.0 'Methodology', p.74) was the design of a framework that would allow the researcher to pilot, assess, and develop the use of the T-shirt as a probe. From the review of examples of how probes have been used in design research and practice, the researcher proposed that employing the T-probe within a participatory workshop could enable a two-fold engagement with participating groups in the research process, i.e.:

i.     Participants creatively engaging with the T-shirt within the workshop setting;

ii.    Participants wearing the T-probe outside of the workshop setting to engage public feedback and response.

As the research practice progressed, the researcher was able to distinguish the points in the research process at which the 'humble' T-shirt truly became the T-probe and an effective research tool.

Chapters 5.0 (p.106), 6.0 (p.155), and 7.0 (p.198) explored the value of the T-shirt within the three discrete research projects (Copy of Table 4.1-1 Discrete research projects overleaf):

Copy of Table 4.1-1 Discrete research projects (p.79)

**Research Project (I) Fungi materials for clothing:**
*Explores perception of mould as a novel material for garment design and fabrication.*

**Research Project (II) Fashion for deafblind people:**
*Studies how a fashion experience may be introduced to a sensitive user group, i.e. people with visual and auditory impairment.*

**Research Project (III) Synthetic ingredients for fine fragrance**:
*Engages consumer understanding of synthetic ingredients in perfumery.*

The three projects were selected based on the following common points:

a) The primary objective of each project was to elicit, study and record participant sensory experience and engagement with novel and challenging material concepts and sensory experiences;

b) An opportunity to enhance designer, industry, and consumer understanding;

c) A designer aspiration to further knowledge and understanding of factors affecting public perception and engagement with novel material concepts and sensory experiences in the domains of design (Projects (I) and (II)) and industry (Project (III)).

The development of research projects that both fulfilled the aim of this research and satisfied the objectives of an external project partner, enabled the research methodology to find resonance and application outside the personal agenda of the researcher / designer.

## 8.2 Summary and interpretation of the research findings

Research outcomes and findings were generated at various points throughout the research process and are outlined in the following section.

### 8.2.1 Key findings in relation to Research Projects (I), (II), and (III)

The research findings that were specific to the research projects showed that within the methodological framework devised for this research, participants engaged actively with the selected stimuli, i.e. fungi, textiles, and synthetic fragrance ingredients in all three cases respectively, and were inspired to be creative in a design-led workshop setting.

The findings established that constructive shifts in perception and an enhanced understanding of novel and challenging material concepts do take place when engaging with materials and experiences designed to elicit specific sensory response and perception.  This indicates that the adoption of novel materials may be well received in situations that employ engagement methods, e.g. participant sensory engagement, co-creation, direct partnering in the research process, etc.

### 8.2.2 Role of the T-probe

The T-shirt as a probe was useful in indicating various levels[131] and types[132] of participant engagement in relation to each research project.

The findings showed a shift in participant understanding of specific materials and sensory experiences.  The analysis of participant feedback

---

[131] Engaged or disengaged

[132] Artistic creativity, personal self-expression, sensory and cognitive experience

during and post-workshop indicated that the sensory experience of specific workshop stimuli, resulted in the creation of T-probes with unique design qualities resulting from the sensory engagement.

Participant and public engagement with the T-probe was imaginative and co-creative. The findings from the three projects showed consistently positive response to the T-probe irrespective of the level of creative engagement involved in the designing of the T-shirt, and the context of that engagement, i.e. a participatory workshop or a social setting. From this, the researcher concluded that involving participants in the designing of the T-shirt, to become the T-probe, would depend on the specific objectives of the research project.

In cases such as Projects (I) and (III), where the aim was to introduce the T-probe to a larger public, the design process had to be carefully considered, to ensure the T-shirt design itself was effective in eliciting instantaneous attention and response. Involving participants to design the T-probe would therefore be a matter of consideration of:

i. Whether the participant would cooperate by wearing the T-shirt as a probe;
ii. Whether a creative engagement by the participant in the design process of the T-shirt would predict their wearing it in public;
iii. Using the co-creative workshops as a platform for bringing concepts closer to the participants;
iv. Management of the co-creative design process to ensure that the T-shirt maintained its function as probe.

In the case of Project (II), where the aim was to study the potential engagement of a sensitive participant group in a fashion experience, the T-shirt became the centrepiece for studying the creative interaction of participants with the T-shirt itself, and an effective research tool.

Overall, the T-shirt enabled the translation of concept-to-design in ways that proved tangible, accessible, and a fun learning experience. This was deemed a valuable first step in taking the projects a little closer to realisation.

## 8.3   Contribution to knowledge

By following a systematic methodology of designing a probe from concept to actualisation this research project contributes to the advancement of understanding of issues relating to the design and application of probes in design research – an approach to research and innovation formulated as *probology* (Gaver *et al.*, 2004).

This research was guided by the general properties of probes evidenced in the literature and design practice. This research however went beyond these qualities by designing and applying a probe in the following ways:

 1)  Design context: conceptual materials and sensory experience

The review of literature provided examples of how probes were used to speculate human engagement with wearable materials and technologies. However, the literature showed little to no evidence of how such interactions were recorded and analysed to inform further developmental activities such as moving from the concept phase into designing viable, desirable, and marketable products.

The T-probe fulfilled this objective. The methodological framework used within this research employed the probe in a way that embodied both design- and research-minded capacities. Such a probe allowed for new ideas, knowledge, and perceptions to emerge naturally as one engaged with it as part of the research process. In this way the probe became a valuable approach to scoping new market interests,

especially in contexts that concern human sensory and cognitive engagement.

2) Format of the probe: wearable

As a research technique, probes widely appear as a collection of devices, including cameras, voice recorders, maps, postcards, photo albums, and diaries, which address various aspects of a person's everyday life.

The probe that was selected as a research technique was fashion-led, i.e. wearable and capable of being experienced.

The usability, simplicity, neutrality, cultural familiarity, and versatility of the common T-shirt as the T-probe, allowed research outputs to be generated at various engagement points throughout the research process, thus creating value for the various stakeholders involved in each project. In this way the research advances understanding of the value of probes, as well as creating scope for discussion and development of enquiry and theory into the value and appropriateness of fashion-led probes, such as the T-shirt, to various outcomes.

3) Rationale of the probe approach: two-fold engagement

Current scholarly debate is concerned with the purpose of using probes in research, i.e. whether they should be employed to generate inspirational data for the designer in developing concepts for materials, products, technologies and services (as originally conceived by Gaver, Dunne and Pacenti (1999)), or if they could yield more specific and comprehensive results, i.e. results that can be rigorously analysed, validated, and generalised.

The specific approach that was taken with a view to testing the T-probe showed that engagement with the probe can elicit feedback and

response that both inspire development of materials, products, technologies, and experiences, as well as serving scholarly enquiry and findings.

4) The probe as technology: designing innovation

The organic emergence of the T-shirt as a probe to test the projects was only the beginning of the research enquiry and subsequent narrative in this study.  As the researcher engaged in various methodological processes in order to transform the T-shirt into a T-probe, it became evident that fashion garments and artefacts can become tools to inspire innovative designing in a realm of subject areas such as physics, chemistry, engineering, etc., technologies being defined as applied knowledge for practical ends found in industrial processes of invention and innovation.

The use of the T-probe in this study has opened up a whole new vista for designers to begin to collaborate with multiple disciplines and industry, to translate new concepts, to inspire and advance innovative designing, to engage specific groups of like-minded individuals in coming together to innovate, to engineer, to express, to raise awareness.  In this sense the probe proves a technology in its own right[133].

---

[133] The researcher has already evidenced this point by becoming part of a company where she is employed to work with the scientific concepts of the owner, to design probes that are used as change technologies in commerce-based environments (See Volume Two, Appendix A.A 'Post-research: The Emo-TTM Global Wall in collaboration with MindRheo®', p.481 for an example).

## 8.4    Critique to the research

### 8.4.1  Rigour of the research process

The study overall, provided a steep learning curve in research-mindedness, rigour and processes.  In the initial stages of the research, decisions about materials to be included in the study, and the delivery of fashion-related concepts to a non-fashion-based audience were driven by personal design aspirations, intuition, and passion.  Being research-minded evolved as a value of primary importance in order to manage the multiple considerations required for scholarship of this level.

As the research in practice progressed and the research methodology was tested with external partnering institutions, the researcher had the opportunity for self-reflection on the scholarly qualities of the study, and note new insights and learning that are already being incorporated in the career opportunities emerging for her.

The combination of intellectual capacities such as design-mindedness and research-mindedness called for a fine balance and discernment relating to appropriateness and combination of design and research methods. Development of thinking and skills relating to the multiple roles of student, designer, researcher, leader and facilitator, all gave a multi-dimensional research and learning experience.

### 8.4.2  Limitations of the study

The scope of the study necessarily had several limitations.  The lack of laboratory setting in the initial stages of the research precluded it from a more in-depth exploration of how a novel and obscure material can transition into design and market realisation.  Other precluding factors

were limited financial outlay and the bringing together of scientific and industry partnerships, to test the concepts beyond the probe-creation stage.  However, the study did not in any way claim that it would fulfil the entire concept-to-market chain of events.  To this extend, the study has fulfilled its main objectives.

Furthermore, the various outcomes of implementing the T-probe in Projects (I), (II), and (III) indicate that the implementation of a probe that directly tests the intention of a hypothesis or a project, requires consideration and alignment of all aspects of aesthetic, technologies, and other components to be integrous with the research purpose and intentions.

Other practical research limitations included the small participant groups, and the planning and management of the research settings.

The small participant groups in all three projects meant that the research findings could not be extrapolated to a wider population. However, the small group provided the benefit of being manageable, and the exploration of the data in depth, to provide rich research and meaningful findings.

In relation to planning, new learning that emerged was that an ideal research setting and scenario can remain elusive however well planned.  All research involving consideration of environmental conditions, the assembling of participants in a given place at a given time, and the use specific technologies, inevitably involve confounding variables that can affect the research process sand outcomes.  For example, in the case of Research Project (III), the researcher would have ideally timed the project and had the T-shirts produced at a time of the year, when T-shirts could be worn more regularly.

As this learning emerged, it proved invaluable to the researcher in managing multiple factors, e.g. time, place, materials, technology, etc. This learning is beneficial due to the realisation that in the business

and career world of post-research, such variables would require acute consideration and intelligent decision-making with razor-sharp intention.

## 8.5    Emerging research questions and future implications

Various opportunities for further scholarly examination and developments in design practice emerged from each of the research projects.

Project (I) poses questions regarding the engagement of designers in advancing conceptual materials. In the pursuit of fabricating obscure textile materials, in this case derived from fungi, one of the earliest realisations uncovered a need for multi-disciplinary and industry-supported partnerships in order to bring forward the development of such a material into an actual product.

Further consideration of the various aspects of designing and producing obscure materials, revealed that inspired and informed design thinking and approaches can enhance understanding of such materials in the public domain and industry. Deliberation of the following questions emerged:

*Why propose novel materials? What are the general and specific intentions underlying the design and fabrication of novel materials?*

*What approaches, partnerships, tools, techniques, and technologies are necessary to make conceptual materials viable and desirable on the consumer market?*

*What are the multi-disciplinary implications that arise from novel material projects? How do obscure materials relate to the wider design context, existing technologies, industry, and consumer markets?*

*What is the role of the designer in the concept-to-market realisation and gradual habituation of such materials?*

*What futures are envisaged by the design visionary in proposing fabrication of novel materials?*

Many of these questions have been partly addressed in this thesis. What remains unanswered is aspects such as the inter- and multi-disciplinary forces that are necessary to interact in order to bring such materials into actualisation. More importantly, the visionary capacities and details required of designers, philosophers, scientists, technologists, commerce-drivers and futurologists, require formal and concerted efforts to exchange and collaborate in order to ensure that novel materials do not become a partial solution in a world of changing sustainability.

In the case of novel materials which are coming to the market, how the role of the designer develops within the remit of design and in collaboration with other disciplines is a matter of subject-related evolution.

Project (II) explored the engagement of a sensory and cognitively impaired group of adults in a fashion experience. The employment of the T-shirt as the centrepiece to this engagement provided an accessible frame for taking the project out into the public arena. A logical next step would be the opening up of a dialogue with industry and affordable high-street brands, e.g. *H&M* and *Top Shop*, about enabling such an experience within the current market reality. This poses questions for designers to consider, e.g.:

*How is the high-street designed to facilitate consumer experience for people who are differently-abled?*

*How does consideration of all sensory modalities inform and inspire the design, marketing, and consumption of fashion?*

*What would a designed world look and feel like, if it was created with the primary objective of being experienced on a multi-sensory level?*

*What is the role of the individual in co-creating preferable design scenarios?*

These questions open up various opportunities for designers at different stages of the design process, to be involved in.  For example, designers who are involved in the ideation and innovation stages have a very different role from designers who are involved in consumer research and experience.  Given that designers are placed in different stage of the concept-to-market evolution of materials, products, services, and consumer experiences, the specialisation of design roles from concept to market will necessarily have to undergo development and evolve.

Project (III) further created scope for development of design-led approaches such as the probe, alongside more traditional research, innovation, communication, education, and marketing techniques.

## 8.6    Further research

Employment of the T-probe within three discrete contexts of human engagement with materials and sensory experience inspired the pursuit of further scholarly enquiry into the design and application of fashion-led probes to fulfil specific research and design aspirations within the various evolutionary stages of materials, products, technologies, and consumer experiences, such as follows:

### **Probes for ideation**

Employing the T-shirt to study the potential engagement of a sensitive participant group in a fashion experience (Research Project (II)) has created scope to design and apply probes at the concept and

exploratory phases of innovation processes, with a view to unravelling and inspiring new design thinking and market opportunities.

**Probes for accomplishment**

Employing the T-shirt to translate a conceptual material project into a tangible artefact (Research Project (I)) has created opportunities for development of probes that inform and inspire decision-making at the prototyping phases, with a view to advancing concepts into actualisation.

**Probes for communication and engagement**

Launching the T-shirt as a probe within three different contexts of human engagement has created scope for co-creating probes with various stakeholders, to enhance perception and engagement with materials, technologies, products and services on a person by person basis.

**Probes for education**

The employment of the T-probe within participatory workshops that intersect design practice and science, has uncovered the potential for intelligent design of probes aimed at making emerging technologies accessible and useful to the wider public.

Practical applications of this point have become a joint undertaking of the researcher in collaboration with MindRheo®, where T-shirt templates are used as probes to inspire audiences to engage with the concept of consciously activating plasticity through mind-training (Volume Two, Appendix A.A 'Post-research: The Emo-TTM Global Wall in collaboration with MindRheo®', p.481).

## 8.7    Concluding remarks

The findings of the research enquiry demonstrated that the T-shirt is well accepted and engaged with, and serves as a probe both within, and outside of the designed research setting.  The cultural familiarity, versatility, and accessibility of the T-shirt inspired communities and the researcher to explore, understand, communicate, reconsider, and evolve design and market opportunities.

From this, it has become clear to the researcher that probes are a necessary addition and approach in the innovation process in testing, educating, and communicating new ideas, materials, products, technologies, and experiences.

The practical component of this research –  the discrete research projects –  has established distinctive roles of the T-probe to the various stakeholders involved:

To participant groups, the T-probe provided a medium to explore novel material concepts and sensory experiences;

To the researcher, the T-probe realised its value and power in engaging user groups, communicating concept and processes, creating new knowledge, and developing new learning leading to potential shifts in thinking within the wider design community;

To the project partners (i.e. *Sense* and *IFF*) and related industries, employment of the T-probe evidenced the value of the approach, the opportunity for innovation, as well as providing a means of electing consumer perception and taste, prior to the launching of new products and services;

To the wider design community, the T-probe evidenced the use of a simple method of translating a conceptual formulation into an actual design capable of eliciting participant feedback, in order to unfold

design realities that not only fulfil personal design aspirations, but also align with a larger unfolding of potential futures in design and changing global trends;

To other disciplines, e.g. biotechnologies, neuroscience, and perfumery, the implementation of the 'humble' T-shirt as a probe within a broad spectrum of research contexts, opens up collaborative approaches to scoping research and innovation opportunities, and development of novel products that are accessible, affordable, and desirable to the wider public.

## 8.8    Personal vision

This doctoral research provided a steep learning curve for the researcher, and a life-changing experience from being a fashion student to coming into the realisation through practice of what is and what it takes to be a designer, researcher, and entrepreneur.

The study uncovered that prior to any co-creative process, being self-led in relation to what inspires from within, irrespective of market trends, theoretical concepts, scientific bias, and resource limitations, is the key to self-discovery and self-distinguishing in the world of Fashion.

The three research projects evidenced the need for:

a) Rigorous research around the initiating idea prior to embarking on a journey of developing workable design proposals;

b) The practical skills and tacit knowledge required in relation to design approaches and conceptualisation of materials, that has become the platform for her post-PhD career development;

c) The multiple career opportunities that are available and the need for a systematic approach to deciding and developing specialised interest / portfolio of interests.

On a personal level, there was a realisation that personal design aspirations and passion are important in generating new ideas and creating partnerships to bring them to fruition.  At the same time, it emerged that such ideas are not only inspiring on a personal level, but can find resonance with, and inspire, wider audiences and the industry market.

The T-shirt as a probe, in this instance, became a tangible bridge between what might be the designer's dream and the translation of that dream into products that are desirable and viable on the high-street.

The collaborative project with the deafblind community at *Sense* provided the researcher with first-hand understanding of the value of co-creating with a highly specialist user group.  Additionally, this collaboration brought new learning about the qualities and approaches required to fulfil a diverse range of aims and objectives without any compromise to the overall goal to the research project.  These are:

> *Immersing oneself in the community setting prior to the start of the project;*
>
> *Consideration of appropriate materials and methods involving sensitive environments and groups of people;*
>
> *Sharpening empathetic and intuition capacity, whilst maintaining objectivity in the interactions with research participants and members of staff;*
>
> *Maintaining a high degree in flexibility and responsiveness in running a workshop that would cater to the requirements of each participant.*

On a professional level, the researcher recognised that there were different hats to be worn as the research process unfolded.  The roles of being a designer and a researcher, called into being intellectual capacities such as design-mindedness and research-mindedness and very real skills, e.g. group facilitation and management.  Engagement with the multiple roles of designer, researcher, leader and facilitator, all gave a multi-dimensional

experience that became easier to express and manage as the Research in Practice progressed.

In this evolutionary process, the new learning emerged from self-examining questions that in the initial stages were far removed from literary sources, which then became the guiding intention in the research and scholarly demeanour of the researcher:

*What is the research aim of my probe?*

*What participant engagement / response do I want to see?  Is this manipulation?*

*How do I record and measure that response in a way that is unbiased by my own intentions, my passion, and wanting specific and favourable outcomes?*

*What new knowledge am I seeking?  Can the new knowledge that I am seeking impact on other designers or researchers?*

*Is my Project going to offer any insights?*

*How would these insights be relatable to other audiences, e.g. designers, trend-setters, scientists, industry collaborators, etc.?*

The three research projects provided new learning for the researcher in relation to research process and the design of probes to fulfil research criteria.  The feedback from employing the T-probe in the three cases was valuable in indicating that research intention, attention, and effort, must be integrally aligned together in order to produce a probe that directly tests the intention of a hypothesis or project.

This new learning is inspiring for the design of probes in the future, where a probe can be anything, but it would be the designer's job to consider and align all aspects of aesthetic, technologies and other components, to be integrous with the research or project purpose and intentions.

It appears then that when a design probe is thought out well, the research- and the design-mindedness overlap to create a probe that allows for new ideas, knowledge, and perceptions to emerge naturally as one engages with it, both as part of the research process, and on a day-to-day basis.  In this way the probe becomes a valuable tool for scoping new market interests, especially in contexts that concern human engagement and perception.

A point of clarity that has emerged for the author, that will continue to inspire and be at the source of her design intentions is the engagement with design materials, products, services, and experiences that are driven by personal intuition, passion, vision, and values that inspire wider audiences; and to develop processes that are co-creative, collaborative, knowledge-creating, and knowledge-sharing, to unfold personal, professional, and global futures by design.

# References

Alive (2013) *Skin Sucka.* Available at: http://thisisalive.com/skin-sucka/ (Accessed: 20 January 2015).

Anderson Feisner, E. and Reed, R. (2014) *Color Studies*. 3rd edn. New York: Bloomsbury.

Antonelli, P. (2007) *Design and the Elastic Mind.* Available at: http://www.ted.com/talks/lang/en/paola_antonelli_previews_design_and_the_elastic_mind.html (Accessed: 10 January 2015).

Armani, G. (1996) 'Introduction', in Harris, A. (ed.) *The White T.* New York: HarperCollins, pp. 13.

Avon (2015) *Avon Breast Cancer Crusade.* Available at: http://www.avoncompany.com/corporate-responsibility/philanthropy/breast-cancer-crusade/ (Accessed: 5 May 2015).

Ballie, J. (2014) *E-co-Textile Design: How can a textile design practice sustainably influence an emerging digital consumer culture?* Available at: http://jenballie.wordpress.com/research/my-phd-research/ (Accessed: 12 August 2014).

Bayer, E. and McIntyre, G. (2012) *Ecovative Design LLC.* Available at: http://www.ecovativedesign.com/  (Accessed: 12 August 2014).

Benedek, L. (1953) *The Wild One.* USA: Stanley Kramer Productions.

Benjamin, D. R. (1995) *Mushrooms: poisons and panaceas: a handbook for naturalists, mycologists and physicians.* New York: Freeman.

Bensmaia, S. (2015) *Bensmaia Lab.* Available at: http://bensmaialab.org/ (Accessed: 18 August 2015).

Boddy, L. (2013) *"Fungi - the most important organisms on the planet?" at 2008 Earthwatch debate.* Available at: http://www.cardiff.ac.uk/biosi/resources/web%20EW%20Fungi.mov (Accessed: 12 August 2014).

Boddy, L. and Coleman, M. (eds.) (2010) *From Another Kingdom: The Amazing World of Fungi.* Edinburgh: Royal Botanic Gardens, Edinburgh.

Boehner, K., Gaver, W. and Boucher, A.(2012) 'Probes', in Lury, C. &Wakeford, N. (eds.) *Inventive methods: the happening of the social.* Abingdon: Routledge, pp. 185-201.

Braddock Clarke, S. E. and Harris, J. (2012) *Digital Visions for Fashion and Textiles.* London: Thames & Hudson.

Braun, V. and Clarke, V. (2006) 'Using thematic analysis in psychology', *Qualitative Research in Psychology,* 3 (2), pp. 77-101.

Bryman, A. (2012) *Social Research Methods.* 4th edn. Oxford: Oxford University Press.

Bult, J. H. F., de Wijk, R. A. and Hummel, T. (2007) 'Investigations on multimodal sensory integration: Texture, taste, and ortho- and retronasal olfactory stimuli in concert', *Neuroscience Letters,* 411 (1), pp. 6-10.

Buur, J. and Matthews, B. (2008) 'Participatory Innovation – a research agenda', *Proceedings of the Tenth Anniversary Conference on Participatory Design,* pp. 186-189.

Candy, L. (2006) *Practice Based Research: A Guide.* Creativity & Cognition Studios. Sydney: University of Technology.

Castells, M. (2001) *The Internet Galaxy: Reflections on the Internet, Business and Society.* New York: Oxford University Press.

Chua, J. (2012) *Adidas Launches Water-Saving "DryDye" Range of T-Shirts.* Available at: http://www.ecouterre.com/adidas-launches-water-saving-drydye-range-of-t-shirts/ (Accessed: 5 May 2015).

Chua, J. (2014) *Sales Halt on Feminist T-Shirt Following Sweatshop Claims.* Available at: http://www.ecouterre.com/sales-halt-on-feminist-t-shirt-following-sweatshop-claims/ (Accessed: 5 May 2015).

Collet, C. (2012) *Biolace, Design and Biofacture, Horizon 2050.* Available at: http://vimeo.com/52572656 (Accessed: 19 August 2014).

Collet, C. (2012) 'BioLace: An Exploration of the Potential of Synthetic Biology and Living Technology for Future Textiles' *Studies in Material Thinking, 7.*

Collet, C. (2013) *Alive: New Design Frontiers.* Available at: http://thisisalive.com/ (Accessed: 12 August 2014).

Congdon, A. (2014) *Amy Congdon: Biological Atelier.* Available at: http://www.amycongdon.com/ (Accessed: 30 July 2014).

Cooke, R. C. (1977) *Fungi, man, and his environment.* New York: Longman.

Corbman, B. P. (1985) *Textiles: Fiber to Fabric.* 6th edn. Singapore: McGraw-Hill Book Co.

Creswell, J. W. (2014) *Research Design.* 4th edn. London: Sage Publications.

Cross, N. (2006) *Designerly Ways of Knowing.* London: Springer.

Daoust, P. (2011) 'Spoilt rotten: good and bad mould', *Science: Food Science | Guardian.Co.Uk*.

Dazed (2010) *The Magic of Lucy and Bart.* Available at: http://www.dazeddigital.com/fashion/article/6040/1/the-magic-of-lucy-and-bart (Accessed: 20 January 2015).

Dazed (2015) *Dazed & Confused.* Available at: http://www.dazeddigital.com/info/article/824/1/dazed-confused (Accessed: 20 January 2015).

Denscombe, M. (2003) *The Good Research Guide.* 2nd edn. Maidenhead: Open University Press.

Denzin, N. K. (1989) 'The Research Act: a Theoretical Introduction to Sociological Methods. 3rd Edn. Prentice Hall, Englewood Cliffs.', in Sim, J. &Sharp, K. (eds.) *A critical appraisal of the role of triangulation in nursing research.* International Journal of Nursing Studies 35 (1998) 23-31: PERGAMON, pp. 23-24.

Deshmukh, S. K. and Rai, M. K. (eds.) (2005) *Biodiversity of Fungi: Their Role in Human Life.* Enfield: Science Publishers.

*Design Against Crime.* (2015) Available at: http://www.designagainstcrime.com/ (Accessed: 20 January 2015).

*Design Interactions Research.* (2015) Available at: http://www.di.research.rca.ac.uk/content/about (Accessed: 20 January 2015).

Dugan, F. M. (2011) *Conspectus of world ethnomycology: fungi in ceremonies, crafts, diets, medicines and myths.* St. Paul, Minn.: APS Press.

Dunn, R. (2011) *The Wild Life of Our Bodies: Predators, Parasites, and Partners That Shape Who We Are Today.* New York: HarperCollins.

Dunne, A. and Raby, F. (2013) *Speculative Everything: Design, Fiction and Social Dreaming.* Cambridge, Massachusetts: The MIT Press.

Dunne, T. and Raby, F. (2015) *Critical Design FAQ.* Available at: http://www.dunneandraby.co.uk/content/bydandr/13/0 (Accessed: 20 January 2015).

DuPont (2014) *Innovation Starts: 1939 Nylon.* Available at: http://www2.dupont.com/Phoenix_Heritage/en_US/1939_c_detail.html (Accessed: 26 April 2014).

Earley, B. (2014) *B. Earley.* Available at: http://www.beckyearley.com/ (Accessed: 9 August 2014).

Earley, B. (2014) *The "I" in the Textile Team.* Huddersfield. Transition: Re-thinking Textiles and Surfaces: University of Huddersfield.

Earley, B. (2014) *Upcycling Textiles: A digital sketchbook for the Top 100 project.* Available at: http://www.upcyclingtextiles.net/about/ (Accessed: 23 January 2015).

Earley, B. and Fletcher, K. (2003) *5 ways.* Available at: http://www.5ways.info/docs/intro/intro.htm (Accessed: 23 January 2014).

Earley, B. and Fletcher, K. (2003) *5 Ways: Updatable.* Available at: http://5ways.info/docs/projects/update/projects.htm (Accessed: 9 August 2014).

Earley, B. and Politowicz, K. (2010) *The TEN.* Available at: http://www.beckyearley.com/the-ten/ (Accessed: 23 January 2015).

Earley, B., Ballie, J. and von Busch, O. (2012) *Black + Hack + Chat.* Available at: http://www.beckyearley.com/films/2014/2/19/black-hack-chat-workshop-at-the-10th-ead-crafting-the-future-design-conference-in-gothenburg (Accessed: 9 August 2014).

Earley, B., Politowicz, K., Goldswrothy, K., Vuletich, C., Ribul, M., Bowles, M., Landalv, J., Child, E., Harvey, B., Round, K. and Dodd, I. (2014) *Textile Toolbox.* Available at: http://www.textiletoolbox.com/ (Accessed: 23 January 2015).

Ekman, P. (2004) *Emotions revealed: understanding faces and feelings.* London: Phoenix.

*European Centre for Living Technology.* (2015) Available at: http://www.unive.it/nqcontent.cfm?a_id=144110 (Accessed: 22 January 2015).

Field, T. (2010) 'Touch for socioemotional and physical well-being: A review', *Developmental Review,* 30 pp. 367-383.

Fletcher, K. (2008) *Sustainable fashion and textiles: design journeys.* London: Earthscan.

Fletcher, K. and Grose, L. (2012) *Fashion & sustainability: design for change.* London: Laurence King.

Flory, M. (2014) *The Sequence and Flow of Unfolding New Realities.* Workshop. London: MindRheo. Unpublished.

Flory, M. (2014) *What is a probe?* Appendices. Transcribed interview. PhD thesis: Ivanova, N.

Fresener, S. (1995) *The T-Shirt Book.* Layton: Gibbs Smith.

Gardien, P. and Gilsing, F. (2013) 'Walking the Walk: Putting Design at the Heart of Business', *Dmi:Review,* 24 (2), pp. 54-66.

Gaver, B., Dunne, T. and Pacenti, E. (1999) 'Design: Cultural probes', *Interactions,* 6 (1), pp. 21-29.

Gaver, W., Boucher, A., Pennigton, S. and Walker, B. (2004) 'Cultural Probes and the Value of Uncertainty', *Interactions,* (September - October), pp. 53-56.

Gaver, W., Bowers, J., Boucher, A., Law, A., Pennington, S. and Villar, N. (2006) *The History Tablecloth: Illuminating Domestic Activity.* 6th conference on Designing Interactive Systems. New York: ACM.

Ginsberg, A. and King, J. (2009-2011) *E.chromi.* Available at: http://www.echromi.com/ (Accessed: 20 January 2015).

Goldsmiths, U. o. L. (2015) *Interaction Research Studio.* Available at: http://www.gold.ac.uk/interaction/  (Accessed: 20 January 2015).

Gordon, J. and Hiller, A. (1988) *The T-shirt Book.* London: Ebury Press.

Hallett, C. and Johnston, A. (2010) *Fabric for Fashion.* London: Laurence King Publishing Ltd.

Hamlyn, P. F. (1991) 'Fabricating fungi', *Textile Technology International,* pp. 254-257.

Hamlyn, P. F. and Schmidt, R. J. (1994) 'Potential therapeutic application of fungal filaments in wound management', *Mycologist,* 8 (4), pp. 147-152.

Handley, S. (1999) *Nylon: The Manmade Fashion Revolution.* London: Bloomsbury.

Harris, A. (1996) *The White T.* New York: HarperCollins Publishers.

Harris, J. (2013) *Digital Skin, How Developments in Digital Imaging Techniques and Culture are Informing the Design of Futuristic Surface and Fabrication Concepts.* Textile: The Journal of Cloth and Culture, 11 (3). pp. 242-261

HCI Bibliography (2015) *Human-Computer Interaction Resources.* Available at: http://hcibib.org/ (Accessed: 22 January 2015).

*Helen Storey Foundation.* (2008) Available at: http://www.helenstoreyfoundation.org/about.htm (Accessed: 8 August 2014).

Herz, R. (2008) *The Scent of Desire.* New York: HarperCollins.

Interaction Design Association (2012) *Keynote - Anthony Dunne: What If... Crafting Design Speculations.* Available at: http://vimeo.com/37557758 (Accessed: 15 August 2014).

Ivanova, N. (2011) *Moulded Mind.* Available at: http://mouldedmind.blogspot.co.uk/p/bio.html  (Accessed: 24 January 2015).

Ivanova, N. (2012) *Fungi & Fibre Symposium.* Unpublished Report.

Ivanova, N. (2012) *The Fungarium.* Unpublished Report.

Ivanova, N. (2013) 'The human-mould-fashion relationship: fungi applications for future design scenarios in fashion and textiles fabrication', *Futurescan 2: Collective voices.* Sheffield Hallam University, 10-11 January 2013.  Association of Fashion and Textiles Courses, pp. 34-41

Ivanova, N. (2013) *Meeting Dr Paul F Hamlyn.* Unpublished Report.

Ivanova, N. (2013) *Meeting Prof Lynne Boddy.* Unpublished Report.

Jakob, A. and Collier, L. (2014) *How to make a Sensory Room for people living with dementia: A Guide Book.* Available at: http://fada.kingston.ac.uk/de/MSE_design_in_dementia_care/doc/How%20to%20make%20a%20Sensory%20Room%20for%20people%20with%20dementia.pdf  (Accessed: 6 July).

Jansen, M. J., Huisman, M., Van Dijk, J. P. M. and Ruijssenaars, W. A. J. J. M. (2012) 'Touching Textures in Different Tasks by a Woman with Congenital Deaf-Blindness', *Journal of Visual Impairment & Blindness,* (December), pp. 739-745.

*Jen Ballie.* (2015) Available at: http://www.jenballie.com/  (Accessed: 20 January 2015).

*Katharine Hamnett.* (2014) Available at: http://www.katharinehamnett.com/pages/about (Accessed: 1 May 2015).

Kazan, E. (1951) *A Streetcar Named Desire.* USA: Warner Bros. Pictures.

Kendall, B. (2013) *The Hidden Kingdom of Fungi.* Radio 4: BBC.

Kerridge, T. (2014) *On Design Probes.* Appendices. Transcribed interview edn. PhD thesis: Ivanova, N.

Lahtinen, R., Palmer, R. and Ojala, S. (2012) 'Visual art experiences through touch using haptices', *Procedia - Social and Behavioral Sciences,* (45), pp. 268-276.

Lee, A. (2014) *The story of a t-shirt.* Available at: http://www.fawcettsociety.org.uk/blog/story-t-shirt/ (Accessed: 5 May 2015).

Lee, S. (2005) *Fashioning the future: tomorrow's wardrobe.* London: Thames & Hudson.

Lee, S. (2012) 'Biocouture or How to Grow a Frock...', in Hemmings, J. (ed.) *The Textile Reader.* London: Berg, pp. 391-394.

Lieshout, C. (2013) 'The art of trends', *Futurescan 2: Collective voices.* Sheffield Hallam University, 10-11 January 2013.  Association of Fashion and Textiles Courses, pp. 6-11.

London Centre for Nanotechnology (2010) *What is nanotechnology?* Available at: https://www.london-nano.com/ (Accessed: 24 January 2015).

Lyons, C. (2014) *ELLE X Whistles For Fawcett: How to buy the T-shirt EVERYONE is talking about.* Available at: http://www.elleuk.com/now-trending/buy-elle-whistles-fawcwett-feminism-unisex-tshirt (Accessed: 5 May 2015).

Längle, E. (2005) *Pierre Cardin: fifty years of fashion and design.* London: Thames & Hudson.

Marketing Research Association (2015) *Focus Groups.* Available at: http://www.marketingresearch.org/focus-groups (Accessed: 20 January 2015).

Mattelmäki, T. and Battarbee, K. (2002) *Empathy Probes.* Malmö: Participatory Design Conference (PDC).

Max-Neef, M. (1992) 'Development and human needs', in Ekins, P. &Max-Neef, M. (eds.) *Real-Life Economics: Understanding Wealth Creation,* London: Routledge, pp. 197-213.

Mayfield, N. P. (2001) *Creative Expression: Opportunities for Persons who are Deafblind*. Indiana State University: Blumberg Center for Interdisciplinary Studies in Special Education.

McKenna, T. K. (1992) *Food of the gods : the search for the original tree of knowledge : a radical history of plants, drugs and human evolution.* London: Rider.

McLuhan, M., McLuhan, E., Kuhns, W. and Carson, D. (2002) *The book of probes.* Corte Madera, CA: Gingko.

Meinhold, B. (2011) *"Intelligent" T-Shirt Monitors Hospital Patients' Vital Signs, Movements.* Available at: http://www.ecouterre.com/intelligent-t-shirt-monitors-hospital-patients-vital-signs-movements/ (Accessed: 5 May 2015).

Meinhold, B. (2012) *An Ordinary Cotton T-Shirt Could Some Day Charge Your Cellphone.* Available at: http://www.ecouterre.com/an-ordinary-cotton-t-shirt-could-someday-charge-your-cellphone/ (Accessed: 5 May 2015).

Meinhold, B. (2014) *Silic: A "Self-Cleaning" T-Shirt That's Nearly Impossible to Stain.* Available at: http://www.ecouterre.com/silic-a-hydrophobic-t-shirt-thats-impossible-to-stain/ (Accessed: 5 May 2015).

Michael, M., Gabrys, J., Gaver, B., Wilkie, A., Kerridge, T. and Ovalle, L. (2014) *Energy & Co-Designing Communities (ECDC).* Available at: http://www.ecdc.ac.uk/ (Accessed: 23 January 2015).

Mills, D. and Brown, P. (2004) *Art and Wellbeing: a guide to the connections between community cultural development and health, ecologically sustainable development, public housing and place, rural revitalisation, community strengthening, active citizenship, social inclusion and cultural diversity.* Sydney: Australia Council for the Arts.

Miriam-Webster Dictionary (2015) *Interdisciplinary: definition.* Available at: http://www.merriam-webster.com/dictionary/interdisciplinary (Accessed: 03 November 2015).

Montalti, M. (2014) *The Future of Plastic.* Available at: http://www.corpuscoli.com/projects/the-future-of-plastic/ (Accessed: 4 September 2014).

Moss, M. O. (1987) 'Fungal Biotechnology Roundup', *Mycologist.,* 21 (2), pp. 1-58.

NASA (2010) *What Is a Space Probe?* Available at: http://www.nasa.gov/centers/jpl/education/spaceprobe-20100225.html (Accessed: 3 November 2015).

National Geographic (2010) *Billion-Pixel Image Tool Probes Science Mysteries.* Available at: http://news.nationalgeographic.com/news/2010/11/101112-gigapan-science-panoramas-technology/ (Accessed: 19 January 2015).

National Geographic (2011) *Einstein Theories Confirmed by NASA Gravity Probe.* Available at: http://news.nationalgeographic.com/news/2011/05/110505-einstein-theories-confirmed-gravity-probe-nasa-space-science/ (Accessed: 20 January 2015).

National Geographic (2012) *Alien Deep: Deep Sea Probe.* Available at: http://channel.nationalgeographic.com/channel/alien-deep/videos/deep-sea-probe/ (Accessed: 19 January 2015).

National STEM Centre (2010) *Smart Materials.* Available at: http://www.nationalstemcentre.org.uk/elibrary/collection/1515/smart-materials (Accessed: 23 January 2015).

NHS Choices (2014) *Deafblindness.* Available at: http://www.nhs.uk/conditions/deafblindness/pages/introduction.aspx (Accessed: 11 November 2014).

O'Connor, K. (2010) 'How Smart Is Smart? T-shirts, Wellness, and the Way People Feel about "Medical" Textiles', *Textile,* 8 (1), pp. 50-67.

Ormiston, R. and Robinson, M. (2007) *Colour Source Book*. London: Flame Tree Publishing.

Oxford Dictionaries (2015) *Ready-to-wear*. Available at: http://www.oxforddictionaries.com/definition/english/ready-to-wear (Accessed: 10 November 2015).

Oxford English Dictionary (2014) *Probe.* Available at: http://www.oed.com/view/Entry/151718?rskey=LBeiTK&result=1#footerWrapper (Accessed: 4 December 2014).

Park, S. and Ivanova, N. (2013) *MycoCouture: BioSuede.* Available at: http://exploringtheinvisible.com/2013/02/26/mycocouture-biosuede/ (Accessed: 15 July 2014).

Pedgley, O. & Wormald, P. (2007) 'Integration of Design Projects within a Ph.D.', *Design Issues*, 23 (3), pp. 70-85

*Phil Ross.* (2015) Available at: http://philross.org/ (Accessed: 24 September 2015).

Philips (2006) *SKIN: Dresses.* Available at: http://www.design.philips.com/about/design/designportfolio/design_futures/dresses.page (Accessed: 20 January 2015).

Philips (2008) *Fractal 'Living jewelry', new provocation of the Philips Design Probe team.* Available at: http://www.newscenter.philips.com/main/design/about/design/designnews/pressreleases/pressbackgrounders/fractal_living_jewelry.wpd (Accessed: 20 January 2015).

Philips (2011) *Microbial home.* Available at: http://www.design.philips.com/about/design/designportfolio/design_futures/microbial_home.page (Accessed: 16 August 2011).

Philips (2014) *Design Futures.* Available at: http://www.design.philips.com/about/design/designportfolio/design_futures/index.page (Accessed: 6 August 2014).

*Pop-up T-shirt Factory.* (2015) Available at: http://trinityleeds.com/whats-on/pop-t-shirt-factory (Accessed: 5 May 2015).

Press, M. and Cooper, R. (2003) *The Design Experience: The Role of Design and Designers in the Twenty-First Century.* Hampshire: Ashgate.

Quinlan, P. and Dyson, B. (2008) *Cognitive Psychology.* Harlow: Pearson Education Ltd.

Quinn, B. (2012) *Fashion futures.* London: Merrell.

Quinn, B. (2013) *Textile Visionaries: innovation and sustainability in textile design.* London: Laurence King Publishing.

Rachman, S. (2004) 'Fear of contamination', *Behaviour Research and Therapy,* 42 (11), pp. 1227-1255.

Ravensbourne (2013) *Wearable Futures.* Available at: http://www.wearablefutures.co/ (Accessed: 31 July 2014).

Ray, N. (1955) *Rebel Without a Cause.* USA: Warner Bros.

Restany, P. (2013) *The 5 Skins.* Available at: http://www.hundertwasser.com/skin (Accessed: 31 July 2014).

Rice, M.C. and Beebee, D. (2012) *Mushrooms for Dyes, Paper, Pigments and Myco-Stix$^{tm}$.* 2nd edn. Fort Bragg, CA: International Mushroom Dye Insttute.

Rob Dunn (December 2011) *Killer fungi made us hot-blooded - life.* Available at: http://www.newscientist.com/article/mg21228411.700 (Accessed: 01 April 2012).

Robson, C. (1993) *Real World Research.* Oxford: Blackwell.

Royal College of Art (2012) *Inspiring Matter.* Available at: http://inspiringmatter.org/ (Accessed: 31 July 2014).

Sanders, E. and Stappers, P. (2008) 'Co-creation and the new landscapes of design', *CoDesign: International Journal of CoCreation in Design and the Arts,* 4 (1), pp. 5-18.

Sense (2015) *TouchBase South East.* Available at: https://www.sense.org.uk/content/touchbase-south-east (Accessed: 25 August 2015).

Shuttleworth, M. (2008) *Scientific Reductionism.* Available at: https://explorable.com/scientific-reductionism (Accessed: 20th January 2015).

Silverman, D. (2000) *Doing Qualitative Research: a practical handbook.* London: Sage Publications.

SKIP (2012) *Skills Development for Researchers in Design Practice.* Available at: http://skip.rca.ac.uk/ (Accessed: 24 January 2015).

*Slim Barret.* (2015) Available at: http://www.slimbarrett.com/ (Accessed: 22 January 2015).

Snell, M. (2005) *Fashion Statement Katharine Hamnett is making green the new black.* Available at: http://blog.katharinehamnett.com/2015/02/flash-back-2005-fashion-statement-katharine-hamnett-is-making-green-the-new-black/ (Accessed: 5 May 2015).

Spooner, B. and Roberts, P. (2005) *Fungi.* London: HarperCollins.

Stamets, P. (2004) *Mycelium running : how mushrooms can help save the world.* Berkeley, California: Ten Speed.

Stamets, P. and Chilton, J. S. (1983) *The Mushroom Cultivator: A Practical Guide to Growing Mushrooms at Home.* Olympia, Washington State: Agarikon Press.

Storey, H. and Ryan, T. (2012) *The Catalytic Clothing Story.* Available at: http://www.catalytic-clothing.org/ccstoryfilm.html (Accessed: 8 August 2014).

Storey, H., Ryan, T., Belford, P., Coates, C., Kelly, F. J., Domen, T., Waywell, P. and Mufti, A. (2014) *Catalytic Clothing.* Available at: http://www.catalytic-clothing.org/home.html (Accessed: 8 August 2014).

Suri, J. F. (2007) *Involving People in the Process.* London: Include.

Talbot, S. (2013) *Slogan T-shirts: Cult and Culture.* London: Bloomsbury.

Tate (2015a)) *Fluxus.* Available at: http://www.tate.org.uk/learn/online-resources/glossary/f/fluxus (Accessed: 20th January 2015).

Tate (2015b)) *Situationist International.* Available at: http://www.tate.org.uk/learn/online-resources/glossary/s/situationist-international (Accessed: 20th January 2015).

Tate (2015c)) *Surrealism.* Available at: http://www.tate.org.uk/learn/online-resources/glossary/s/surrealism (Accessed: 20th January 2015).

Tate (2015d)) *Jackson Pollock*. Available at:
http://www.tate.org.uk/art/artists/jackson-pollock-1785 (Accessed: 23 Sept
2015).

Techtextil (2011) *MA Fashion.* Work display. Frankfurt: Messe Frankfurt.

TED (2011) *Suzanne Lee: Grow your own clothes.* Available at:
http://www.ted.com/talks/suzanne_lee_grow_your_own_clothes (Accessed:
31 July 2014).

TEDx (2012) *Spray-On Fabric: Manel Torres at TEDxImperialCollege.*
Available at: https://www.youtube.com/watch?v=EW6Gv-IoErw (Accessed:
29 April 2014).

*Teespring.* (2015) Available at: http://teespring.com/ (Accessed: 5 May
2015).

The Collins English Dictionary (2015) *Pershing.* Available at:
http://www.collinsdictionary.com/dictionary/english/pershing (Accessed: 5
May 2015).

The Fawcett Society (2014) *'This is what a feminist looks like t-shirt':
Fawcett Society Response.* Available at:
http://www.fawcettsociety.org.uk/2014/11/feminist-looks-like-t-shirt-fawcett-
society-response/ (Accessed: 5 May 2015).

The Guardian (2014) *Harriet Harman wears feminsm T-shirt to prime
minister's questions.* Available at:
http://www.theguardian.com/politics/2014/oct/29/harriet-harman-wears-
feminism-t-shirt-to-pmqs (Accessed: 5 May 2015).

The Stanford Encyclopaedia of Philosophy (2008) *Causation and
Manipulability.* Available at: http://plato.stanford.edu/entries/causation-
mani/#Interventions (Accessed: 23 January 2014).

*The T/Shirt Issue.* (2015) Available at: http://the-t-shirt-
issue.com/home.1.0.html (Accessed: 5 May 2015).

Thiele, M. and Marsden, S. (2003) *Engaging Art: The Artful Dodgers
Studio.* Richmond Victoria: Jesuit Social Services.

Tilbury, N. (2009) *Digital Skins - Body Atmospheres.* Available at:
http://vimeo.com/9962212 (Accessed: 6 August 2014).

Tilbury, N. (2011) *Digital Catwalk - MA Fashion, Kingston University 2011.* Available at: http://vimeo.com/29404174 (Accessed: 10 November 2014).

Tillotson, J. (1997) *Interactive Olfactory Surfaces: The Wellness Collection - A Science Fashion Story.* PhD thesis. Royal College of Art.

Tillotson, J. (2011) *Scentsory Design*®*.* Available at: https://www.youtube.com/watch?v=G9nLCPEGzRw (Accessed: 22 January 2015).

Tillotson, J. (2013) *Sensory Fashion - eScent Animation.* Available at: http://vimeo.com/78410173 (Accessed: 7 August 2014).

Tillotson, J. (2013) 'The Oneiric Reality of Electronic Scents', *Futurescan 2: Collective voices.* Sheffield Hallam University, 10-11 January 2013. Association of Fashion and Textiles Courses, pp. 74-89.

Tracy, S. (2013) *Qualitative Research Methods Collecting Evidence, Crafting Analysis, Communicating Impact.* Oxford: Blackwell.

Twigg, J. (2010) 'Clothing and dementia: A neglected dimension?', *Journal of Aging Studies,* 24 pp. 223-230.

UAL: London College of Fashion (2014) *Orchid Charity T-Shirt Project.* Available at: http://www.arts.ac.uk/fashion/about/better-lives/orchid-charity-t-shirt-project/ (Accessed: 5 May 2015).

UK Synaesthesia Association (2014) *What is synaesthesia?* Available at: http://www.uksynaesthesia.com/whatis.html (Accessed: 6 July 2015).

University of Cambridge (2015) *Ethnographic and Field Study Techniques.* Available at: https://camtools.cam.ac.uk/wiki/site/e30faf26-bc0c-4533-acbc-cff4f9234e1b/ethnographic%20and%20field%20study.html (Accessed: 22 January 2015).

Vogelpoel, N. and Gattenhoff, S. (2012) 'Arts-Health intersections: A model of practice for consistency in the arts-health sector', *Journal of Applied Arts & Health,* 3 (3), pp. 259-274.

Volsing, C. (2014a) 'Rise and rise of the humble t-shirt', *V&A Magazine,* (Summer), pp. 15.

Volsing, C. (2014b) *T-Shirts 101.* Available at:
http://www.vam.ac.uk/blog/network/t-shirts-101-part-1 (Accessed: 1 May 2015).

Wagner, P. (2013) *New materiologists.* Available at:
http://philippawagner.co.uk/blog/tags/materiologists/ (Accessed: 20 January 2015).

Wainwright, M. (1992) An Introduction to Fungal Biotechnology. Chichester: John Wiley & Sons Ltd.

Wallace, J., McCarthy, J., Wright, P. C. and Olivier, P. (2013) *Making Design Probes Work.* SIGCHI Conference on Human Factors in Computing Systems. New York: ACM.

Watt, J. (2012) *Vogue on Elsa Schiaparelli.* London: Quadrille Publishing.

Web Center for Social Research Methods (2006) *Survey Research.* Available at: http://www.socialresearchmethods.net/kb/survey.php (Accessed: 20th January 2015).

Wegner, C. and Flandorfer, P. (2011) *Methodological triangulation is applicable to health and mortality research in demography: An illustrated example.* University of York. London: British Society for Population Studies.

Wired (2014) *These Guys Made a T-Shirt. Now Silicon Valley Is Giving Them Millions.* Available at: http://www.wired.com/2014/11/guys-made-t-shirt-now-silicon-valley-giving-millions-2/ (Accessed: 5 May 2015).

WWF (2011) *Ads for WWF's 50th Anniversary.* Available at: http://wwf.panda.org/who_we_are/history/50_years_of_achievements/50th_advertisements/ (Accessed: 5 May 2015).

WWF (2013) *The Impact of a Cotton T-Shirt.* Available at: http://worldwildlife.org/stories/the-impact-of-a-cotton-t-shirt (Accessed: 15 July 2014).

Yeasmin, S. and Rahman, K. F. (2012) 'Triangulation' Research Method as the Tool of Social Science Research', *BUP JOURNAL,* 1 (1), pp. 154-163.

# Glossary

**Affective neuroscience**    The study of how neurons behave in relation to emotions

**AHRC**    The Arts and Humanities Research Council

**Amadou**    A leather-type material, derived from the tree fungus *Fomes fomentarius*, produced by craftsmen in Hungary, Bohemia and Romania.

**Anne Wall Centre (AWC)**    (Currently TouchBase South East) A day service that works with deafblind adults of all ages and individuals who have sensory impairments with additional learning and other associated disabilities (Sense, 2015)

**Baby boomers**    A saturation of infants and children on the consumer landscape post World War II (O'Connor, 2010)

**Biofilm**    A thin layer of microorganisms adhering to the surface of a structure, which may be organic or inorganic, together with the polymers that they secrete.

**Catalytic converter**    A catalyst is a term used to describe something that makes a reaction proceed at a greater rate but isn't actually consumed during that reaction. A photocatalyst gains the energy it needs to be active from light. The two biggest sources of air borne pollutants are industry and motor vehicles. (Storey and Ryan, 2012)

**Closed questions**    Questions that structure the answers by allowing only answers that fit into categories that have been pre-selected by the researcher; generally used to produce quantitative data (Denscombe, 2003)

**Coding**    A stage of data analysis used by social researchers to quantify data that has been obtained in unstructured form, i.e. by grouping the data into categories and

| | assigning numbers to the different categories so that it could be analysed and interpreted (Bryman, 2012) |
|---|---|
| **Communication guide** | Communication guides, provide one-on-one care, support, and interpretation to the deafblind facility users during their daily activities. |
| **Critical design** | Design proposals that challenge narrow assumptions, preconceptions and givens about the role products play in everyday life (Dunne and Raby, 2015) |
| **Dazed & Confused** | An influential independent youth culture magazine, showcasing "agenda-setting editorial and pioneering fashion photography, [...] read in print and online by over 1.7m style leaders." (Dazed, 2015) |
| **Deafblind** | A person is deafblind if they have a combined sight and hearing impairment that causes difficulties with communication, access to information and mobility (NHS Choices, 2014). |
| **Design Futures** | A design department within Philips that explores how emerging 'societal signals' and technologies could potentially shape lives in future years (Philips, 2014) |
| **Energy & Co-Designing Communities (ECDC)** | A project by the Departments of Sociology & Design, Goldsmiths, University of London which has aimed to understand how new technologies can be designed to engage communities in reducing energy consumption |
| **Ethnography** | A predominantly qualitative research method developed originally by anthropologists studying the cultures of non-Western societies; Also used in other fields of social research, such as sociology, management and human computer interaction to study settings; Aimed at producing a detailed description of how a particular social group operates, based on observation of, and often participation in, the group; may be supplemented by interviews and gathering of documents and artefacts. |

(University of Cambridge, 2015)

**Ethnomycology**    A field of studies concerned with the cultural perceptions and uses of fungi by humankind

**Fashion futures**    'Fashion futures', 'textile futures', and 'material futures' are terms which are often used in the language of designers to describe collective thinking about future directions within their respective domains (Wagner, 2013; Quinn, 2012; Ravensbourne, 2013)

**Fawcett Society**    The UK's leading charity campaigning for women's rights and gender equality (The Fawcett Society, 2014)

**Fluxus**    An international avant-garde group or collective that was founded and flourished in the1960s but still continues today; [...] played an important part in the opening up of definitions of what art can be (Tate, 2015c)

**Focus group**    A qualitative research technique to uncover insights on consumer attitudes and behaviour, within a meeting of a small group of individuals who are guided through a discussion by a trained moderator, or a consultant (Marketing Research Association, 2015)

**Fungi**    A group of organisms including mushrooms, toadstools, moulds, yeasts and lichens

**Haute couture**    From French for "high dressmaking" and refers to clothes that are considered haute couture by French law, approved by the Chambre Syndicale de la Haute Couture and often require a thousand hours of work including elaborate embellishments and finishes (Vogue, 2014)

**Human-Computer Interaction (HCI)**    A discipline concerned with the design, evaluation and implementation of interactive computing systems for human use and with the study of major phenomena surrounding them. (HCI Bibliography, 2015)

| | |
|---|---|
| **Interdisciplinary** | Involving two or more academic, scientific, or artistic areas of knowledge: involving two or more disciplines (Miriam-Webster Dictionary, 2015) |
| **Interventionist approach** | An approach that explains causal relationships between research variables (The Stanford Encyclopedia of Philosophy, 2008) |
| **Likert scales** | The summated rating (or Likert) scale is a type of systematic scaling technique used for attitude measurement, originally devised by Likert in the 1930s and therefore commonly referred to as Likert scale (Robson, 1993) |
| **Living technologies** | The design and creation of biological components which are non-existent in nature, yet embody the essential properties of life, such as self-organization, adaptability, capacity to evolve and react to environmental stimuli, etc. (European Centre for Living Technology. 2015) |
| **Macro photography** | Close-up photography in which the image produced is as large, or larger, than the life size of the object |
| **Mycelium** | The fine filamentous body of most fungi, except for yeasts |
| **Mycology** | The science of fungi |
| **Nanotechnology** | A set of technological tools that rely on the ability to control matter precisely on length scales below 100nm (that is, below one ten thousandth of a millimetre). (London Centre for Nanotechnology, 2010) |
| **Narrative account** | A descriptive approach used to provide a detailed story of the events and interactions that have taken place (Robson, 1993) |
| **Open questions** | Questions that allow the respondent to decide the wording and length of the answer, and the kind of |

|  |  |
|---|---|
|  | matters to be raised in the answer (Denscombe, 2003) |
| **Participatory design** | A Scandinavian legacy of design and development process in which end-users are invited to participate and contribute, not simply critique and evaluate product and systems concepts. (Buur and Matthews, 2008; Sanders and Stappers, 2008) |
| **Pershing** | A US ballistic missile capable of carrying a nuclear or conventional warhead (The Collins English Dictionary, 2015) |
| **Photographic fictions** | A photographic representation of imagined past, present and future design concepts |
| **Probe** | *n*., from the Latin word *proba,* refers to a test, an examination, or a sample for testing (Oxford English Dictionary, 2014) |
| **Problem-solving design** | Design as means to resolve societal and environmental challenges (Interaction Design Association, 2012) |
| **Probology** | Gaver et al. (2004)  define probes as a methodology in its own right. |
| **Proto T-shirt** | A predecessor of the T-shirt with elbow-length sleeves and a placket with two buttons on the side of a collarette hemmed with binding (Harris, 1996) |
| **Provotype** | A term coined by Boer and Donovan (2012), which encompasses the idea of design probes; they are designed in such a way so to expose and embody tensions the surround a field of interest for various stakeholders |
| **Pure sciences** | Sciences that depend on deductions from demonstrated truths, such as mathematics or logic, and are studied without regard to practical applications (Flory, 2014) |

**Ready-to-wear**     Made for the general market and sold through shops rather than made to order for an individual customer (Oxford Dictionaries, 2015)

**Reductionism**     The idea of reducing complex interactions and entities to the sum of their constituent parts, in order to make them easier to study (Shuttleworth, 2008)

**Screen printing**     One of the earliest methods of printing; involves the passing of ink or any other printing medium through a mesh or 'screen' that has been stretched on a frame, and to which a stencil has been applied

**Second skin**     The idea of clothing as a 'second skin' to the human body often features in the language adopted to communicate innovative material concepts.  The usage of the term can be dated back to the 1960s when Hundertwasser – an artist, visionary and "responsible creator" (Restany, 2013) – theorised around the physical, psychological and social functions of 'the five skins of the human body'.

**Sense**     The UK charity for deafblind people

**Situationist International**     Revolutionary alliance of European avant-garde artists, writers and poets formed at a conference in Italy in 1957; Developed as a critique of capitalism based on a mixture of Marxism and surrealism; In the field of culture situationists wanted to break down the division between artists and consumers and make cultural production a part of everyday life (Tate, 2015a)

**SKIP**     A skills-development programme for researchers in design practice, coordinated between Royal College of Art, University of the Arts London and Kingston University London (SKIP, 2012).  SKIP offered PhD researchers training in specialist skills, as well as provision for a limited number of research placements within non-academic partnering institutions, as a format for skills development and knowledge exchange in

Design Research.

| | |
|---|---|
| **Smart materials** | Materials that have one or more properties that can be significantly changed in a controlled fashion by external stimuli, such as stress, temperature, moisture, or pH (National STEM Centre, 2010) |
| **Societal signals** | Relates to emerging behavioural changes in society (Lieshout, 2013) |
| **Speculative design** | A kind of design that is used to create not only things but ideas (Dunne and Raby, 2013) |
| **Surrealism** | A movement of writers and artists who experimented with ways of unleashing the subconscious imagination (Tate, 2015b) |
| **Survey** | Any measurement procedures that involve asking questions of respondents, e.g. questionnaires and interviews (Web Center for Social Research Methods, 2006) |
| **Synaesthesia** | Often described as a joining of the senses.  Sensations in one modality, e.g. hearing, produce sensations in another modality, e.g. colour, as well as its own. Synaesthetic experiences are driven by symbolic rather than sensory representations, such as letters, numbers and words. (UK Synaesthesia Association, 2014) |
| **Synthetic biology** | A biotechnological domain that merges biology and code to enable a bottom-up engineering of new biological systems |
| **Techtextil** | The International Fair for Innovative Textiles and Technologies hosted in Messe Frankfurt (Techtextil. 2014) |
| **Tee** | Another term used to describe the T-shirt that references the T-shaped silhouette of the garment |

**Transfer print**      Heat-transfer T-shirt printing technique using plastisol inks (Gordon and Hiller, 1988)

**Triangulation**      The use of *"multiple observers, methods, interpretive points of view, and levels and forms of empirical materials in the construction of interpretations"* (Denzin, 1989)

**Unstructured observation**      Unstructured observation, in contrast to structured observation, does not involve the design of observation schedules. These are a set of rules for the observation and recording of behaviour, used to ensure that each participant's behaviour is systematically recorded so that it is possible to aggregate the behaviour of all of those in the sample in respect of each type of behaviour being recorded (Bryman, 2012).

**World Wide Fund for Nature (WWF)**      An international non-governmental organization founded on April 29, 1961, working in the field of the biodiversity conservation, and the reduction of humanity's footprint on the environment.

# The T-Probe:

A fashion-led approach to advance understanding of novel and challenging material concepts and sensory experiences

Volume Two of Two. Appendices

Ninela IVANOVA

# List of Appendices

# 1.0 Appendix to Chapter 1.0 Background and Introduction

## 1.1 Fungi for fashion and textiles fabrication

This design-led materials investigation emerged from the author's personal interest in the development of novel bio-based materials for design applications, particularly fungi as potential media for clothing fabrication.

### Why fungi?

As a natural resource, fungi appear to be relatively untapped (Boddy, 2013; Kendall, 2013; Deshmukh and Rai, 2005; Boddy and Coleman, 2010; Cooke, 1977; Stamets, 2004). Their kingdom, comprising mushrooms, toadstools, bracket fungi, yeasts and lichens, is estimated to include 1.5 million species, of which less than 10 percent have been described.

Fungi are easy to grow in bioreactors, with biomass becoming available in days (Stamets and Chilton, 1983; Moss, 1987; Hamlyn, 1991). They have a novel cell wall chemistry based on chitin – the same material that forms the outer skin of crustaceans and has strong and resistant material properties. The body of most fungi, except for yeasts, has a fine filamentous structure, called mycelium, which has absorbent, binding, filtration, delivery and healing functions (Hamlyn, 1991; Hamlyn and Schmidt, 1994; Stamets, 2004).

From the above, the researcher considered how the properties of fungi can inform and be incorporated into materials design and fabrication.

## Beneficial properties and applications

Despite the fact that fungi have a reputation as agents of decay, disease and deterioration, their many useful applications have long been developed by biotechnology sectors. Examples include food and beverages production, medicine, agriculture, and perfumery (Moss, 1987; Wainwright, 1992).

Ethnomycology[134] has provided examples of various miscellaneous fungi applications, e.g. hats made from mushroom leather[135] and dried fruit bodies worn as scented body adornment by indigenous people, to enhance manhood and create a spiritual link with the Gods (McKenna, 1992; Spooner and Roberts, 2005; Dugan, 2011).

The biotechnological development of the beneficial properties of fungi into consumable products for the market has also inspired the pursuit of fungi as media for design production, e.g. packaging and insulation (Bayer and McIntyre, 2012), furniture and building blocks (*Phil Ross.* 2015) , product design (Montalti, 2014) (Figure A.1.1-1  overleaf), dyes and paper (Rice and Beebee, 2012; Ivanova, 2012) .

---

[134] A field of studies concerned with the cultural perceptions and uses of fungi by humankind (Boddy & Coleman, 2010; Dugan, 2011; Spooner & Roberts, 2005)

[135] Amadou leather, derived from the tree fungus *Fomes fomentarius,* produced by craftsmen in Hungary, Bohemia and Romania.
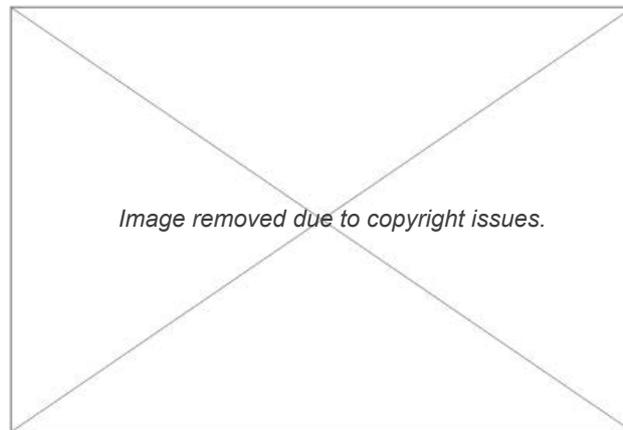
Figure A.1.1-1 *The Future of Plastic*: domestic objects (Montalti, 2014)

The review of science literature and existing design practice (Ivanova, 2013) above provided a starting point for the researcher's own design-led investigation in the use of fungi to fabricate materials that were closer to soft textile-like structures.  What ensued were questions such as:

*What natural properties of fungi can inform materials design, research, and development?*

*Which fungi would be best suited to create textile-like structures?*

*What kind of textile-like forms could be produced?*

*What techniques and technologies would be required for the potential fabrication of fungi-based materials and fabrics?*

## Design-led material experimentation with various fungal species

In attempting to identify which fungal species would be most suitable to produce textile-like structures, the researcher conducted unstructured interviews with:

a) Dr Bryn Dentinger, Dr Begona Aguirre-Hudson and Dr Heidi Doring at the *Royal Botanic Gardens Kew* (Ivanova, 2012);

b) Dr Paul F Hamlyn from the *British Textile Technology Group*, who had previously conducted research on the use of fungi for medical textiles (Hamlyn, 1991; Hamlyn and Schmidt, 1994; Ivanova, 2013);

c) Prof Lynne Boddy from *Cardiff University*, who studies the types of fungi which in nature form cords with strong tensile properties in search for their food sources (Figure A.1.1-2  below).



Figure A.1.1-2 Cord-forming fungi at the laboratory of Proff Lynne Boddy, Cardiff University. Images taken by the author with permission, 2013

From the above discussions, it appeared possible to imagine that depending on the morphology of the fungal mycelium and the processing of the raw material, one could produce a variety of textile-like structures, e.g. a mycelium cord, a felt-like fungal mat, a membrane or a lace-like structure.  These could be either conventionally fabricated by appropriating existing textile technologies, or grown as bio-films using biotechnological methods.

A series of experiments were conducted at *Cardiff University* and the *Royal Botanic Gardens Kew*, aimed at testing the potential of different fungal species to create textile-like structures on their own, and as composite materials with fabrics.

Figure A.1.1-3 below illustrates some of the early outcomes, which explored the behaviour and properties of various species in response to traditional textiles, e.g. linen, silk and netting.  It was observed that some fungi develop stronger, cord-like mycelium when grown on protein-based textile materials.



Figure A.1.1-3 Mycelial textile structures on netting. Images from the author's archive, 2013

The property of fungal mycelium to bind matter also informed another potential application, i.e. the use of fungi for recycling and potentially upcycling textile waste (Figure A.1.1-4 below).



Figure A.1.1-4 Fungal mats growing on denim fibre waste. Images from the author's archive, 2013

Another project conducted with Dr Simon Park from the *University of Surrey* further explored the potential of another type of fungi – cheese-moulds, e.g. *Penicillium roqueforti* and *Penicillium camemberti,* to grow into textile-like forms when cultured on milk, a process resembling cheese production (Park & Ivanova, 2013) (Figure A.1.1-5 below).



Figure A.1.1-5 *MycoCouture*: cultured form *P.roqueforti* and *P.camemberti* (Park & Ivanova, 2013). Image courtesy of Dr Simon Park, 2013

The resulting materials[136] had the appearance of suede and demonstrated both anti-bacterial and water-repelling properties (Figure A.1.1-6 below).



Figure A.1.1-6 Close up of the *MycoCouture* surface showing its hydrophobic properties (Park & Ivanova, 2013). Image courtesy of Dr Simon Park, 2013

---

[136] Essentially a living fungal biofilm.

## 2.0 Appendix to Chapter 2.0 Probes in research and design practice

## 2.1 Dr Melanie Flory[137] on Scientific Probes

03-12-2014, transcription of recorded response

*1. What is a probe?*

In science, we use… in research design in science, in general, we use probes for very specific reasons. There are various scientific principles in which probes are introduced into a research population, because there are huge ethical considerations when you introduce probe, probes, in an experiment. They are mainly used for these reasons:

They are used as an intervention, to create specific outcomes, or to evaluate possible outcomes that are hypothesised.

They are used as interference to create new outcomes deliberately. This is why ethics, it's really important.

Another reason why probes are used is that scientists are looking for measurements, measurements against which they can then use to either invent, innovate, or create new bodies of theory, that then become the basis, the platform for new methodologies, whether that is a new

---

[137] Dr Melanie Flory is neuroscientist. Her fascination with the brain capacity to continuously change and evolve, led her to enquire specific aspects of brain plasticity within the field of neurocognitive science. Based on the results of her research, Dr Flory has established a clinical career, personal enterprise, corporate consultancy, and teaching programme for groups and individuals, to enable human beings to actively create and consciously design the life they really desire, on a personal, professional and global level.

methodology in treatment methodologies, clinical methodologies or medical methodologies.

Probes are very useful in looking at a "typical", population statistic, and extrapolating from that a generalised concept, or extrapolating from that statistic, generalised concepts, generalised behavioural patterns, or generalised predictions.   The more indicative the probed research [...], or the more well-chosen the research population is, in terms of mirroring, or the more indicative the research participants are of the "typical" research group you are aiming at, the more specific your conclusions can be.  This is very important in medicine and in clinical applications because ethics is of the main essence in doing it.

I would understand that in the fashion industry it is slightly different. It's exciting to use probes because you are not using it more as an intervention but it's the researcher using it as a personal intervention to gain public perception. So it's used from a very, well, from a different perspective.

However, it is exciting for me as a scientist to possibly look into the future in which design probes are thought out so well so as the probe itself becomes an intervention, to shift tastes, or to shift thoughts, about what design means on a personal and group bases. So it's a very exciting time for design, for art and design I guess, using probes."

## 2.2    Design probes: Interview / e-mail questionnaire

The questions below were sent out as a part of an e-mail requesting a brief interview on the value of using design probes as part of research and / or design practice:

1. *How do you use design probes in your practice? Why do you use them?*
2. *What are the benefits of this approach compared to other approaches?*
3. *Are there any disadvantages to the probes?*
4. *How do you design the probes?*
5. *How do you record feedback from the probes? Does that feedback satisfy what you were hoping to achieve with the probes?*
6. *How do you use the insights from the probes? How do they inform project outcomes?*

This questionnaire was aimed at complementing the existing literature on Design Probes, given the recency of the approach.  For this reason, it was distributed to some of the designers and researchers who have already explored the potential of this approach in both research and design practice.

The questions were included in the e-mail, to provide an option to the interviewees to respond in writing in the case their time was very limited for a one-to-one interview.

Below is a list of the selected interviewees:

Prof Anthony Dunne – Head of the Design Interactions programme at the Royal College of Art, London; Involved in the inception of the *Cultural Probes* packages (Gaver, Dunne and Pacenti, 1999); Also refer back to Chapter 2.2.2 'Speculating design futures' (p. 27);

Tobie Kerridge – Research Fellow at the Interaction Design Studio, Goldsmiths University of London (Goldsmiths, 2015); His PhD thesis explores the mixing of speculative design and public engagement with science and technology;

Prof Lorraine Gamman – Professor of Product and Spatial Design at Central Saint Martins College of Art & Design, University of the Arts London; Founder of the *Design Against Crime* Research initiative (*Design Against Crime.* 2015), using design to address social issues linked to products, public spaces and/or public services;

Nancy Tilbury – Fashion designer creating design experiences in the field of intimate body technologies, Co-founder of *Studio XO* (2015); Refer back to Chapter 2.2.3 'Conceptual materials design' (p. 32);

Jen Ballie (PhD) – Designer / Researcher with research interests focused on design activism, social innovation and focus on the ever changing role of the design practitioner (*Jen Ballie.* 2015);

Jen Ballie has further recommended forwarding the questionnaire to Dr Lilia Gomez Flores – Research Assistant at the University of Dundee, who has accumulated experience in working with design probes.

*Below are the responses that were received to the above questionnaire:*

## 2.2.1 Tobie Kerridge on design probes

(17-12-2014 via e-mail)

*1. How do you use design probes in your practice? Why do you use them?*

They support design process and also establish a relationship with respondents. With the ECDC project they helped set the tone of the project, with the practitioners we were working with and other researcher groups.

*2. What are the benefits of this approach compared to other approaches?*

Probes support inventive work, they lead to design workbooks so they help with conceptualising design proposals in relation to empirically derived data. They also generate lots of ancillary activities, and these cascades are usually aligned to designerly concerns.

*3. Are there any disadvantages to the probes?*

Probes are hard work, they are intensive and they can be misunderstood.

*4. How do you design the probes?*

Iteratively and through group work, moving from specific issues or objects, through selecting and grouping, exploring materials and construction, on to final stages of making and packaging

*5. How do you record feedback from the probes? Does that feedback satisfy what you were hoping to achieve with the probes?*

Feedback is treated in ways that aren't really rigorous, though this varies. I would say that with ECDC the returns were less important than the process of making, placing, discussing and supporting the probes.

*6. How do you use the insights from the probes? How do they inform project outcomes?*

They make others present in the studio. When returns are put on the wall we are thinking about the experiences that came about through doing probes and reminded of the people we are working with.

## 2.2.2  Jen Ballie on design probes

(21-01-2015 via e-mail)

I mainly used design interventions as a method and I think the components that made up each intervention could be referred to as probes.

*1. How do you use design probes in your practice? Why do you use them?*

I found taking a prototype or tangible thing to a meeting, or embedding them within workshops produced a better response. The tactile nature of these artefacts has more of an impact on the end user / participant.

*2. What are the benefits of this approach compared to other approaches?*

I used them as a tool to imagine alternative fast fashion futures, people often accept the status quo as it is difficult to imagine an alternative. If found that these tools even in a lo-fi form helped facilitate more meaningful conversations.

*3. Are there any disadvantages to the probes?*

The disadvantage, or difficulty if you like is that out width a facilitated environment like a workshop, the response rate is low. Jayne Wallace did a talk during our Masters and advised that if the design and development of each probe is undertaken with special care and attention to detail helps people pay greater attention and complete them. So, features like labelling,

instructions and even the aesthetic qualities can really make a difference and aid usability.

*4. How do you design the probes?*

Each probe is very different. I would begin using very lo-fi materials, possibly starting with a doodle or sketch. The next stage might be a simple and lo-fi prototype... a very simple mock up using card or canvas and limited colour. I would take this as a talking point or prop to facilitate a conversation with a colleague / peer and capture feedback. Following on from feedback, I would further iterate and refine the probe. So, I might test it myself for a few days or walk through the workshop scenario to identify glitches, difficulties, challenges with the purpose of refining usability. Often, technology would be embedded and this would require additional testing.

*5. How do you record feedback from the probes? Does that feedback satisfy what you were hoping to achieve with the probes?*

I found if people left a workshop they would find it difficult to come back for part two, if they took something home they were not all likely to complete it for example a diary each day. They might be more inclined to use social media as they might have twitter, instagram or Facebook, blogging tools on their phone. I used social media to enable people to connect with one another post workshop. I always captured feedback via postcards or post-its which was anonymous and then closed each session with an open conversation. Auto-documentation is a method to enable them to document a session themselves via note taking or photography. I would like to use sketch-notes in the future and even find funding to have a live sketch note scribe on hand to document feedback visually.

*6. How do you use the insights from the probes? How do they inform project outcomes?*

The insights are hard but after transcribing trends and patterns emerged not just with the one probe but across each design intervention. I designed a generic template for recording each intervention and each interaction. I think that would be helpful to cross analyse data.

## 2.2.3  Lilia Gomez Flores on design Probes

(21-01-2015 via e-mail)

Jen asked me to have a look at your questions because I worked with probes for my last research project (http://www.imprintsfutures.org/)

*1. How do you use design probes in your practice? Why do you use them?*

We used them as one of the research methods to gather information on the way people manage their identities on a daily basis. Our sample was professional Scottish women.

We used them because based on their responses we developed a series of prototypes for Identity Management.

*2. What are the benefits of this approach compared to other approaches?*

You get a non-invasive, real view on how people behave, in this case related to Identity Management.

*3. Are there any disadvantages to the probes?*

Yes, the response rate tends to be very low; you have to chase people in a very nice, polite way to try to get as many probes as you can back.

*4. How do you design the probes?*

We designed them to be playful experiences that wouldn't be very time consuming and that were aligned to our research objectives.

*5. How do you record feedback from the probes? Does that feedback satisfy what you were hoping to achieve with the probes?*

We sent prepaid envelopes with the probes to make it easy for people to send them back, in general terms yes, we achieved what we were looking for.

*6. How do you use the insights from the probes? How do they inform project outcomes?*

Once we had all the probes back (40 out of 100 we sent out), we came together as a research team and did an analysis of the responses we got and all the information we already had based on the other research methods we were using (focus groups, interviews, videogames, etc.), we compared and crossed all the results we had to make sure they were coherent and then we designed prototypes for the future of Identity Management.

# 5.0 Appendix to Chapter 5.0 Research Project (I): *Fungi materials for clothing*

## 5.1 Workshop materials: Research Project (I)

### 5.1.1 Information Sheet

## MOULD PERCEPTIONS

Information Sheet

| | |
|---|---|
| Contact: | Ninela Ivanova, PhD student Art & Design |
| | e-mail: K1020964@kingston.ac.uk; M: 07983 140 401 |
| Study location: | FADA, Kingston University, Knights Park Campus, Grange Road, Kingston upon Thames, KT1 2QJ |
| Study Title: | Mould Perceptions (The study examines people's perceptions of mould as a potential fashion material.) |

1. Invitation

You are invited to participate in a series of events that aim to explore people's perceptions of mould as a potential fashion material. These include workshops, exhibition and an online platform.

The study is being conducted as part of a research project by Ninela Ivanova – a PhD Art & Design student working on a cross disciplinary project between design, science and psychology.

Before you decide whether you are willing to take part in this study or not, you need to understand why the study is being done and what it will involve.

## 2. What is the purpose of this study?

The *Mould Perceptions* study is a series of events that explore people's perception of mould, what kind of preconditions and stimuli it is influenced by, and if they can be altered through design.

The 1st workshop on *Mould Perceptions* takes place at Knights Park Campus, Kingston University London. It targets 12 undergraduate students, 6 students in Art & Design and 6 Science students.

This workshop aims to establish an online platform and an ongoing discussion around the mould perception. The 12 students attending the 1st workshop are invited to become ambassadors to the hidden beauty in it. At this stage, entrants engage in a bespoke *Mould-Your-Tee* exercise, where they select the mould image, colours, and design of a T-shirt. The T-shirts are awarded to the participants who agree to wear them and report back human reactions, remarks, questions, to upload photos on the online platform and invite other people to share the same experience for a period of 6 months.

## 3. Are there any risks involved?

All the workshops will be conducted in accordance with the University's health & safety guidelines: http://www.kingston.ac.uk/aboutkingstonuniversity/howtheuniversityworks/policiesandregulations/documents/health_safety_statement.pdf You should inform us if you suffer from pollen allergies, hay fever, asthma, or a known mould allergy.

## 4. Why have I been invited?

You have been invited because you are an undergraduate student in Art & Design, or Science. Genuine interest in participation is essential to the study.

## 5. Participation in the study

If you do decide to take part you will be given this information sheet to keep and be asked to sign a consent form. You will also receive a copy of the signed consent form to keep. This consent will not expire. Either you or the workshop team may terminate your participation in the study under any unanticipated circumstances, but the results obtained by that point will be still used for research purposes.

## 6. What does the study involve?

If you agree to take part in the study you will be participating for a total duration of up to 9 months.

Over this period, you will be asked to participate in 2 workshops, and an online platform, as described above. The results of the workshop may be exhibited and you may be required to have your picture taken with your bespoke Tee.
*Even though you will participate in the creation of the Tee shirt, the design rights will remain property of Kingston University, as the study is part of a University funded research project.*

## 5.1.2 Informed Consent form

# MOULD PERCEPTIONS

Informed Consent Form

| | |
|---|---|
| Contact: | Ninela Ivanova, PhD student Art & Design, |
| | e-mail: K1020964@kingston.ac.uk; M: 07983 140 401 |
| Study location: | FADA, Kingston University, Knights Park Campus, Grange Road, Kingston upon Thames, KT1 2QJ |
| Study Title: | Mould Perceptions (The study is a series of events that test people's perception of mould, what kind of preconditions and stimuli it is influenced by, and if they can be altered through design.) |

Subject Number (please copy from your questionnaire):  **H_**

Please tick the boxes if you agree with these statements and sign the form on the next page:

I, _____          Yes       No
(participant's name) have read and understand the
information sheet for subjects taking part in the study
designed to explore a relationship between humans and
mould.

I have had enough time to talk with the study team about          Yes       No
the nature and purpose of the study and what I will be
expected to do.

I know who to contact if I have any questions about the          Yes       No
study.

I understand that taking part in this study is voluntary (my          Yes       No
choice) and I may withdraw from the study at any time,

without giving any reasons, and this will in no way affect my
legal rights. The data collected from my participation may
still be used for research purposes.

I understand that if having been awarded a bespoke mould-    Yes     No
printed Tee, I agree to engage further in the study,
including participation in the online platform.

I understand that my participation further in this project is     Yes     No
not strictly confidential, as it involves participation in an
online platform and exhibition and publication of the results
from the workshop as part of the study itself.

*Statement of Participant*

I hereby consent to take part in this study.

I understand that I will receive a signed copy of this consent form for my
records.

Name:                                    KU Number:

Date:                                    Signature:

*Statement of Consenter (Investigator/designee)*

I have discussed this study with the above named participant.

The participant appeared to fully understand the information provided

about the study.

Name:

Date:                                    Signature:

## 5.1.3  Workshop questionnaire

# MOULD PERCEPTIONS

## Workshop 1

*Questionnaire*

$$H\_(x)$$
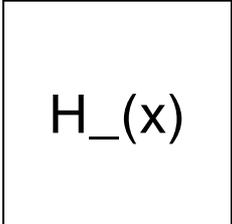
## Task 1

*Please fill in your personal details:*

Faculty:

Studies:

Age:                                Gender:        F                M

## Task 2

*Please carefully examine the boxes in front of you.*

Q1. What can you see inside?

- o Colours (please specify)

  _____

- o Texture (please specify)

  _____

- o Smell (please specify)

  _____

- o Other (please specify)

  _____

Q2. Please indicate where on the scale you mostly agree in regards with the way you feel about the content of the boxes:

Dislike     1        2        3        4        5        6        7        Like

## Task 3

*Please have a look at the images you are shown on the screen.*

Q3. Please indicate where on the scale you mostly agree in regards with the way you feel about them:

| Image 1 | Dislike | 1 | 2 | 3 | 4 | 5 | 6 | 7 | Like |
|---------|---------|---|---|---|---|---|---|---|------|
| Image 2 | Dislike | 1 | 2 | 3 | 4 | 5 | 6 | 7 | Like |
| Image 3 | Dislike | 1 | 2 | 3 | 4 | 5 | 6 | 7 | Like |
| Image 4 | Dislike | 1 | 2 | 3 | 4 | 5 | 6 | 7 | Like |
| Image 5 | Dislike | 1 | 2 | 3 | 4 | 5 | 6 | 7 | Like |
| Image 6 | Dislike | 1 | 2 | 3 | 4 | 5 | 6 | 7 | Like |

Q4. How would you describe the images in one word?

_____

## Task 4

Q5. Please indicate where on the scale you mostly agree in regards with the way you feel about the following images:

| Image 7 | Dislike | 1 | 2 | 3 | 4 | 5 | 6 | 7 | Like |
|---------|---------|---|---|---|---|---|---|---|------|
| Image 8 | Dislike | 1 | 2 | 3 | 4 | 5 | 6 | 7 | Like |
| Image 9 | Dislike | 1 | 2 | 3 | 4 | 5 | 6 | 7 | Like |
| Image 10 | Dislike | 1 | 2 | 3 | 4 | 5 | 6 | 7 | Like |
| Image 11 | Dislike | 1 | 2 | 3 | 4 | 5 | 6 | 7 | Like |
| Image 12 | Dislike | 1 | 2 | 3 | 4 | 5 | 6 | 7 | Like |

Q6. How would you describe the images in one word? _____

Q7. Would you wear a personally designed T-shirt printed with any of the images above?

- ○ Yes
- ○ No (please specify why)

_____

## Task 5

Q8. Would you like to participate further in the project?

- ○ Yes
- ○ No


If "No", the data collected from you will only be used for research purposes and in reference with your allocated H_(x) number.

If "Yes", please leave your contact details:

Name:

e-mail:

Facebook:

Contact number:

I have read and signed the Informed Consent Form.         ☐

T-shirt Size:        XS        S        M        L        XL        2XL


Date:                                Signature:

## 5.1.4  Picture gallery
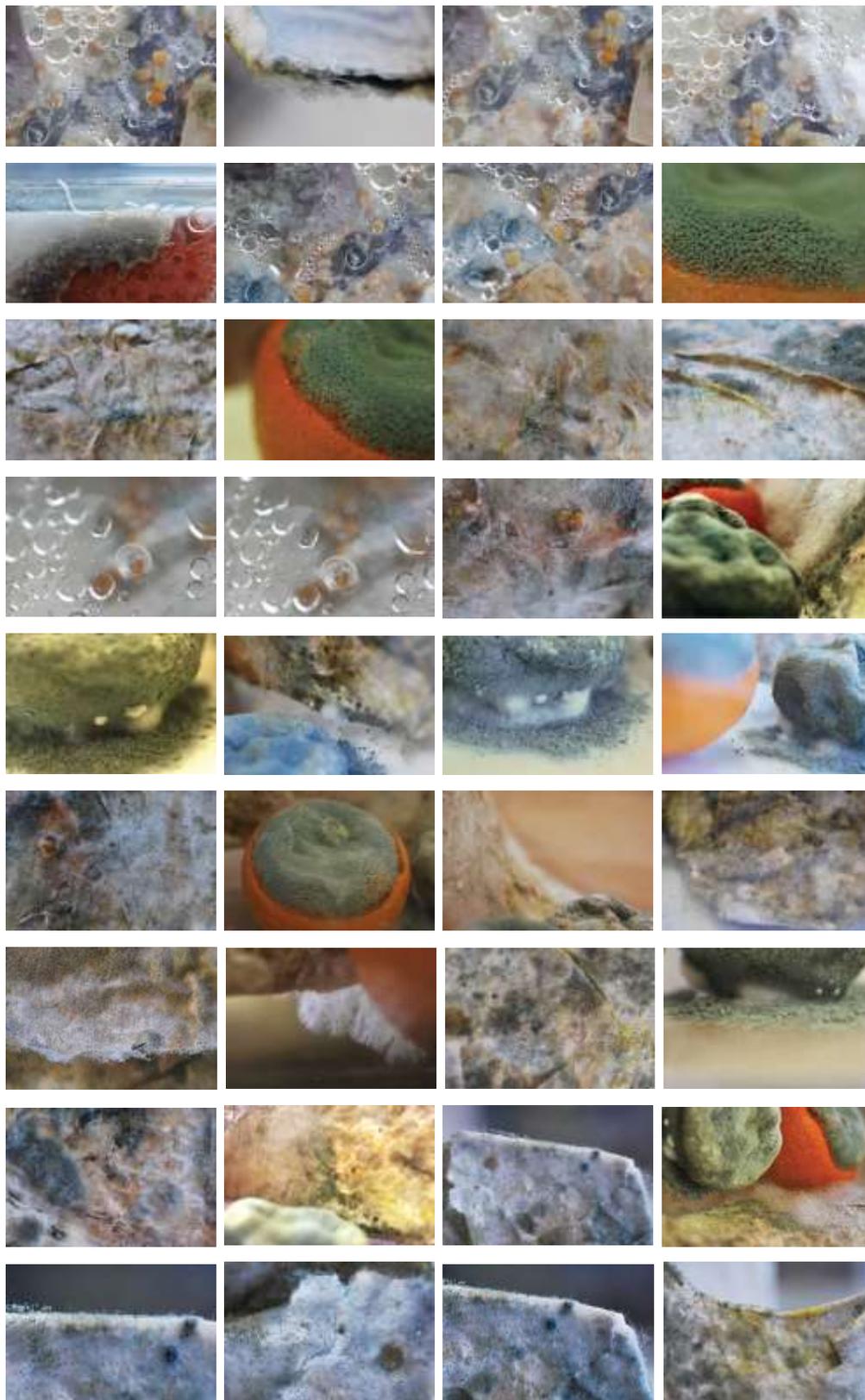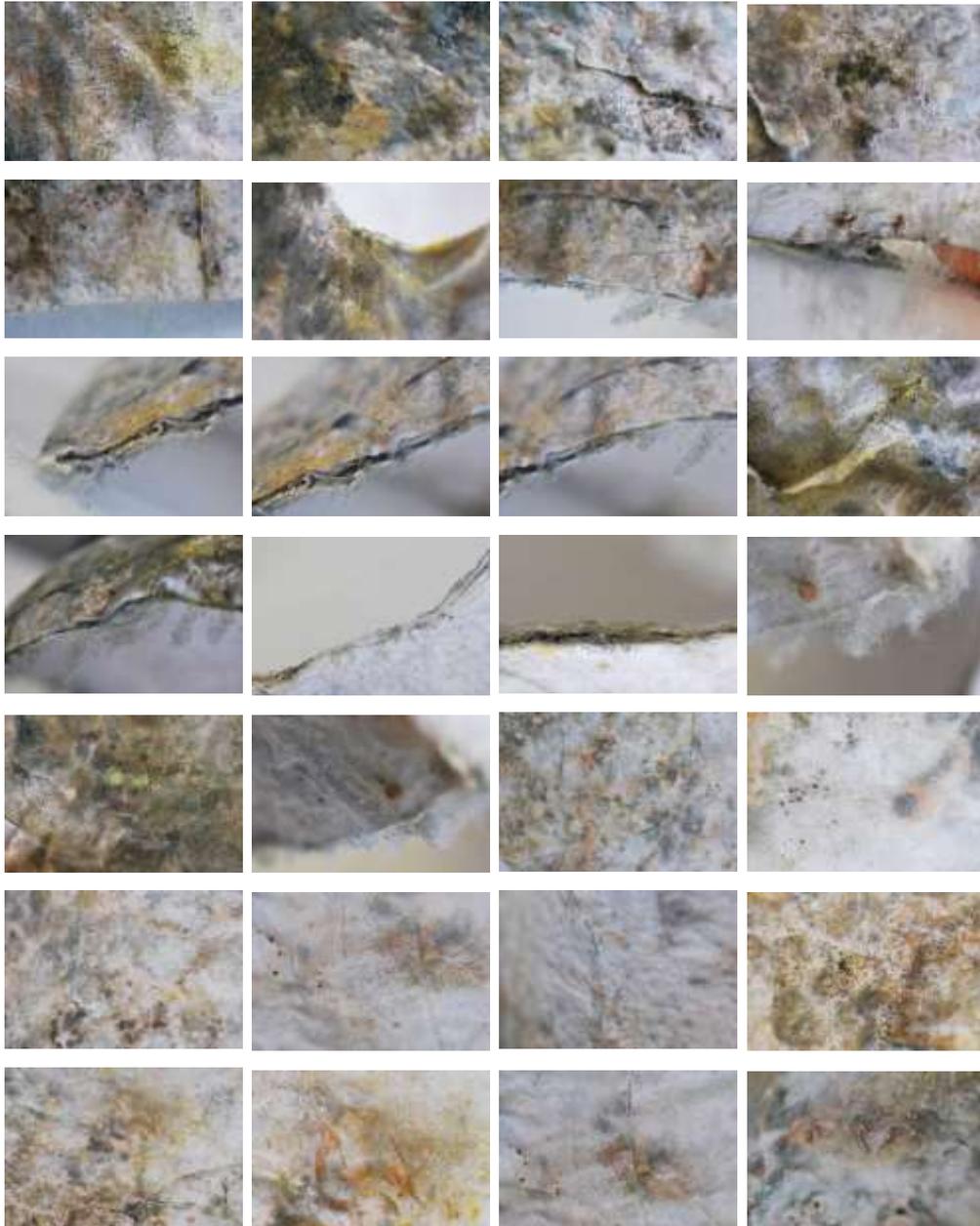
## 5.1.5  Post-workshop participation: Feedback questionnaire

Table A.5.1-1 Research Project (I): Post-workshop participation, feedback questionnaire

| **Q1. Are you happy with your T-shirt design?** | | | | |
|---|---|---|---|---|
| Very satisfied | Satisfied | Neither Satisfied nor Dissatisfied | Dissatisfied | Very dissatisfied |

| **Q2. How often have you worn your T-shirt?** | | | |
|---|---|---|---|
| Often | Sometimes | Seldom | Never |

| **Q3. Where have you worn your T-shirt?** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| At home | At work | In the college / university | In cafes | In pubs | In bars | At parties | On holiday | Other (please specify) |
| | | | | | | | | |

| **Q4. Have people reacted to your T-shirt?** | | |
|---|---|---|
| Yes | No | Don't know |

| **Q5. Has your T-shirt engaged people in a conversation about fungi?** | | |
|---|---|---|
| Yes | No | Don't know |

| **Q6. What comments have been made about your tee?** |
|---|
| |

## 5.2    Participant data: Research Project (I)

Table A.5.2-1 Research Project (I): Participant data (age, gender, studies)

| Research participant | Faculty | Studies | Age | Gender |
|---|---|---|---|---|
| H_1 | Life Science | Pharmacology | 20 | M |
| H_2 | Life Science | Pharmacology | 21 | F |
| H_3 | Art, Design & Architecture | BA Fine Art | 21 | F |
| H_4 | Art, Design & Architecture | BA Graphic Design | 19 | F |
| H_5 | Art, Design & Architecture | MA Product and Space | 24 | M |
| H_6 | Art, Design & Architecture | Fine Art Foundation | 18 | F |
| H_7 | Art, Design & Architecture | MA Fashion | 30 | F |
| H_8 | Art, Design & Architecture | PhD Design | 23 | M |
| H_9 | Art, Design & Architecture | MA Fashion | 24 | F |
| H_10 | Art, Design & Architecture | MA Fashion | 25 | M |
| Average age: | | | | **22.5** |
| Science : Art / Design students: | | | | **2:8** |
| Female : Male participants: | | | | **4:6** |

# 5.3   Data Sets: Research Project (I)

Table A.5.3-1 below summarises the data sets collected via the methodology and methods used for Project (I).

Table A.5.3-1 Research Projects (I): Data Sets

| Research Stage | Data Set | Method | | |
|---|---|---|---|---|
| Stage One: *Participatory workshop* | **Data Set One:** participant response to living fungi, i.e. seven jars of mouldy fruit | Questionnaire | Quantitative | 7-point Like / Dislike Likert scale |
| | | | Qualitative | Open-ended question |
| | | Observation | Qualitative | Photographic evidence |
| | **Data Set Two:** participant response to six images of food and plant moulding matter as photographed with a standard optical lens | Questionnaire | Quantitative | 7-point Like / Dislike Likert scale |
| | | | Qualitative | Open-ended question |
| | **Data Set Three:** participant response to six images of rotting matter but this time as viewed through a macro lens of the camera | Questionnaire | Quantitative | 7-point Like / Dislike Likert scale |
| | | | Qualitative | Open-ended question |
| | **Data Set Four:** T-shirt design sheets | T-shirt design | Visual analysis | Design sheets |
| Stage Two: *Post-workshop participation* | **Data Set Five:** public response to the T-shirts | Questionnaire | Quantitative | Multiple-choice questions |
| | | | Qualitative | Open-ended questions |

## 5.3.1  Data Set One: Participant response to jars of mouldy fruit

a)      Participant response to the jars of mouldy fruit: Questionnaire (quantitative data)

Table A.5.3-2 Research Project (I): Likert scale response to jars of mouldy fruit

| Q2. Please indicate where on the scale you mostly agree in regards with the way you feel about the content of the boxes: | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Dislike | 1 | 2 | 3 | 4 | 5 | 6 | 7 | Like | **Average** |
| | 0 | 2 | 2 | 1 | 1 | 1 | 3 | | **4.6** |

b)      Participant response to jars of mouldy fruit: Questionnaire (qualitative data)

Copy of Table 5.3-2 Research Project (I): Colour-coding of participant response to the jars of mouldy fruit (p.123)

| *Theme* | *Colour-Coding* |
|---|---|
| Affinity / Aversion response | |
| Sensory qualities | |
| Cognitive associations | |
| Other / descriptive | |

Table A.5.3-3 Research Project (I): Participant response to the jars of mouldy fruit (qualitative)

| Participant | Task 1 Please carefully examine the boxes in front of you. Q1. What can you see inside? | | | |
| --- | --- | --- | --- | --- |
| | Colours | Texture | Smell | Other |
| H_1 | creamy browns, whites and pinks, plus the reds of fruits | hairs, spores and creases | alcohol, sweet | - |
| H_2 | many, grey, dark, red | soft | sour, sweet | liquid |
| H_3 | warm colours, reds, oranges, yellows with spots of white or green | liquid, fluffy areas, dry dehydrated areas along with smooth rounded surfaces | sweet, vinegary, alcohol | remind of swamps |
| H_4 | red, green, yellow, grey | fluffy | stinky like a mould, fish, tomatoes, strawberries | - |
| H_5 | red, white contrast, red, brown, orange, pink, white brown | smooth surface with reliefs | sweet poison, shots of alcohol / apple | - |
| H_6 | the almost pink of the tomatoes, the white mould on the faded colour of the pear | the smell white blobs on the surface of the strawberries - the bubbles going up around the tomatoes from the water | zesty, slightly off but most not offensive | pushed up strawberries against the glass, the blobs |
| H_7 | pink, dark brown, ocre, green, blue, orange, yellow, red, grey | spongy, fluffy, soft, wet, powdery | unpleasant - very familiar from home | |
| H_8 | reds, dark green, mostly warm colours - brown, yellow and white | a furry or hairy texture in part | alcohol, fermentation, mouldy bread, fishy | landscapes, new patterns & lovely colours |
| H_9 | brown, red, green, yellow - earthy colours | fury, liquid, spongy - interesting mix | little bit of sweet smell - not unpleasant | familiar content, but at the same time not because of the different environment |
| H_10 | mint green | hairy | remind of hospital | Uneven |

c)     Participant response to jars of mouldy fruit: Participant observation via photographic evidence

*All images in this section were taken on 17th April 2012 at Kingston University London, and are courtesy of Ezzidin Alwan from the Web & Multimedia department at the University.*



Image 1: Neutral– reflecting, assessing, noting, evaluating

Image 2: Neutral / Engaged – participant taking picture of the stimuli



Image 3: Neutral / Engaged – participants exploring stimuli

Image 4: Neutral / Engaged – participant looking at stimuli



Image 5: Neutral / Engaged – participant assessing the stimuli

Image 6: Affinity – touching, smelling



Image 7: Affinity - smelling

Image 8: Neutral / Engaged – participant taking lid of jars of mouldy fruit



Image 9: Affinity - smelling

Image 10: Neutral / Engaged - Participant assessing the smell of mouldy fruit and one participant observing



Image 11: Affinity - smelling

Image 12: Aversion – participant expressing a dislike to the smell



Image 13: Affinity – touching, smelling

Image 14: Affinity - touching



Image 15: Affinity – touching and inviting others to smell

Image 16: Neutral / Engaged – participant looking at stimuli

## 5.3.2  Data Set Two: Participant response to mould visual stimuli (Group 1: Images 1-6)

### a)     Participant response to mould visuals (Images 1-6): Questionnaire (quantitative data)

Table A.5.3-4 Research Project (I): Likert scale response count to mould visuals (Images 1-6)

| Q3. Please indicate where on the scale you mostly agree in regards with the way you feel about the following images: | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Dislike | 1 | 2 | 3 | 4 | 5 | 6 | 7     Like | Average |
| Image 1 | 0 | 2 | 2 | 2 | 1 | 2 | 1 | **4.2** |
| Image 2 | 0 | 1 | 2 | 2 | 1 | 1 | 3 | **4.8** |
| Image 3 | 0 | 1 | 0 | 1 | 2 | 4 | 2 | **2.6** |
| Image 4 | 0 | 1 | 0 | 0 | 2 | 3 | 4 | **5.8** |
| Image 5 | 4 | 4 | 1 | 1 | 0 | 0 | 0 | **1.9** |
| Image 6 | 2 | 5 | 2 | 1 | 0 | 0 | 0 | **2.2** |

## b)     Participant response to mould visuals (Images 1-6): Questionnaire (qualitative data)

Copy of Table 5.3-6 Research Project (I): Colour-coding of participant response to mould visuals (p.135)

| Theme | Colour-Coding |
|---|---|
| Affinity | 🟦 |
| Aversion | 🟨 |
| Neutral, i.e. descriptive | ⬜ |

Table A.5.3-5 Research Project (I): Participant response to mould visuals (Images 1-6)

| Participant | Q4. How would you describe images 1-6 in one word? |
|---|---|
| H_1 | I find them interesting and like the colours and textures but dislike the ones which appear as though they are on food. |
| H_2 | playful |
| H_3 | intriguing |
| H_4 | abstract (most of them) |
| H_5 | contrast |
| H_6 | remind me of the moldy injures |
| H_7 | controversial |
| H_8 | engaging |
| H_9 | textured |
| H_10 | unhygienic |

### 5.3.3 Data Set Three: Participant response to mould visual stimuli (Group 2: Images 7-12)

**a)** Participant response to mould visuals (Images 7-12): Questionnaire (quantitative data)

Table A.5.3-6 Research Project (I): Likert scale response count to mould visuals (Images 7-12)

| Q5. Please indicate where on the scale you mostly agree in regards with the way you feel about the following images: | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Dislike | 1 | 2 | 3 | 4 | 5 | 6 | 7 | Like | Average |
| Image 7 | 0 | 0 | 0 | 1 | 3 | 5 | 1 | | **5.6** |
| Image 8 | 0 | 2 | 0 | 3 | 1 | 3 | 1 | | **4.6** |
| Image 9 | 0 | 2 | 0 | 1 | 2 | 2 | 3 | | **5.1** |
| Image 10 | 0 | 0 | 1 | 1 | 2 | 4 | 2 | | **5.5** |
| Image 11 | 0 | 1 | 0 | 2 | 2 | 1 | 4 | | **5.4** |
| Image 12 | 0 | 2 | 0 | 0 | 1 | 2 | 5 | | **5.6** |

**b)** Participant response to mould visuals (Images 7-12): Questionnaire (qualitative data)

Copy of Table 5.3-6 Research Project (I): Colour-coding of participant response to mould visuals (p.135)

| *Theme* | *Colour-Coding* |
|---|---|
| Affinity | |
| Aversion | |
| Neutral, i.e. descriptive | |

Table A.5.3-7 Research Project (I): Participant response to mould visuals (Images 7-12)

| Participant | Q6. How would you describe images 7-12 in one word? |
|:---:|:---:|
| H_1 | This images had nicer colours and textures |
| H_2 | forest |
| H_3 | off-putting |
| H_4 | - |
| H_5 | powerful structure |
| H_6 | spores, life |
| H_7 | interesting |
| H_8 | - |
| H_9 | colourful |
| H_10 | kind of pretty |

## c)     Data Set Three: Yes / No response count

Table A.5.3-8 Research Project (I): Expressed interest in wearing a T-shirt printed with a mould image and further participation in the research

| Research participant | Q7. Would you wear a personally designed T-shirt printed with any of the presented images? | | Q8. Would you like to participate further in the project? | |
|---|---|---|---|---|
| | Yes | No | Yes | No |
| H_1 | 1 | | 1 | |
| H_2 | 1 | | 1 | |
| H_3 | 1 | | 1 | |
| H_4 | 1 | | 1 | |
| H_5 | 1 | | 1 | |
| H_6 | 1 | | 1 | |
| H_7 | 1 | | 1 | |
| H_8 | 1 | | 1 | |
| H_9 | 1 | | 1 | |
| H_10 | 1 | | 1 | |
| Response count | **10** | **0** | **10** | **0** |

## 5.3.4 Data Set Four: T-shirt design sheets

| T-shirt code | | T-shirt design |
|---|---|---|
| Participant No: | T-shirt No: | |
| **P1** | **T1** |  |
| | |  |

| T-shirt code | | T-shirt design |
|---|---|---|
| Participant No: | T-shirt No: | |
| **P2** | **T1** |  |
| | |  |

| T-shirt code | | T-shirt design |
|---|---|---|
| Participant No: | T-shirt No: | |
| **P2** | **T2** |  |

| T-shirt code | | T-shirt design |
|---|---|---|
| Participant No: | T-shirt No: | |
| **P3** | **T1** |  |

| T-shirt code | | T-shirt design |
| --- | --- | --- |
| Participant No: | T-shirt No: | |
| **P3** | **T2** |  |
| | |  |

| T-shirt code | | T-shirt design |
|---|---|---|
| Participant No: | T-shirt No: | |
| **P3** | **T3** |  |

| T-shirt code | | T-shirt design |
| --- | --- | --- |
| Participant No: | T-shirt No: | |
| **P4** | **T1** |  |
| | |  |

| T-shirt code | | T-shirt design |
| --- | --- | --- |
| Participant No: | T-shirt No: | |
| **P4** | **T2** |  |

| T-shirt code | | T-shirt design |
|---|---|---|
| Participant No: | T-shirt No: | |
| **P5** | **T1** |  |
| | |  |

| T-shirt code | | T-shirt design |
| --- | --- | --- |
| Participant No: | T-shirt No: | |
| **P5** | **T2** |  |
| | |  |

| T-shirt code | | T-shirt design |
|---|---|---|
| Participant No: | T-shirt No: | |
| **P5** | **T3** |  |
| | |  |

| T-shirt code | | T-shirt design |
|---|---|---|
| Participant No: | T-shirt No: | |
| **P5** | **T4** |  |
| | |  |

| T-shirt code | | T-shirt design |
|---|---|---|
| Participant No: | T-shirt No: | |
| **P6** | **T1** |  |

| T-shirt code | | T-shirt design |
| --- | --- | --- |
| Participant No: | T-shirt No: | |
| **P6** | **T2** |  |

| T-shirt code | | T-shirt design |
|:---:|:---:|:---:|
| Participant No: | T-shirt No: | |
| **P7** | **T1** |  |
| | |  |

| T-shirt code | | T-shirt design |
| --- | --- | --- |
| Participant No: | T-shirt No: | |
| **P7** | **T2** |  |
| | |  |

| T-shirt code | | T-shirt design |
| --- | --- | --- |
| Participant No: | T-shirt No: | |
| **P7** | **T3** |  |
| | |  |

| T-shirt code | | T-shirt design |
| --- | --- | --- |
| Participant No: | T-shirt No: | |
| **P8** | **T1** |  |
| | |  |

| T-shirt code | | T-shirt design |
| --- | --- | --- |
| Participant No: | T-shirt No: | |
| **P8** | **T2** |  |

## 5.3.5   Data Set Five: Participant feedback of public response to the 'mouldy' T-shirts

### a)      Participant feedback of public response to the 'mouldy' T-shirts: Post-workshop questionnaire (quantitative)

Table A.5.3-9 Research Project (I): Participant feedback of public response to the T-probe (quantitative)

| Question | Choice | Response count |
|---|---|---|
| **Q1. Are you happy with your T-shirt design?** | Very satisfied | 3 |
| | Satisfied | 2 |
| | Neither Satisfied nor Dissatisfied | 0 |
| | Dissatisfied | 0 |
| | Very dissatisfied | 0 |
| **Q2. How often have you worn your T-shirt?** | Often | 2 |
| | Sometimes | 2 |
| | Seldom | 1 |
| | Never | 0 |
| **Q3. Where have you worn your T-shirt?** | At home | 3 |
| | At work | 2 |
| | In the college / university | 5 |
| | In cafes | 3 |
| | In pubs | 3 |
| | In bars | 2 |
| | At parties | 2 |
| | On holiday | 3 |
| | Other (please specify) | 0 |

| Comments: | | |
|---|---|---|
| at conferences and research meetings | | |
| It is now one of the main t shirts I wear | | |
| **Q4. Have people reacted to your T-shirt?** | Yes | 3 |
| | No | 2 |
| | Don't know | 0 |
| **Q5. Has your T-shirt engaged people in a conversation about fungi?** | Yes | 3 |
| | No | 2 |
| | Don't know | 0 |

b)      Participant feedback of public response to the 'mouldy' T-shirts: Post-workshop questionnaire (qualitative)

Table A.5.3-10 Research Project (I): Colour-coding of public response to the 'mouldy' T-shirts

| *Theme* | *Colour-Coding* |
|---|---|
| Affinity |  |
| Neutral, i.e. descriptive |  |

Table A.5.3-11 Research Project (I): Participant feedback of public response to the 'mouldy' T-shirts (qualitative)

| Question | Responses |
|---|---|
| **Q6. What comments have been made about your tee?** | People haven't realised the colour palette of fungi. |
| | There wasn't much comment I think people generally don't make much conversations out of t-shirts. |
| | I've had a lot of compliments about the t shirt and every time I do, I get to tell them its actually a pattern created by mould. Which makes it infinitely more interesting. |
| | oh cool! it is not what it looks like!" "really? i did not know it could be this colour!" " wow! what is it? is it what it looks like? I would love to have the same" |
| | Cool top, where did you get it from? whats that on it? |

# 6.0 Appendix to Chapter 6.0 Research Project (II): *Fashion for deafblind people*

## 6.1 Workshop materials: Research Project (II)

### 6.1.1 Application for Ethics approval, initially submitted to *Sense*[138]

**Sense in Textiles: the role of wearable textiles and fashion for people with dual sensory impairment**

| | |
|---|---|
| Applicant details: | Ninela Ivanova, Design Research student, Kingston University London |
| | e-mail: ninelaivanova@gmail.com; M: 07983 140 401 |
| Study Title: | Sense in Textiles: the role of wearable textiles and fashion for people with dual sensory impairment |
| Study location: | Sense's Anne Wall community resource centre, 2 Hyde Close, Barnet, Hertfordshire, EN5 5TJ |
| Study Details: | First application for a series of 4-6 individual case studies within the Anne Wall Centre |
| Date: | 10th March 2013 |

---

[138] The study was refined in discussion with Sense's Head of Arts & Wellbeing and members of staff at the Anne Wall Community Resource Centre, and was conducted in the format discussed in Chapter 6.0 'Research Project (II): *Fashion for deafblind people*', p.181 ('Study design').

Project Summary

*Sense in Textiles* is a short-term research project aimed at exploring deafblind people's perception of wearable textiles and concept of clothing and fashion, in order to propose a way for future development of fashion and textiles design tailored to the needs of people with dual sensory impairment. The project draws on the compensation theory of sensory impairment (Palmer, 1997 as cited in (Lahtinen, Palmer and Ojala, 2012)) which suggests that the loss, or severe damage, of hearing and sight would lead to an enhanced role of touch and tactile memory. While there has been research in the areas of multisensory environments for people with sensory and / or cognitive disabilities, and the role of art for personal development and wellbeing (Field, 2010; Jansen *et al.*, 2012; Mills and Brown, 2004; Twigg, 2010), there has been little research into the role of fabric and dress within a deafblind person's everyday environment.

The methodology suggested for this research stems from the design of perception workshops piloted as part of my PhD design research project into people's interaction with mould – aimed at generating a positive shift in social perception of this media. The communication 'mouldy' T-shirts – designed by the participants in the project, were used both as a creative tool to understand human perception of mould, and to promote public engagement with this subject.

The *Sense in Textiles* project is proposed to take place at the Anne Wall Resource Centre. It will include a series of individual case studies comprising participant observation, a 2-day individual textiles and T-shirt design workshop, accompanied by an informal discussion on the subject of everyday dressing up. Qualitative research data will be collected from participant observation, semi-structured interviews in the form of informal discussions, and the workshop outcomes. The research will be documented via film, photography voice-recording and note-taking. These

methods will have to be tailored and agreed with the individual participants.

The research project is hoping to generate insights into the relationship between people with dual sensory impairment and clothing which may scope further research possibilities to improve wellbeing and quality of life for the deafblind. The T-shirt workshops developed as part of this brief could also propose new methods for learning and creative expression for Sense's facility users, as well as suggest an opportunity to develop a fashion experience as part of Anne Wall's leisure activities programme.

Aims

- o  Develop un understanding the role of wearable textiles for people with dual sensory impairment
- o  Suggest the wellbeing potential of fashion & textiles for deafblind people

Objectives

- o  Describe Sense facility users' interaction with clothing in their everyday through participant observation and a semi-structured interviews
- o  Document and analyse the interaction of deafblind people with a range of wearable textiles through a T-shirt design workshop
- o  Probe the role of fashion ant textiles as a way of self-expression and communication for people with dual sensory impairment through an informal discussion with the participants of their view of clothing and messages they would like to express through fashion
- o  Search for ways to facilitate a fashion experience for Sense's facility users

Research Participants and Recruitment

Participants' recruitment is currently being arranged with Graham Nolan – community services manager of The Anne Wall Centre. A researcher presentation of the project and an open invitation to the service users has been suggested as the most appropriate way to recruit participants – ideally between 4-6 people, who would give informed consent to participate in the research project and permission for the process to be document in some form (see Appendix 6.1.36.1.3 Informed Consent forms, p.388).

Methodology

Individual case studies, including:

- Participants observation during everyday activities and art classes within the Anne Wall Centre, aimed at describing an existing interaction with fabric and dress, and also for the participants to get used to the researcher's presence; this method will be supplementary to the data collected from the following workshops;
- Textiles and T-shirt design workshops, exploring the tactile and emotional perception of a range of fabrics, and the potential role of the T-shirt as a form of self-expression and communication;
- Semi-structured interviews, conducted as informal discussions during the textile workshops;
- Outcomes exhibition will launch the T-shirts as a tool for delivering fashion identity messages by Sense's facility users, and audience as well as participant feedback will ensure triangulation of research data;

Procedures

I. Access arrangements

1. Dates for visits and project launch date to be confirmed with Graham Nolan;
2. Permission from Graham Nolan to observe and document facility users' interactions with textiles and clothing during their visits to the resource centre without explicit prior informed consent – also coordinated with the support workers;
3. Informed consent procedures for the facility users who would like to take part in the project and the support workers; translation of the Informed Consent Form and Information Sheet according to individual methods of communication;
4. Research documentation arrangements: video, photography, voice recording, note-taking with the individuals and the communication guides;
5. Permission from the Arts Projects coordinator to attend the arts sessions, observe and document;
6. Arrange a TOP SHOP clothes shopping day.

II. Schedule of data collection (provisional)

1$^{st}$ May – 10$^{th}$ May

- Presentation to the Anne Wall Centre facility users, support workers and staff, aimed at introducing the research project and recruiting participants (ideally 4-6). The participants will have to give an informed consent to participate in the project, which means fully understanding what the purpose of the project and their commitment to it, as well as agree that the process be recorded through at least one of the specified methods;
- Research visits to the Anne Wall Centre to observe the facility users interaction with their clothing and textiles in their everyday activities;
- Attendance to the art classes of the facility users who have agreed to participate in the project.

13$^{th}$ may – 21st May (flexible period of Tuesdays, Thursday and Fridays)

- 1 session with each participant in the form of a textile exploration through touch, testing different feels and textures of fabric, role of colour brightness, different lighting set-up;
- 1 T-shirt design session with each participant with an informal discussion about their relationship to clothing;
- Possibility for an additional day of a "real world" clothes shopping experience.*

*Need further discussions with involved parties*

III. Reporting

June 2013, dates tbc

- Workshop outcomes exhibition – participants and audience feedback;
- Research data analysis and presentation.

Ethical principles

I. Consent

- The research project will be introduced via presentation, including visual and tactile materials. It will be clearly explained what the commitment to the project will be in terms of workshop attendance, engagement in a discussion, the need of some form of documentation of the process and the possibility for exhibition of the outcomes. An offer to participate in the project will be extended to the Anne Wall facility users and will be on a voluntary basis.

- An Information Sheet and an Informed Consent Form will be provided to those willing to participate in the project and arrangements how to tailor the project to their individual needs will be made. These documents will be translated in accordance to the individual requirements and with the supervision of the Anne Wall Centre.

- Informed consent will be also sought form the support staff, and will be arranged according to their requirements, as valuable research insights may evolve as part of their participation in the project.

II. Deception

- No intentional deception of the participants in this study will be required. The participants will be informed that the project has a research purpose, even though it will be executed in the form of a creative workshop.

III. Debriefing

- Participants will be presented with the study outcomes, and their feedback on the experience of the study will be sought.

IV. Withdrawal from the investigation

- Participants will have the right to withdraw at any time during the study, and require that their own data, including recordings, be destroyed.

V. Confidentiality

- All data obtained during the research will be confidential, unless agreed with the participant in the Informed Consent Form, subject to the requirements of the Data Protection Act.

- If in the case of exhibition of the T-shirt outcomes participants may wish to no longer remain anonymous, all other research data will still be kept and disseminated confidentially.

VI. Protection of participants

- Prior approval of this project will be sought from Sense's Director of Research, the Arts and Wellbeing Development Manager, the Anne Wall Centre's Manager and facility users support staff. Participation in this project will not deliberately aim to generate any physical and mental harm, and will comply with the guidelines of the creative art classes already developed within the community centre's programme.

- Participants will be informed that they need not give answers to questions where they feel the information is personal and private, i.e. re their clothing habits.

## VII. Observational Research

- Permission to observe and document the Anne Wall facility users without explicit prior informed consent will be sought from the facility manager in order to provide data on the interactions of deafblind people with textiles and clothing naturally occurring in their everyday – to ensure triangulation of research data. The participant observation will be documented solely in writing, and will ensure anonymity of the subjects. If any disturbance of the facility users is noted, the observation process will be immediately terminated. If permission is not granted, observation will only focus on the participants who have given Informed Consent.

## VIII. Colleagues

- The study will be conducted with the consent and guidance from Sense's Research Centre and the managing and support staff of the Anne Wall Community Centre.

## VIII. Affiliation

- The research project is part of a work placements scheme within the SKIP PhD skills training programme http://skip.rca.ac.uk/. All research outcomes and data evaluation will be reported to Sense's Research Centre, and the student's PhD supervisory team at Kingston University London.

## Risks

- The research project will involve participation of people with dual sensory impairment, where participants may also have other learning disabilities. The execution of the project will be overseen by the Anne Wall facility support staff to ensure the physical and mental comfort of the participants.

- There is a possibility that deafblind people may not be familiar with the concept of fashion and clothing, and therefore discussion on the subject may cause slight emotional discomfort. If that is the case and a participant does not wish to discuss the subject, they will have the right to do so.

- Deafblind people have an enhanced sense of touch and therefore some of the fabrics and textures presented as part of the workshop may cause slight physical discomfort to a participant.

- The emotional and physical response to the subject of textiles and fashion, even being negative or slightly uncomfortable, will generate valuable research insights into textiles for health and wellbeing for the Centre's facility users.

- No monetary compensation will be offered to the participants, but the T-shirt outcomes will be presented as a prize for participating in the study.

## 6.1.2 Information Sheets

a)     Information sheet for deafblind participants

# Sense in Textiles

INFORMATION SHEET

Contact:               Ninela Ivanova, Design Research student, Kingston
                        University London

                        e-mail: ninelaivanova@gmail.com; M: 07983 140 401

Study location:     The Anne Wall community resource centre

Study Title:         Sense in Textiles: the role of wearable textiles and
                        fashion for people with dual sensory impairment

**1.  Invitation**

You are invited to participate in a series of events that aim to explore
your perception of textiles and clothing. These will include a couple
of workshops, where you will get to 'play' with a range of textile
materials, collage your own T-shirt, and talk about your thoughts and
feelings about dress and fashion.

The study is being conducted by Ninela Ivanova – a design student
at Kingston University London, as part of her research placement
within Sense.

Before you decide whether you are willing to take part in this research project, you need to understand why the study is being done and what it will involve.

**2. What is the purpose of this study?**

*Sense in Textiles* is a project aimed at exploring deafblind people's perception of wearable textiles and clothing preferences. It is hoping to generate insights for future development of fashion and textiles design tailored to the needs of people with dual sensory impairment. The outcomes of this research may help improve wellbeing and quality of life for deafblind people.

**3. Are there any risks involved?**

Slight emotional and physical discomfort may occur throughout the project, at which point you will have full right to temporarily or permanently withdraw from the project, refuse to give an answer to a question, and /or be documented. The execution of the project will be overseen by the Anne Wall facility support staff to ensure your physical and mental comfort.

**4. Why have I been invited?**

You have been invited because you are a Sense Community Centre user.

**5. Participation in the study**

If you do decide to take part, you will be given this information sheet to keep and be asked to sign a consent form. You will also receive a copy of the signed consent form to keep. This consent will not expire. Either you or the workshop team may terminate your

participation in the study under any unanticipated circumstances and refuse the results obtained by that point to be used for research purposes.

**6. What does the study involve?**

If you agree to take part in the study you will have to:

Let the researcher observe a few of your art classes prior to commencement of the project. This will give you an opportunity to get to know her and communicate better afterwards.

Agree to participate in two workshops, where dates will be arranged with you in advance. The first workshop will ask you to play with a range of textile materials and discuss how they make you feel. The 2nd workshop will ask you to design your own T-shirt and participate in a conversation about what you wear in your everyday and how it makes you feel.

The T-shirt you create may be exhibited as part of the project. It will be then given to you as a prize for our participation.

b)      Information sheet for communication guides

# Sense in Textiles

INFORMATION SHEET

Contact:              Ninela Ivanova, Design Research student, Kingston
                      University London

                      e-mail: ninelaivanova@gmail.com; M: 07983 140 401

Study location:   The Anne Wall community resource centre

Study Title:       Sense in Textiles: the role of wearable textiles and
                   fashion for people with dual sensory impairment

1. **Invitation**

   You are invited to participate as a communication guide in a series
   of events that aim to explore deafblind people's perception of textiles
   and clothing.

   The study is being conducted by Ninela Ivanova – a design student
   at Kingston University London, as part of her research placement
   within Sense.

   Before you decide whether you are willing to take part in this
   research project, you need to understand why the study is being
   done and what it will involve.

## 2. What is the purpose of this study?

*Sense in Textiles* is a project aimed at exploring deafblind people's perception of wearable textiles and clothing preferences. It is hoping to generate insights for future development of fashion and textiles design tailored to the needs of people with dual sensory impairment. The outcomes of this research may help improve wellbeing and quality of life for deafblind people.

## 3. Are there any risks involved?

Slight emotional and physical discomfort to the facility users may occur throughout the project, at which point they will have full right to temporarily or permanently withdraw from the project, refuse to give an answer to a question, and /or be documented. You will have a responsibility to ensure the physical and emotional comfort of the users during the workshops.

## 4. Why have I been invited?

You have been invited because you provide care and support to Sense Community Centre users on a daily basis, including arts class activities.

## 5. Participation in the study

If you do decide to take part you will be given this information sheet to keep and be asked to sign a consent form. You will also receive a copy of the signed consent form to keep. This consent will not expire. Either you or the workshop team may terminate your participation in the study under any unanticipated circumstances.

Data obtained by that point may still be used for research purposes with your participation kept anonymous.

6. **What does the study involve?**

If you agree to take part in the study you will have to:

Let the researcher observe a few of your art classes prior to commencement of the project. This will give you an opportunity to get to know her and communicate better afterwards.

Agree to participate in two workshops, where dates will be arranged in advance. The first workshop will involve an exploration of a range of textile materials, and the second will consist of a design and a making stage of a bespoke T-shirt for each facility user, participating in the project.

You will be asked to provide support in communication between the researcher and the participants, as well as assisting with the workshop tasks throughout the project.

## 6.1.3 Informed Consent forms

a)      Informed Consent Form for deafblind participants

# Sense in Textiles

INFORMED CONSENT FORM

Contact:            Ninela Ivanova, Design Research student, Kingston
                    University London

                    e-mail: ninelaivanova@gmail.com; M: 07983 140 401

Study location:     The Anne Wall community resource centre

Study Title:        Sense in Textiles: the role of wearable textiles and
                    fashion for people with dual sensory impairment

**Please tick the boxes if you agree with the following statements and
sign the form on the next page:**

I, _____            Yes      No
(participant's name) have been introduced to the project.

I have had enough time to talk with the study team about            Yes      No
the nature and purpose of the study and what I will be
expected to do.

I understand that parts of the project will be documented.      Yes      No

Please indicate the methods of documentation you are comfortable with. You

should allow at least one in order to be able to participate in the project:

❏ **Video**      ❏ **Photography**   ❏ **Sound recording** ❏ **Note-taking**

| | | |
|---|---|---|
| I would like the outcomes of this project to be exhibited to the public. | Yes | No |
| I would like my participation in the project to stay anonymous. | Yes | No |
| I know who to contact if I have any questions about the study. | Yes | No |
| I understand that taking part in this study is voluntary (my choice) and I may withdraw from the study at any time I no longer wish to be involved. | Yes | No |

**Statement of Participant**

I hereby consent to take part in this study.

I understand that I will receive a signed copy of this consent form for my records.

**Name:**

**Date:**                                    **Signature:**

**Statement of Support worker**

I agree that data collected as part of my participation      Yes      No
in the project may be valuable and therefore I consent
that it is used for research purposes.

I would like my participation in the project to stay      Yes      No
anonymous.

I hereby consent to take part in guiding the participant throughout this study. I will oversee that the ethics of translation are followed to my best capacity.

I understand that I will receive a signed copy of this consent form for my records.

| |
|---|
| **Name:** |
| **Date:**                 **Signature:** |

**Statement of Consenter (Investigator / designer)**

I have discussed this study with the above named participant. The

participant appeared to fully understand the information provided about the

study.

| |
|---|
| **Name:** |
| **Date:**                 **Signature:** |

b)  Informed Consent Form for communication guides

# Sense in Textiles

INFORMED CONSENT FORM

Contact:  Ninela Ivanova, Design Research student, Kingston
University London

e-mail: ninelaivanova@gmail.com; M: 07983 140 401

Study location:  The Anne Wall community resource centre

Study Title:  Sense in Textiles: the role of wearable textiles and
fashion for people with dual sensory impairment

**Please tick the boxes if you agree with the following statements and sign the form on the next page:**

| | | |
|---|---|---|
| I, _____ (communication guide's name) have been introduced to the project. | Yes | No |
| I have had enough time to talk with the study team about the nature and purpose of the study and what I will be expected to do. | Yes | No |
| I understand that parts of the project will be documented. | Yes | No |

Please indicate the methods of documentation you are comfortable with. You should allow at least one in order to be able to participate in the project:

❏ **Video**     ❏ **Photography**     ❏ **Sound recording**     ❏ **Note-taking**

I understand that data collected as part of my participation in
the project may be valuable, and therefore I consent that it          Yes     No
may be used for research purposes.

I would like my participation in the project to stay anonymous.     Yes     No

I know who to contact if I have any questions about the study.     Yes     No

I understand that taking part in this study is voluntary (my          Yes     No
choice) and I may withdraw from it at any time I no longer wish
to be involved.

**Statement of Communication guide**

I hereby consent to take part in guiding the participants throughout this study. I will
oversee that the ethics of translation are followed to my best capacity.

I understand that I will receive a signed copy of this consent form for my records.

| |
|---|
| **Name:** |
| **Date:**                                    **Signature:** |

**Statement of Consenter (Investigator / designer)**

I have discussed this study with the above named communication guide. The

participant appeared to fully understand the information provided about the study.

| |
|---|
| **Name:** |
| **Date:**                                    **Signature:** |

## 6.1.4  Workshop questionnaire

| **Sense in Textiles** | | | | | |
|---|---|---|---|---|---|
| Textile | | | | Name of Participant: | |
| | | | | Comments: | |
| WOVEN | cellulose | cotton | 1 | muslin | |
| | | | 2 | poplin | |
| | | | 3 | organdie | |
| | | | 4 | cotton | |
| | | | 5 | stretch cotton | |
| | | | 6 | organic cotton | |
| | | | 7 | denim 1 | |
| | | | 8 | denim 2 | |
| | | | 9 | velvet | |
| | | | 10 | linen 1 | |
| | | | 11 | linen 2 | |
| | | | 12 | viscose | |
| | protein | wool | 13 | suiting | |
| | | | 14 | mixed wool | |
| | | | 15 | tweed | |
| | | silk | 16 | organza | |
| | | | 17 | chiffon | |
| | | | 18 | sandwashed silk | |
| | | | 19 | taffeta | |
| | | | 20 | satin | |
| | | | 21 | silk shantung | |
| | | | 22 | velvet | |
| | | | 23 | duchess satin | |

| | | |
|---|---|---|
| KNIT | 24 | cotton jersey |
| | 25 | sweatshirt jersey |
| | 26 | silk jersey |
| | 27 | acetate jersey |
| | 28 | polyester jersey |
| | 29 | woollen knit |
| | 30 | polyester knit |
| TEXTURES | 31 | silver mesh |
| | 32 | tulle |
| | 33 | lace |
| | 34 | metallic organza |
| | 35 | paper lame |
| | 36 | all over sequin |
| | 37 | foil print on jersey |
| | 38 | 3D puff print on jersey |
| | 39 | 3D puff print on muslin |
| | 40 | 3D puff print on cotton |
| | 41 | ajur jersey |
| | 42 | laser cut jersey |
| | 43 | polyester devoré |
| | 44 | light embroidery (cotton) |
| | 45 | heavy embroidery (cotton) |
| | 46 | etched suedette |
| | 47 | suedette |
| | 48 | felt |

Name of Communication Guide:

## 6.2 Data Sets: Research Project (II)

Table A.6.2-1 below summarises the data sets collected via the methodology and methods used for Project (II).

Table A.6.2-1 Research Project (II): Data sets

| Research setting | Data Sets | Method | | |
|---|---|---|---|---|
| Participatory workshop | **Data Set One:** participant response to presentation of 48 textile materials | Questionnaire | Qualitative | Record of feedback sheet |
| | | Observation | Qualitative | Photographic evidence |
| | **Data Set Two:** T-shirt designs and artefacts | T-shirt design and making | Narrative analysis | T-shirt design sheets |
| | | | | Photographic evidence |

## 6.2.1 Data Set One: Participant response to 48 textile materials

### a) Example of a record of feedback sheet

06/08/2013

| | | | | Sense in Textiles | |
|---|---|---|---|---|---|
| | | | Textile | Name of Partipant: | |
| | | | | Comments: | |
| WOVEN | cellulose | cotton | 1 | muslin | — |
| | | | 2 | poplin | |
| | | | 3 | organdie | Good colour. Liked it the best out of colour. |
| | | | 4 | cotton | |
| | | | 5 | stretch cotton | |
| | | | 6 | organic cotton | |
| | | | 7 | denim 1 | Liked the green colour. |
| | | | 8 | denim 2 | — |
| | | | 9 | velvet | |
| | | | 10 | linen 1 | — |
| | | | 11 | linen 2 | — |
| | | | 12 | viscose | |
| | protein | wool | 13 | suiting | Good colour, doesn't like it |
| | | | 14 | mixed wool | Liked the colour too, but didn't like it |
| | | | 15 | tweed | Liked it |
| | | silk | 16 | organza | Dropped it off |
| | | | 17 | chiffon | — |
| | | | 18 | sandwashed silk | Found it hard |
| | | | 19 | tafeta | |
| | | | 20 | satin | Likes the colour |
| | | | 21 | silk shantung | — |
| | | | 22 | velvet | — |
| | | | 23 | duchess satin | — |

Figure A.6.2-1 Research Project (II): Example of record of participant feedback, Side A

| | | | |
|---|---|---|---|
| KNIT | 24 | cotton jersey | Liked the texture and colour |
| | 25 | sweatshirt jersey | Liked it |
| | 26 | silk jersey | Didn't look interested |
| | 27 | acetate jersey | ~ 11~ |
| | 28 | polyester jersey | ~11~ |
| | 29 | woolen knit | Didn't like it |
| | 30 | polyester knit | Good colour |
| TEXTURES | 31 | silver mesh | Smiles |
| | 32 | tulle | No |
| | 33 | lace | Liked the bright colour but not the texture |
| | 34 | metalic organza | Wasn't interested |
| | 35 | paper lame | Liked it |
| | 36 | all over sequin | Not good texture but shiny what he liked |
| | 37 | foil print on jersey | Liked to feel the dots on the texture. |
| | 38 | 3D puff print on jersey | Really liked the texture |
| | 39 | 3D puff print on muslin | ✓ |
| | 40 | 3D puff print on cotton | Good colour, interested in texture |
| | 41 | ajur jersey | — |
| | 42 | laser cut jersey | Wasn't sure |
| | 43 | polyester devore | Liked the 3D texture |
| | 44 | light emroidery (cotton) | — |
| | 45 | heavy embroidery (cotton) | Liked the 3D texture |
| | 46 | etched suedette | — |
| | 47 | suedette | Good texture, not good colour |
| | 48 | felt | — |

Name of Communication Guide:

Figure A.6.2-2 Research Project (II): Example of record of participant feedback, Side B

Copy of Table 6.3-2 Research Project (II): Colour-coding of participant response to 48 textile materials (p.175)

| Theme | Colour-Coding |
|---|---|
| Showing affinity | (green) |
| Showing aversion | (magenta) |
| Showing sensory experience | (cyan) |
| Showing cognitive response | (yellow) |
| Showing neutrality, i.e. unable to assess whether the response was an expression of affinity / aversion | (grey) |

Table A.6.2-2 Research Project (II): Participant response to 48 textile materials as reported by communication guides

| Textile material No | Name | U_1 | U_2 | U_3 | U_4 | U_5 | U_6 | Total No. of responses |
|---|---|---|---|---|---|---|---|---|
| 24 | Cotton jersey | prefers this to 26 | liked the texture and colour | feels very nice | happy with this one | don't want it | smiles | 6 |
| 25 | Sweat-shirt jersey | likes her hoody, stroked it | liked it | hard (made sign) makes a comparison | swirly patterns | smiles | puts to the side | 6 |
| 26 | Silk jersey | prefers 27 | didn't look interested | no! too clingy, shakes head | like this one | was holding on to it, smiles (not the colour) | smiles, wraps around hand | 6 |
| 30 | Polyester knit | likes this, picked out first from pack | good colour | "quite nice" !the texture - rough | swirly pattern, holes, comfy | seemed to like it, chose this on from the category | smiles, puts to the side | 6 |
| 32 | Tulle | scrunched up to hear sounds | no | def yes | nice feel | no | puts aside | 6 |
| 38 | 3D puff print on jersey | yellow is Nicola's favourite raised surface, maybe | really liked the texture | yes! massaging | likes this, would like on t-shirt, on neck | no | feels the bubbles | 6 |
| 13 | Cold wool suiting | held for a long time, looked at detail | good colour, doesn't like it | | Hazel likes it, feels smart | no | no, groaned | 5 |

Page 1/4

398

| No | Name | U_1 | U_2 | U_3 | U_4 | U_5 | U_6 | Total No. of responses |
|---|---|---|---|---|---|---|---|---|
| | Textile material | | | Participant number | | | | Total No. of responses |
| 14 | Mixed wool | rubbed on her arm a lot | liked the colour too, but didn't like it | | fur, cotton, soft | not interested | likes textures, smiles | 5 |
| 15 | Tweed | wanted to share | liked it | | summertime, not itchy, would like to put it on T-shirt | not interested | likes, smiles | 5 |
| 16 | Silk organza | looked through, preferred to 23 | dropped it off | no | | seemed to like it | yes, picks again | 5 |
| 27 | Acetate jersey | rubbed on arm, felt and showed different ways it falls | | yes | like this one, soft | didn't like it | stretches, tries to shred | 5 |
| 28 | Polyester jersey | prefers 30 | | no def. | funky, stretchy, tight t-shirt | likes it better than the previous one | feels the smoothness | 5 |
| 29 | Woollen knit | rubs onto arm, prefers 30 | didn't like it | likes def | socks, holes, warm | | likes | 5 |
| 31 | Silver mesh | put up to her face and smiled | smiles | | curtains, nice feel, wedding | wasn't interested | engages well | 5 |
| 33 | Lace | feel texture | likes the bright colour but not the texture | | would like to wear it on a t-shirt - chest | smiles, but said no, picked it later | feels again | 5 |
| 34 | Metallic organza | not brushing it against skin - scrunching up | wasn't interested | | likes to add on t-shirt | preferred this via lace | puts aside, feels again | 5 |
| 43 | Polyester devoré | enjoyed this, feeling the velvet soft flowers | liked the 3D texture | | soft | good texture | feels the pattern | 5 |
| 47 | Suedette | stroked this one + pointed to T-shirt | good texture, not good colour | | soft | no | feels it | 5 |
| 3 | Cotton organdie | folds into a ball | good colour, liked the best out of colour | | | signed that she likes it and the colour1 | made into a book, foldable | 4 |
| 10 | Linen 1 | nicer than viscose | | grabbing with toes, likes 7 (1-10) | | wasn't interested | no, groaned | 4 |
| 19 | Silk taffeta | prefers 21 to this one | found it hard | | | liked it, seems to like silver and shiny things | heavy breathing, likes | 4 |
| 35 | Paper lame | | liked it | | smooth likes it | didn't hold on to it | smooth feeling | 4 |

| No | Textile material Name | U_1 | U_2 | U_3 | U_4 | U_5 | U_6 | Total No. of responses |
|---|---|---|---|---|---|---|---|---|
| 14 | Mixed wool | rubbed on her arm a lot | liked the colour too, but didn't like it | | fur, cotton, soft | not interested | likes textures, smiles | 5 |
| 42 | Laser cut jersey | enjoyed too - scrunched it up | wasn't sure | | she likes this one, like Suzanne's hair, silky, light | | plays with it, wraps around | 4 |
| 44 | Light-weight machine embroidery on cotton | these didn't get too much attention | | | feels like a dress material, like to have that on a t-shirt | signed no straight | likes a lot, spends time | 4 |
| 46 | Etched suedette | liked the feel | | | leather (on t-shirt, wants a flower) | seemed to like the texture | explores the pattern | 4 |
| 9 | Cotton velvet | | | rubbish | | liked it | stroked this one, felt for very long time in both hands | 3 |
| 12 | Viscose | touches elbow (rubs it) | | no | | | placed to the side | 3 |
| 17 | Silk crepe chiffon | scrunched it up | | not as much as the black velvet | | | wraps around, yes, really likes | 3 |
| 18 | Sand-washed silk | likes the feel (didn't choose because of colour) | | def affirmative | | smiles, was holding on to it | | 3 |
| 21 | Silk shantung | scrunched in her hand. 'party' | | no, too stiff | | | picks it again, can tell she's given/found a new material | 3 |
| 22 | Silk velvet | stroked on her arms | | smile, affirmative 10! | | | likes velvet, wraps soft | 3 |
| 37 | Foil print on jersey | | liked to feel the dots on the texture | | she thinks it feels like a jacket, likea the feel of the bumps | | no attention to print, puts aside | 3 |
| 39 | 3D puff print on muslin | | | | likes this, light and cool | looked at the colour, but not the texture | spends a while stroking it | 3 |
| 45 | Heavy-weight machine embroidery on cotton | | liked the 3D texture | | big patterns (prefer big patterns) | shook her head | | 3 |

| | Textile material | | Participant number | | | | | | Total No. of responses |
|---|---|---|---|---|---|---|---|---|---|
| No | Name | U_1 | U_2 | U_3 | U_4 | U_5 | U_6 | |
| 14 | Mixed wool | rubbed on her arm a lot | liked the colour too, but didn't like it | | fur, cotton, soft | not interested | likes textures, smiles | 5 |
| 4 | Cotton | | | | | smiled at the colour | knows this one, placed it on her hand | 2 |
| 5 | Stretch cotton | | | | | picked up, felt the texture | stretched it | 2 |
| 11 | Linen 2 | | | no | | | better, slight smile | 2 |
| 23 | Silk Duchess satin | prefers velvet to d.satin | | | | | feels smoothness | 2 |
| 40 | 3D puff print on cotton | | good colour, interested in texture | | cotton, prefers bumps on this one | | | 2 |
| 41 | Ajur jersey | | | | cotton, feels holes | | can feel the wholes | 2 |
| 1 | Cotton muslin | | | 3 (1-10) | | | | 1 |
| 2 | Cotton poplin | | | | | smiles, picked up, liked it the most of out of colours | | 1 |
| 7 | Cotton denim | | liked the green colour | | | | | 1 |
| 8 | Heavy duty cotton denim | | | | | | folded it | 1 |
| 20 | Silk satin | | likes the colour | | | | | 1 |
| 48 | Felt | | | | at home, smooth, use for a t-shirt, bright | | | 1 |
| 6 | Organic cotton | | | | | | | 0 |

Table A.6.2-3 Research Project (II): Thematically categorised participant response to 48 textile materials

| Showing affinity | | | |
|---|---|---|---|
| "quite nice" ! the texture - rough | liked it | likes, smiles | smiles |
| (prefers big patterns) | liked it liked it | looked through, preferred to 23 | smiles |
| better, slight smile | liked it, seems to like silver and shiny things | nice feel | smiles |
| big smiles, was holding on it (liked the texture) | liked the 3D texture | nice feel | smiles |
| definite affirmative | liked the 3D texture | nicer than viscose | smiles, picked up, liked it the most of out of colours |
| definite yes | liked the colour too | on t-shirt, wants a flower | smiles, puts to the side |
| engages well | liked the feel | picked it later | smiles, was holding on to it |
| enjoyed this, feeling the velvet | liked the green colour | plays with it, wraps around | smiles, wraps around hand |
| enjoyed too - scrunched it up | liked the texture and colour | preferred this via lace | spends a while stroking it |
| feels again | liked to feel the dots on the texture | prefers bumps on this one | stroked it |
| feels very nice | likes | prefers this to 26 | stroked on her arms |
| good colour | likes a lot, spends time | put up to her face and smiled | stroked this one + pointed to T-shirt |
| good colour, interested in texture | likes definite | puts aside, feels again | stroked this one, felt for very long time in both hands |
| good colour, liked the best out of colour | likes it | really liked the texture | touches elbow (rubs it) |
| good texture | likes it | rubbed on arm, felt and showed different ways it falls | use for a t-shirt, |
| good texture | likes it better than the previous one | rubbed on her arm a lot | wanted to share |
| grabbing with toes, likes 7 (1-10) | likes textures, smiles | scrunched in her hand | was holding on to it, smiles |
| happy with this one | likes the bright colour | seemed to like it | would like to put it on T-shirt |
| Likes it, feels smart | likes the colour | seemed to like it, chose this on from the category | would like to wear it on a t-shirt |
| heavy breathing, likes | likes the feel | seemed to like the texture | |
| held for a long time | likes the feel of the bumps | she likes this one | wraps around, yes, really likes |
| held for a long time, looked at detail | likes this | shiny what he liked | yes |
| like this one | likes this, picked out first from pack | signed that she likes it and the colour1 | yes! massaging |
| like this one | likes this, would like on t-shirt | smiles, affirmative 10! | yes, picks again |
| like to have that on a t-shirt | likes to add on t-shirt | smiled at the colour | |
| | likes velvet, wraps soft | | |

## Showing aversion

| | | | |
|---|---|---|---|
| didn't choose because of colour | good colour | no! too clingy, shakes head | not the texture |
| 3 (1-10) | no | no, groaned | not the texture |
| but said no, | no | no, groaned | rubbish |
| didn't like it | no | no, too stiff | shook her head |
| didn't hold on to it | no | not, brushing it against skin - scrunching up | signed no straight |
| didn't like it | no | not good colour | these didn't get too much attention |
| didn't like it | no | not good texture | wasn't interested |
| didn't look interested | no | not interested | wasn't interested |
| doesn't like it | no | not interested | wasn't interested |
| don't want it | no def. | not the colour | |
| dropped it off | | | |

## Sensory engagement

| | | | |
|---|---|---|---|
| bright | feels the bubbles | scrunched up to hear sounds | soft |
| can feel the wholes | feels the pattern | silky, light | soft |
| explores the pattern | feels the smoothness | smooth | soft |
| feel texture | felt the texture | smooth | stretch |
| feels holes | light and cool | smooth feeling | stretches |
| feels it | looked at the colour | soft | warm |
| feels smoothness | not itchy | | |

## Cognitive associations

| | | | |
|---|---|---|---|
| at home | fur, cotton | picks it again, can tell she's given/found a new material | prefers 30 |
| big patterns | hard (made sign) makes a comparison | prefers 21 to this one | prefers 30 |
| chest | knows this one, placed it on her hand | prefers 27 | prefers velvet to d.satin |
| cotton | leather | swirly patterns | she thinks it feels like a jacket |
| cotton | like Suzanne's hair | tight t-shirt | socks, holes |
| curtains | likes her hoody | wants a flower | summertime, |
| feels like a dress material, | not as much as the black velvet on neck | wedding | swirly pattern , holes, comfy |
| feels like disco light | 'party' | yellow is Nicola's favourite raised surface | |
| feels like shiny beads | | | |
| funky | | | |

| Neutral response | | | |
|---|---|---|---|
| maybe | tries to shred | made into a book, foldable | no attention to print, puts aside |
| rubs onto arm | folds into a ball | placed to the side | stretched it |
| puts to the side | scrunched it up | picked up | folded it |
| puts aside | wasn't sure | | |

## b)     Observation: photographic evidence

*All images in this section were taken by the researcher in August 2013 at the Anne Wall Community Resource Centre, London.*



Image 1: Non-engagement

Image 2: Engagement – aversion



Image 3: Engagement

Image 4: Engagement – affinity



Image 5: Engagement

Image 6: Engagement – affinity



Image 7: Engagement

Image 8: Engagement - cognitive



Image 9: Engagement

Image 10: Engagement – affinity



Image 11: Engagement – affinity

Image 12: Engagement – affinity



Image 13: Engagement

Image 14: Engagement



Image 15: Engagement – affinity

Image 16: Engagement – affinity



Image 17: Engagement

Image 18: Engagement



Image 19: Engagement

Image 20: Engagement



Image 21: Non-engagement

Image 22: Engagement
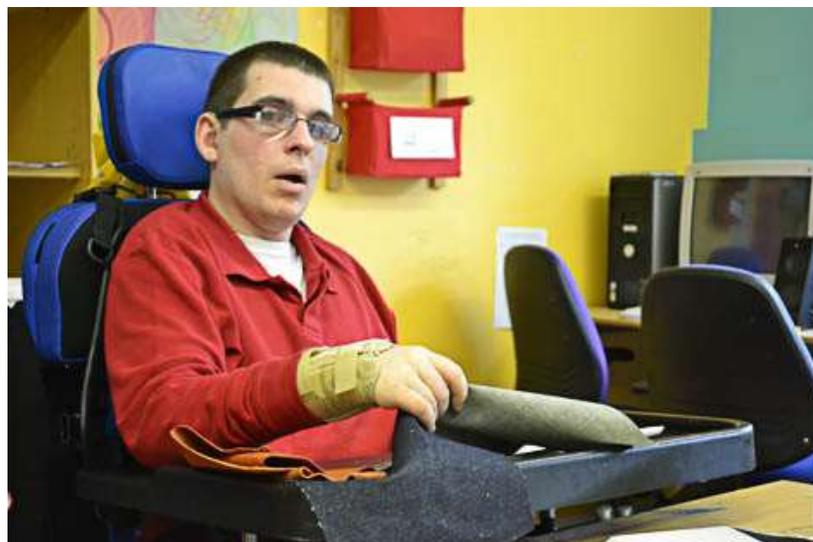


Image 23: Engagement

Image 24: Engagement – affinity



Image 25: Engagement – affinity

Image 26: Engagement



Image 27: Engagement

Image 28: Engagement



Image 29: Engagement

Image 30: Engagement



Image 31: Engagement

Image 32: Engagement – affinity



Image 33: Engagement

Image 34: Engagement – aversion



Image 35: Engagement

Image 36: Non-engagement



Image 37: Engagement

Image 38: Engagement



Image 39: Engagement

Image 40: Engagement



Image 41: Engagement

Image 42: Engagement



Image 43: Engagement – affinity

Image 44: Engagement

## 6.2.2  Data Set Two: T-shirt design sheets

*Data Set Two* comprised T-shirt design sheets that were filled in by the participants with the support of the communication guides;

T-shirt design, Participant No. 1 (U_1)

## T-shirt design, Participant No. 2 (U_2)

T-shirt front

T-shirt back



Sense in Textiles — T-shirt Design

Name of Participant: ▮▮▮▮▮▮  Date: 14/08/13

Blue

markers + finger puff painting

Name of Communication Guide:

## T-shirt design, Participant No. 3 (U_3)



**Sense in Textiles**      **T-shirt Design**

Name of Participant:      Date: 13/08/2013

woolen jersey cutouets

cut?
footprint
with point

juxtaposition - velvet, alternative, punk
but also softer

Name of Communication Guide:

## T-shirt design, Participant No. 4 (U_4)

T-shirt front

T-shirt back

T-shirt design, Participant No. 5 (U_5)

**Sense in Textiles**                                          **T-shirt Design**

Name of Participant: _____          Date: 13/08/2013

colour Blocking
&
cut outs
appliqué

Name of Communication Guide: _____

## T-shirt design, Participant No. 6 (U_6)



**Sense in Textiles**                                         **T-shirt Design**

**Name of Participant:**               **Date:** 14/8/13

↑ V neck.

Heart made of torn materials sewn on

shiny material ~ Paper lame as base for heart

Mandy's name in braille printed on material
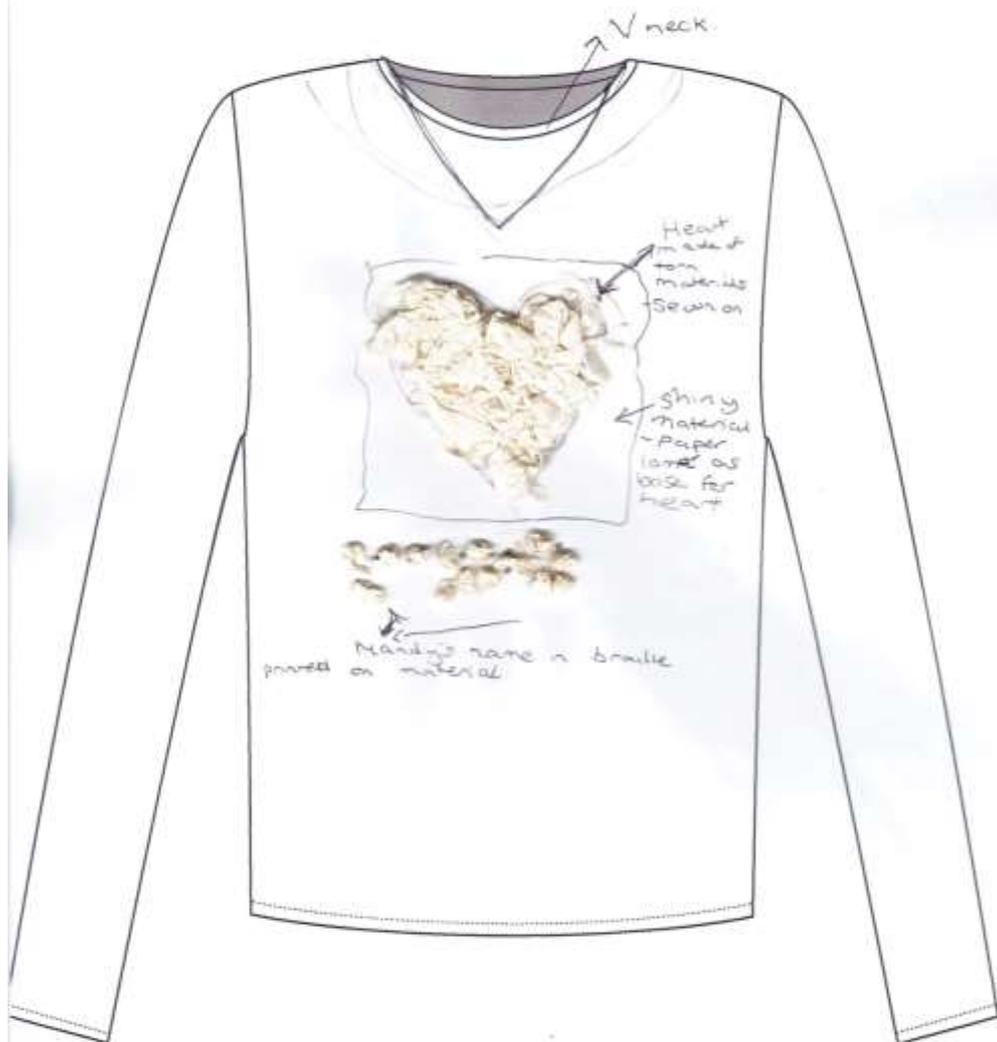
**Name of Communication Guide:**

## 6.3   *Sense in Textiles*: Press release

# Sense in Textiles – A fashion show by deafblind people

"Sense in Textiles" a fashion show by deafblind people took place on 18 September at the Anne Wall Centre in Barnet.

Six first-time designers took to the catwalk to showcase their creations crafted at a fashion workshop for people with both sight and hearing difficulties, run by Sense, the national deafblind charity and designer Ninela Ivanova.

Guided by the suggestion that the loss, or severe damage, of hearing and sight could lead to an enhanced role of touch and tactile memory, the workshops explored deafblind people's perception of clothing and fashion -suggesting fashion designs tailored to their sensory needs.

Designer Ninela Ivanova said: "The 'Sense in Textiles' project aims to reveal the potential of dress as a self-expression and communication tool for deafblind people. By putting forward a new way of accessing fashion for people with dual sensory loss we are hoping to challenge mainstream perceptions of fashion and suggest new methods for creative expression."

During the month-long project the participants had the chance to feel different fabrics from velvet and suede to silk and muslin, and choose the ones they wanted to work with. They discovered different techniques for each textile and created their own individual designs using sensory materials such as feathers, sequins and 3D prints.

John Kirkham, Sense's Activity Co-ordinator, said: "This fashion project enabled the deafblind people involved to take charge of their wardrobes – possibly for the very first time. It gave them 100% say in what they were creating and allowed them to make something that they can wear not only because they want to, but also because they are proud to."

"Sense in Textiles" is part of Sense's Arts and Wellbeing programmes, which develop opportunities for deafblind people to contribute to the arts and cultural life of their communities. For more information http://www.sense.org.uk/content/arts-and-wellbeing

**ENDS**

Photos attached

**Media enquiries:**

Anna Tsirmpa                                        0207 520 0965

Out-of-hours                                               07770 580 843

**Notes to editors:**

**Ninela Ivanova** is a Design PhD student within the Design for Body & Material research group in the Faculty of Art, Design and Architecture, Kingston University London – http://fada.kingston.ac.uk/dfbm/.

**SKIP** is an AHRC-funded collaborative skills development programme for design researcher students, coordinated between Royal College of Art, University of the Arts London and Kingston University London – http://skip.rca.ac.uk/.

**Sense** is a national charity that has supported and campaigned for children and adults who are deafblind for over 50 years.  Further information can be found on Sense's website – www.sense.org.uk; http://www.sense.org.uk/content/arts-and-wellbeing.

**Deafblindness** is a combination of both sight <u>and</u> hearing difficulties. Some of these people are completely deaf and blind, but others have some remaining use of one or both senses.

## 6.4    *Sense in Textiles*: Feedback response received from Nic Vogelpoel, Head of Arts & Wellbeing at *Sense*

*Received via personal e-mail correspondence.*

1. Do you find *Sense in Textiles* similar/different to other art/design projects that you have run at the community resource centres?

   Please comment on the following:

   ❏  Aims and objectives

   *The Aims and objectives are very clear in the project focussed on skill-development in arts-practices, wellbeing improvements and innovative project delivery.*

   ❏  Project structure

   *The structure is robust but flexible so that it could be self-directed by participants ensuring personal choice was at the forefront of all the sessions.*

   ❏  Methodology

   *The methodology incorporates a number of different data collection and analysis methods and these are useful for catering to the different communication styles in the group.*

   ❏  Materials used

   *Flexible and adaptive.*

❑ Project outcomes

*Excellent and exciting – a personal and generalised approach to how arts activities can benefit the deafblind community.*

2. Has the project achieved its aim and objectives?

*Yes. As an exploratory project, it tells us the potential of doing work like this and how far it can be pushed and developed in further reiterations of the project. It demonstrates very clearly the potential for developing work in this area.*

3. What insights has it brought to Sense as an organisation?

*It tells us that self-directed, and person centred activity programmes are possible to develop and run. It tells us that there is a multitude of interests in our user group and that working outside the box will tell us more and more about the people we support.*

4. Are there long term impacts from the study?

*Absolutely. It has changed the way that activities are developed, opened new doors to the participants who were involved, and inspired staff to think differently about programme structures.*

5. Any suggestions on how the project could be improved?

*My only suggestion would be for the programme to be longer, and to draw from a more rigorous health and wellbeing reporting format to show the benefits to integrated care developments, but this could be achieved in further developments of the programme.*

# 7.0 Appendix to Chapter 7.0 Research Project (III): *Synthetic ingredients for fine fragrance*

## 7.1 Workshop Materials: Research Project (III)

### 7.1.1 Information Sheet

**THE SCENTED TEE: Information Sheet**

| | |
|---|---|
| Study location: | Kingston University London |
| Contact: | Ninela Ivanova, PhD Design Research student, FADA, Kingston University London |
| | k1020964@kingston.ac.uk;  +44 (0) 7983 140401 |
| Date: | 15th September 2014 |

1. Invitation

   You are invited to participate in a research workshop that will explore your perception of fragrance ingredients. The study is being conducted by Ninela Ivanova – a Design PhD student at Kingston University London, as part of a project set-up in partnership with the International Flavors & Fragrances company (IFF).

   Before you decide whether you are willing to take part in this research project, you need to understand why the study is being done and what it will involve.

2. What is the purpose of this study?

   *The Scented Tee* is a creative workshop aimed at testing the potential of the T-shirt in engaging understanding of fragrance ingredients for olfactory design, development and marketing. This workshop aims to establish an online platform and an ongoing discussion around perception of fragrance ingredients. After the workshop on 15th September, you will be invited to become a scent ambassador and awarded a slogan T-shirt, which you will design as part of this workshop.

3. Why have I been invited?

Through conversations with IFF, it has been noted that perception and use of fragrance is greatly influenced by cultural background. Therefore, a cross-cultural participant group has been composed to explore the range of sensory responses to novel scent creations that can be relevant to IFF's markets across the globe.

4. What does the study involve?

If you agree to take part in the study you will be participating for a total duration of up to 2 months. Over this period, you will be asked to:

- Engage in an olfactory workshop
- Design a T-shirt
- Wear the slogan T-shirt for a minimum period of 1 month (at least once a week), and feedback public responses and personal insights to the project
- The results of the workshop may be exhibited and you may be required to have your picture taken with your Scented Tee.

5. Are there any risks involved?

No, however you must refrain from ingesting the fragrance ingredients!
The workshop will be conducted in accordance with the University's health & safety guidelines:
http://www.kingston.ac.uk/aboutkingstonuniversity/howtheuniversityworks/policiesandregulations/documents/health_safety_statement.pdf
You should inform us if you suffer from pollen allergies, hay fever, asthma, or have a self-reported poor sense of smell. All fragrance ingredients have been previously commercially tested within IFF, and are accompanied by Material Safety Data Sheets.

6. Participation in the study

If you do decide to take part you will be given this information sheet to keep and be asked to sign a consent form. You will also receive a copy of the signed consent form to keep. This consent will not expire. Either you, or the workshop team may terminate your participation in the study under any unanticipated circumstances, but the results obtained by that point will be still used for research purposes.

*Even though you will participate in the creation of the T-shirt, the design rights will remain property of Kingston University, as the study is part of a University-funded research project and supported by an industry partner.*

## 7.1.2 Informed Consent form

**THE SCENTED TEE: Informed Consent Form**

Study location:       Kingston University London

Contact:             Ninela Ivanova, PhD Design Research student, FADA, Kingston University London

                     k1020964@kingston.ac.uk;  +44 (0) 7983 140401

Date:               15th September 2014

Please tick the boxes if you agree with the following statements and sign the form on the next page:

| | | |
|---|---|---|
| I _____ (participant's name) have read and understood the Information Sheet for this project. | Yes | No |
| I have had enough time to talk with the study team about the nature and purpose of the study and what I will be expected to do. | Yes | No |
| I understand that parts of the project will be documented through questionnaires, photography and sound recording. | Yes | No |
| I understand that this is a research project that involves social engagement and therefore project documentation may be publically disseminated as part of the research. | Yes | No |
| I understand and agree that outcomes of this project may be exhibited to the public. | Yes | No |
| I would like my participation in the project to remain anonymous. | Yes | No |
| I know who to contact if I have any questions about the study. | Yes | No |
| I understand that taking part in this study is voluntary (my choice) and I may withdraw from the study at any time I no longer wish to be involved. | Yes | No |

*Please sign on the next page*

**Statement of Participant**

I hereby consent to take part in this study. I understand that I will receive a signed copy of this consent form for my records.

Name:

Date:                                    Signature:

**Statement of Consenter (Investigator / Designer)**

I have discussed this study with the above named participant. The participant appeared to fully understand the information provided about the study.

Name:

Date:                                    Signature:

## 7.1.3 Introduction on fragrance, delivered by fragrance consultant Nick Gilbert

*The following is a draft submitted via e-mail prior to the workshop.*

*Describing Smells*

In most western languages we have no specific words relating to descriptions of smells – but we are familiar with words that we use for our other senses: taste, sight, touch and hearing. Can also describe objects, places, memories or people that the scent evokes. Creating an image with words will help you grasp the concept of fragrance.

Does it smell like something? What is the character or facet of that thing that the smell evokes? Or if an object had a smell, would this be it? Where is this? Who would wear this?

Hearing: Is it loud/quiet? Is it sharp/flat? Is it high/low pitch? Does it shout/whisper? If it were do/re/mi/fa/so/la/ti/do? Symphony or single instrument?

Touch: What texture does it have – rough/smooth? Is it warm/cold? What temperature is it? Does it feel rounded/pointy? Does it have a shape? Are there any fabrics or materials it feels like?

Taste: Sweet? Bitter? Salty? Sour? Umami/Savoury?

Sight: Which colour is it? Multi-coloured/Monochromatic? Light/Dark? Intensity of brightness or darkness?

Shades – is it a cold or a warm shade? Pastel or bright? Does the colour change as the fragrance develops? Are there shadows or reflections?

We talk about perfume as having 'notes', 'accords' and 'facets'. For eg, a rose not may have a very 'jasmine' facet (meaning it is viewed as translucent

*Materials*

Essential oils or absolutes are created from natural ingredients

Bark: cinnamon, cassia.

Flowers: jasmine, tuberose, ylang-ylang, neroli/orange blossom, geranium, rose, mimosa, narcissus, osmanthus.

Fruits: bergamot, lemon, lime, grapefruit, orange, mandarin, tangerine, blackcurrant.

Leaves/twigs: petitgrain, patchouli, violet leaf, sage, tomato, raspberry.

Lichens: oakmoss, treemoss.

Resins: frankincense, myrrh, opoponax, benzoin, peru balsam, labdanum, galbanum.

Roots: ginger, iris, vetiver.

Seeds: tonka beans, ambrette, carrot, coriander, caraway, anise, cocoa, nutmeg.

Woods: cedar, sandal, gaiac, birch, pine, agar, juniper.

Animal: honey, beeswax, musk, civet, castoreum, hyraceum, ambergris.


Synthetics refer to various materials:

Nature identical (around 90% of all synthetic materials) responsible for facets of natural materials, ie: citronellol from rose, vanillin from vanilla, citral from lemon, coumarin from tonka.

Artificial molecules are designed in a lab and do not exist in nature (or are modifications of something that occurs in nature) but allow perfumers to introduce effects like cotton candy (ethyl maltol) and sea breeze (calone).

## 7.1.4 Workshop questionnaire

P[n]

**THE SCENTED TEE**

**Task 1**

Please fill in your personal details (these are for statistical research purposes, and will not be disclosed with third parties):

Name:

Background:

Nationality:

Age:                                    Gender:        F                M

**Task 2**

You have been presented with a Scent Perceptions package. The package contains: a questionnaire, a colour chart, textile materials, and a fonts chart. Please, fill in the requested information for each fragrance ingredient. (Questions 1-6)

**Task 3**

Q7. Which of the presented ingredients do you like best?

Q8. Which of the presented ingredients do you like least?

Q9. Could you identify the natural from the synthetic ingredients?

Q10. Would you like to participate further in the project?

- o Yes
- o No

*If "Yes", please fill in the required details on the back of this card.*
*If "No", the data collected from you will only be used for research purposes and in reference with your allocated participant number.*

Selected ingredient:

T-shirt Size:     XS          S          M          L          XL          2XL

Would you like the background or the print to be coloured?      ○  Print
○  Background

'E-mail:

Contact number:

Address (to receive your T-shirt with instructions):

Preferred social platform:

I agree to wear my Scented Tee and feedback into the project.      ☐

I have read and signed the Informed Consent Form.      ☐

Date:                                    Name:
Signature:

**Task 2**

Fragrance Ingredient No:

Q1. What is your immediate association with the presented fragrance?

Q2. Please indicate where on the scale you mostly agree in regards to the way you feel about this fragrance ingredient:

| Dislike | 1 | 2 | 3 | 4 | 5 | Like |
|---------|---|---|---|---|---|------|
| Foreign | 1 | 2 | 3 | 4 | 5 | Familiar |

Q3. For each category, please select a word descriptor that best corresponds with the fragrance you have been presented:

| **Intensity** | Delicate | | Moderate | | Powerful | |
|---------------|----------|---|----------|---|----------|---|
| **Brightness** | Dark | Shadowy | Hazy | Bright | Luminous | |
| **Pitch** | High | | | Low | | |
| **Tone** | Flat | | | Sharp | | |
| **Temperature** | Cold | | | Warm | | |
| **Balance** | Dominating | | Even | | Weak | |
| **Character** | Simple | | Moderate | | Complex | |

Q4. Based on the Colours chart provided, please select a colour that best describes your perception of the presented fragrance:

Q5. Based on the Materials provided, please select a texture that best describes your perception of the presented fragrance:

Q6. Based on the Fonts chart provided, please select a font that best describes your perception of the presented fragrance:

Table A.7.1-1 Research Project (III): Standardised questionnaire sheet

## 7.1.5  Post-workshop participation: Feedback questionnaire

Table A.7.1-2 Projects (III): Post-workshop participation, feedback questionnaire

| Q1. How satisfied were you with the design of your tee? | | | | |
|---|---|---|---|---|
| Very satisfied | Satisfied | Neither Satisfied nor Dissatisfied | Dissatisfied | Very dissatisfied |

| Q2. How often have you worn your T-shirt? | | | |
|---|---|---|---|
| Often | Sometimes | Seldom | Never |

| Q3. Where have you worn your T-shirt? | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| At home | At work | In the college / university | In cafes / pubs/ restaurants/ clubs | In the gym | For business | At parties | On holiday | Other (please specify) |
| | | | | | | | | |

| Q4. Have people reacted to your T-shirt? | | |
|---|---|---|
| Yes | No | Don't know |

| Q5. Has your T-shirt engaged people in a conversation? | | |
|---|---|---|
| Yes | No | Don't know |

| Q6. *If 'Yes' to Q5 above, what discussions took place?* |
|---|
| |

## 7.2   Participant data: Research Project (III)

Table A.7.2-1 Research Project (III): Participant data

| Research participant | Background | Nationality | Age | Gender |
|---|---|---|---|---|
| P_1 | Perfumery / Psychology | British | 29 | M |
| P_2 | Arts & Design History | British | 36 | F |
| P_3 | Art – MA Illustration | Romanian | 22 | F |
| P_4 | Science / Biology/ Chemistry | Albanian | 40 | F |
| P_5 | Researcher - Jeweller | Saudi Arabian | 36 | F |
| P_6 | N/A | British + Colombian | N/A | F |
| P_7 | Researcher | British | 31 | M |
| P_8 | Neuroscientist | British | 33 | F |
| P_9 | Fashion, Law | Hungarian | 32 | F |
| | | | **Average age:** | **32.4** |
| | | | **British : Non-British participants:** | **1:1** |
| | | | **Female : Male participants:** | **7:2** |

## 7.3    Data Sets: Research Project (III)

Table A.7.3-1 below summarises the research methodology and methods used for Project (III).

Table A.7.3-1 Research Project (III): Data sets

| Research setting | Data Sets | Method | | |
|---|---|---|---|---|
| Participatory workshop | **Data Set One:** participant response to presentation of 10 synthetic fragrance ingredients | Questionnaire | Quantitative | 5-point Likert-scale response |
| | | | | Multiple-choice questions |
| | | | Qualitative | Open-ended question |
| | | Observation | Qualitative | Photographic evidence |
| | **Data Set Two:** T-shirt designs | Questionnaire | Summary table of designs chosen | |
| Post-workshop participation | **Data Set Three:** public response to the T-shirts | Questionnaire | Quantitative | Multiple-choice questions |
| | | | Qualitative | Open-ended questions |

## 7.3.1  Data Set One: Participant response to the ten fragrance ingredients

## a)      Participant response to the workshop questionnaire (quantitative)

Likert-scale response

Table A.7.3-2 Research Project (III): Like / Dislike Likert scale response count

| Q2. Please indicate where on the scale you mostly agree in regards with the way you feel about this fragrance ingredient: | | | | | | | |
|---|---|---|---|---|---|---|---|
| Ingredient No. | Dislike   1 | 2 | 3 | 4 | 5   Like | Average |
| 1 | 2 | 2 | 2 | 1 | 2 | **2.9** |
| 2 | 0 | 0 | 1 | 3 | 4 | **4.4** |
| 3 | 0 | 0 | 2 | 4 | 3 | **4.1** |
| 4 | 0 | 3 | 2 | 1 | 2 | **3.3** |
| 5 | 2 | 3 | 2 | 1 | 0 | **2.3** |
| 6 | 1 | 1 | 1 | 3 | 1 | **3.3** |
| 7 | 0 | 1 | 2 | 1 | 4 | **4.0** |
| 8 | 0 | 2 | 1 | 2 | 4 | **3.9** |
| 9 | 6 | 1 | 0 | 0 | 2 | **2.0** |
| 10 | 0 | 2 | 1 | 1 | 4 | **3.9** |

Table A.7.3-3 Research Project (III): Familiar / Foreign Likert scale response count

| Q2. Please indicate where on the scale you mostly agree in regards with the way you feel about this fragrance ingredient: | | | | | | | |
|---|---|---|---|---|---|---|---|
| Ingredient No. | Foreign  1 | 2 | 3 | 4 | 5  Familiar | Average |
| 1 | 0 | 2 | 1 | 2 | 3 | **3.8** |
| 2 | 0 | 0 | 0 | 2 | 7 | **4.8** |
| 3 | 0 | 3 | 1 | 2 | 2 | **3.4** |
| 4 | 0 | 1 | 1 | 1 | 5 | **4.3** |
| 5 | 0 | 2 | 2 | 1 | 2 | **3.4** |
| 6 | 1 | 0 | 3 | 3 | 1 | **3.4** |
| 7 | 2 | 2 | 1 | 1 | 3 | **3.1** |
| 8 | 0 | 3 | 2 | 1 | 2 | **3.3** |
| 9 | 0 | 2 | 1 | 1 | 4 | **3.9** |
| 10 | 0 | 1 | 0 | 2 | 6 | **4.4** |

## Multiple-choice questions

Table A.7.3-4 Research Project (III): 'Best' and 'Least' liked fragrance ingredients

| Ingredient No. | Q6. Which if the presented ingredients do you like best? | Q7. Which if the presented ingredients do you like best? |
|---|---|---|
| 1 | **1** | **1** |
| 2 | **2** | **1** |
| 3 | **4** | **0** |
| 4 | **3** | **0** |
| 5 | **0** | **0** |
| 6 | **0** | **0** |
| 7 | **2** | **0** |
| 8 | **3** | **0** |
| 9 | **0** | **6** |
| 10 | **3** | **0** |
| Total No. of responses: | **18** | **8** |

Table A.7.3-5  Research Project (III): Quantification of participant response to each ingredient in relation to olfactory qualities

| Ingredient No. | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Intensity | Delicate | 4 | 0 | 8 | 0 | 0 | 1 | 5 | 2 | 0 | 2 |
| | Moderate | 1 | 1 | 1 | 3 | 3 | 4 | 4 | 5 | 0 | 3 |
| | Powerful | 1 | 8 | 0 | 6 | 6 | 4 | 0 | 2 | 9 | 3 |
| Brightness | Dark | 2 | 1 | 0 | 0 | 3 | 1 | 0 | 1 | 6 | 1 |
| | Shadowy | 2 | 2 | 2 | 1 | 4 | 2 | 0 | 2 | 0 | 4 |
| | Hazy | 3 | 1 | 4 | 2 | 1 | 3 | 5 | 2 | 1 | 0 |
| | Bright | 2 | 4 | 2 | 4 | 0 | 2 | 4 | 3 | 1 | 2 |
| | Luminous | 1 | 1 | 2 | 2 | 0 | 2 | 0 | 1 | 0 | 2 |
| Pitch | High | 4 | 8 | 1 | 8 | 5 | 7 | 3 | 5 | 6 | 3 |
| | Low | 4 | 1 | 6 | 1 | 3 | 1 | 6 | 3 | 3 | 5 |
| Tone | Flat | 5 | 1 | 6 | 2 | 2 | 2 | 4 | 3 | 4 | 3 |
| | Sharp | 6 | 8 | 3 | 7 | 6 | 6 | 4 | 5 | 5 | 5 |
| Temperature | Cold | 6 | 7 | 6 | 4 | 3 | 4 | 4 | 3 | 3 | 1 |
| | Warm | 3 | 2 | 3 | 6 | 6 | 3 | 6 | 5 | 6 | 7 |
| Balance | Dominating | 5 | 7 | 0 | 5 | 6 | 6 | 0 | 3 | 9 | 4 |
| | Even | 1 | 2 | 5 | 3 | 3 | 3 | 7 | 5 | 0 | 4 |
| | Weak | 3 | 0 | 4 | 1 | 0 | 0 | 2 | 0 | 0 | 0 |
| Character | Simple | 2 | 1 | 3 | 2 | 2 | 4 | 5 | 0 | 3 | 3 |
| | Moderate | 4 | 5 | 2 | 5 | 3 | 3 | 3 | 2 | 2 | 4 |
| | Complex | 3 | 4 | 4 | 2 | 4 | 1 | 1 | 6 | 4 | 2 |

Table A.7.3-6 Research Project (III): Scent-colour subjective associations

Table A.7.3-7 Research Project (III):  Scent-type subjective associations

| | P1 | P2 | P3 | P4 | P5 | P6 | P7 | P8 | P9 |
|---|---|---|---|---|---|---|---|---|---|
| Ingredient No 1 MARITIMA | Scent | Scent | Scent | Scent | SCENT | Scent / Scent / Scent | Scent | Scent | Scent |
| Ingredient No 2 ROAVOINE | Scent | Scent | — | SCENT | SCENT | Scent / Scent | Scent | SCENT | Scent |
| Ingredient No 3 ISO E SUPER | Scent | Scent | Scent | Scent | Scent | Scent | Scent | Scent | Scent |
| Ingredient No 4 FRUCTONE | Scent | Scent | Scent | Scent | SCENT | Scent | Scent | Scent | Scent |
| Ingredient No 5 GALBASCONE | Scent | Scent | SCENT | — | Scent | SCENT | Scent | Scent | Scent |
| Ingredient No 6 OXASPIRANE | Scent | Scent | SCENT | SCENT | Scent | Scent | Scent | Scent | Scent |
| Ingredient No 7 HEXALON | SCENT | Scent | Scent | Scent / Scent | Scent | Scent | SCENT | Scent | Scent |
| Ingredient No 8 CASHMERAN | Scent | Scent | Scent | Scent | Scent | Scent | Scent | Scent | SCENT |
| Ingredient No 9 AMBROXOL | Scent | Scent | Scent | Scent | Scent | Scent | SCENT | Scent | Scent |
| Ingredient No 10 BICYCLONONALACTONE | Scent | SCENT | Scent / Scent | Scent / Scent | Scent | Scent | Scent | Scent | Scent |

## b)        Participant response to the workshop questionnaire (qualitative)

Copy of Table 7.3-5 Research Project (III): Colour-coding of subjective scent-texture associations (p.232)

| Theme | Colour-Coding |
|---|---|
| Natural associations | |
| Synthetic associations | |
| Sensory qualities | |
| Cognitive associations | |
| Other / descriptive | |

Table A.7.3-8 Research Project (III): Scent-texture subjective associations

| Participant | Fragrance ingredients | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | No. 1 | No. 2 | No. 3 | No. 4 | No. 5 | No. 6 | No. 7 | No. 8 | No. 9 | No. 10 |
| P_1 | 2 Sequins | Bark Rough | 1 Chiffon 3 Metallic organza | 10 Suedette | 4 Organic cotton | 7 Puff-printed jersey | 8 Denim 6 Velvet | - | 8 Denim | Velvet |
| P_2 | 1 Chiffon | 9 Cotton twill | 1 Chiffon | 3 Metallic organza | 10 Suedette | 2 Sequins | 3 Metallic organza | 10 Suedette | 6 Velvet | 7 Puff-printed jersey |
| P_3 | Cheap Transparent | Fluid Sand-paper Jeans Cool Rigid | Soft Fluid Dry Light | Bubbly Synthetic Detailed | Jeans Rough Powdery Synthetic | Synthetic Elastic Fishy Cheap | Metallic Crispy Detailed | Soft Velvet Powdery | Simple Powdery | Silky Liquid Soft |
| P_4 | Needle Metallic Sharp | Wood | Crispy Silky | Elastic Synthetic | Plastic | - | Soft Sharp Alcohol | Velvet | - | Velvet |
| P_5 | Synthetic | Comfort | Velvety | Dry | Liquid | Dry | Cheap | Luxurious | Fishy | Rubbery |
| P_6 | Light | In between soft and rough | Airy, Faint Watery | Silky | Tough | Soft Textured | Airy | Soft Cold | Crispy | Fluid |
| P_7 | Jagged Woolly Vomit Knife | Voluptuous Powdery Alluring Seductive Rounded Velvety | Fish-scale Slippery Wet Fluid Chainmail | Sawdust Womanlike 7 Puff-printed jersey | - | 3 Metallic organza Silky Soft | Powdery 1 Chiffon | Cotton Soft Brushed cotton | Sticky Dirty | 1 Chiffon Shimmer Gauze |
| P_8 | Slimy | Thick Woody Dense | Soft Velvety Smooth | Synthetic Rubbery Solid | Thick Dense | Chic Expensive Sophisticated Soft Natural | Cold Flat Unsophisticated Rough | Woody Husky Powdery | Thin Stretched Synthetic | Smooth Soft Velvet |
| P_9 | Powdery Milky | Intense Weary Metallic | Crispy Sand-papery Cool | Sticky Soft Wet | Synthetic Cheap Stretchy | Delicate Silky Cold Synthetic | Velvety 1 Chiffon | Cottony Dry | Liquid Crispy Sharp | Rubbery White Fishy |

Table A.7.3-9 Research Project (III): Subjective participant associations with the ten synthetic fragrance ingredients

| Ingredient No 1 MARITIMA | |
|---|---|
| P_1 | egg white, semen, metal, ocean |
| P_2 | rubbing alcohol, side, hospitals |
| P_3 | fungus, bacteria, dirty |
| P_4 | - |
| P_5 | alcoholic |
| P_6 | a remedy used for small cuts |
| P_7 | toilet, bathroom cleaner; pine; acrid; alcohol |
| P_8 | neutral, flat, grey, light, cold, damp |
| P_9 | freshness |
| **Ingredient No 2 KOAVONE** | |
| P_1 | terpenic, pine, woods, forest, air |
| P_2 | pine, linseed oil, white spirit, wood varnish |
| P_3 | granny smell, tree smell, the tree you hang in cars |
| P_4 | old wooden box, mold, old house |
| P_5 | methanol |
| P_6 | forest |
| P_7 | parma violet sweets, lavender, flowery, floral |
| P_8 | Christmas, winter, eucalyptus, woody |
| P_9 | church |
| **Ingredient No 3 ISO E SUPER** | |
| P_1 | heaven, molten wood, sandalwood , cream |
| P_2 | deep earth, mille ice |
| P_3 | alcohol, soft |
| P_4 | - |
| P_5 | powder |
| P_6 | vague |
| P_7 | sea spray, breezy, fresh |
| P_8 | musky, soft, sexy, gentle, graceful |
| P_9 | old book |

| | **Ingredient No 4 FRUCTONE** |
|---|---|
| P_1 | tangy, bubble gum, fruity, juicy fruit, powdery, chalky |
| P_2 | burnt orange, bubble gum |
| P_3 | paint, sweet with lots of chemicals |
| P_4 | Tutti-fruity bubble gum, nail polish, industrial |
| P_5 | nail varnish |
| P_6 | paint, nail varnish, sweet |
| P_7 | solvent, glue, methylated spirit, wood glue |
| P_8 | playful, bubble gum, pink, synthetic |
| P_9 | chewing gum, pear |
| | **Ingredient No 5 GALBASCONE** |
| P_1 | "dr horrible's sweet factory", plastic hot vinyl, dry wood,  circular saw |
| P_2 | cut paper, recently sawn pine, cut fabric, toner cartridge, mechanical |
| P_3 | (car) gas |
| P_4 | paint factory |
| P_5 | bug killer |
| P_6 | fire, burnt |
| P_7 | smoky, strong, rubber, chlorine, mysterious-depth, can't reach |
| P_8 | sulphuric acid, Bunsen burner, excitement, anticipation |
| P_9 | burnt rubber, bit of wood |
| | **Ingredient No 6 OXASPIRANE** |
| P_1 | leafy, cut, wax, mint, point, sharp, intense, cool-sweet, camphor, |
| P_2 | moth balls, methylated spirits |
| P_3 | chemical, still somehow like gas, more powerful |
| P_4 | green geranium |
| P_5 | Frankincense |
| P_6 | vegetal |
| P_7 | pearly, silky |
| P_8 | neroli, flowers - geranium, pleasant, sensual |
| P_9 | mint |

| Ingredient No 7 HEXALON | |
|---|---|
| P_1 | clouds, fluff, vanilla, powder |
| P_2 | liquid glucose, vanilla sugar |
| P_3 | sweet, bubbles, synthetic |
| P_4 | magenta, white flowers |
| P_5 | labs |
| P_6 | reminds of scent No 3 [Iso E Super], bit of alcohol |
| P_7 | marker pen |
| P_8 | medical, chemical, injection, alcohol |
| P_9 | violet |
| **Ingredient No 8 CASHMERAN** | |
| P_1 | hot earth, sunshine, terpene / pine, Alien Mugler |
| P_2 | damp carpet / adhesive, damp vegetable, matte, mouldy |
| P_3 | flowers - plants - bacteria |
| P_4 | corn / damp / autumn |
| P_5 | Parisian perfumes |
| P_6 | fresh, woody |
| P_7 | flighty, floral, swift, pink, coral, soft, fruity |
| P_8 | Playful, teasing, Paris |
| P_9 | suits, men, black, serious |
| **Ingredient No 9 AMBRINOL** | |
| P_1 | pissy, faecal, civet, musty, damp, toilets, chlorine, fishy |
| P_2 | rot, musk, fox pee |
| P_3 | toilet, shit, awful, filthy |
| P_4 | bad mouth smell |
| P_5 | toilets |
| P_6 | mothball, neftalene |
| P_7 | colostomy bag, decay |
| P_8 | damp wall, caves |
| P_9 | bleach, mould, cleaning products |

| Ingredient No 10 BICYLONONALACTONE | |
|---|---|
| P_1 | cotton, tonka, coumarin, bitter almond, hay, tobacco, cherry vanilla, desiccated coconut |
| P_2 | carpet with pee, amarone, sour cherries |
| P_3 | lily of the valley, fresh, spring |
| P_4 | manuka honey |
| P_5 | rubber |
| P_6 | musky, unrinous, fox / animal urine |
| P_7 | honey, lavender, syrupy, sunshine |
| P_8 | sweet, soft, heady, too sweet |
| P_9 | coconut, vanilla |

## c)        Participant observation via photographic evidence

*All images in this section were taken on 15th September 2014 at Kingston University London, and are courtesy of Ezzidin Alwan from the Web & Multimedia department at the University.*



Image 1 Affinity



Image 2 Affinity

Image 3 Neutral



Image 4 Neutral

Image 5 Affinity



Image 6 Affinity

Image 7 Neutral



Image 8 Neutral

Image 9 Neutral



Image 10 Neutral

Image 11 Neutral



Image 12 Aversion

Image 13 Affinity



Image 14 Affinity

Image 15 Neutral



Image 16 Neutral

Image 17 Neutral



Image 18 Affinity

Image 19 Neutral



Image 20 Neutral

Image 21 Affinity



Image 22 Affinity

Image 23 Affinity



Image 24 Affinity

Image 25 Neutral



Image 26 Affinity

Image 27 Affinity



Image 28 Affinity

Image 29 Aversion



Image 30 Neutral

## 7.3.2  Data Set Two: T-shirt designs

Table A.7.3-10 Research Project (III): Selected fragrance ingredients for T-shirt designs

| Partici pant | Chosen ingredient | Molecular code | Size | Colour applied to molecule symbol or the T-shirt background |
|---|---|---|---|---|
| P_1 | Ingredient No 8 CASHMERAN | $C_{14}H_{24}O$ | Male XL | molecule |
| P_2 | Ingredient No 3 ISO E SUPER | $C_{16}H_{26}O$ | Female L | molecule |
| P_3 | Ingredient No 10 BICYCLONONALACTONE | $C_9H_{14}O_2$ | Female S | T-shirt |
| P_4 | Ingredient No 7 HEXALON | $C_{14}H_{22}O$ | Female XS | Molecule |

| Partici pant | Chosen ingredient | Molecular code | Size | Colour applied to molecule symbol or the T-shirt background |
|---|---|---|---|---|
| P_5 | Ingredient No 3 ISO E SUPER |  $C_{16}H_{26}O$ | Female M | molecule |
| P_6 | Ingredient No 8 CASHMERAN |  $C_{14}H_{22}O$ | Female L | T-shirt |
| P_7 | Ingredient No 8 CASHMERAN |  $C_{14}H_{22}O$ | Male M | molecule |
| P_8 | Ingredient No 4 FRUCTONE |  $C_8H_{14}O_4$ | Female M | T-shirt |
| P_9 | Ingredient No 4 FRUCTONE |  $C_8H_{14}O_4$ | Female L | T-shirt |
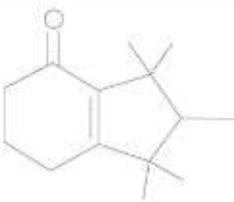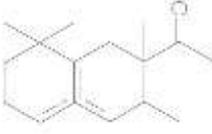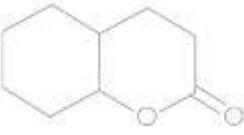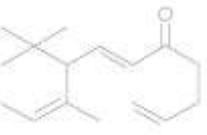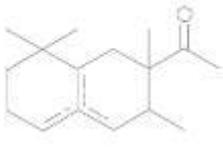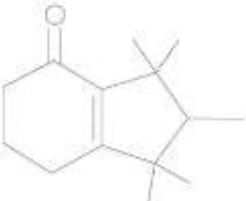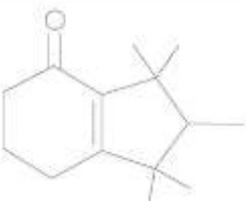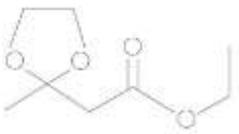
### 7.3.3 Data Set Three: Participant feedback of public response to the 'scented' tees

a)      Participant feedback of public response to the 'scented' tees: Post-workshop questionnaire (quantitative)

Table A.7.3-11 Research Project (III): Participant feedback from post-workshop participation (quantitative)

| Question | Choice | Response count |
|---|---|---|
| **Q1. Are you happy with your T-shirt design?** | Very satisfied | 4 |
| | Satisfied | 2 |
| | Neither Satisfied nor Dissatisfied | 1 |
| | Dissatisfied | 0 |
| | Very dissatisfied | 0 |
| **Q2. How often have you worn your T-shirt?** | Often | 2 |
| | Sometimes | 3 |
| | Seldom | 2 |
| | Never | 0 |
| **Q3. Where have you worn your T-shirt?** | At home | 5 |
| | At work | 2 |
| | In the college / university | 0 |
| | In cafes / pubs / bars / restaurants / clubs | 3 |
| | In the gym | 3 |
| | For business | 0 |
| | At parties | 0 |
| | On holiday | 3 |
| | Other (please specify) | 2 |
| *Comments:* | | |
| "In the park" x 2 | | |

| Question | Choice | Response count |
|----------|--------|----------------|
| **Q4. Have people reacted to your T-shirt?** | Yes | 7 |
| | No | 0 |
| | Don't know | 0 |
| **Q5. Has your T-shirt engaged people in a conversation?** | Yes | 5 |
| | No | 2 |
| | Don't know | 0 |

## b) Participant feedback of public response to the 'scented' tees: Post-workshop questionnaire (qualitative)

Table A.7.3-12 Research Project (III): Colour-coding of public response to the 'scented' tees

| Theme | Colour-Coding |
|---|---|
| Affinity | |
| Neutral, i.e. descriptive | |

Table A.7.3-13 Research Project (III): Participant feedback from post-workshop participation (qualitative)

| Question | Responses |
|---|---|
| **Q6. What comments have been made about your tee?** | I was asked what the molecule was on my shirt, and was able to explain that it was Cashmeran, and its use in perfumery. I was also asked if I was a scientist. This surprised a few people who didn't realise "chemicals" were used in perfumes, but then I got to engage them in the myth around nature vs chemical, and how everything is a chemical. I guess I have a somewhat unique place in that I already understood the molecule and its place in perfumery, so it didn't change my understanding of synthetic fragrance at all. |
| | No discussion as such, just curious where I'd bought it from. |
| | What is it? Does the t-shirt smell like that? |
| | I asked them what they thought the design represented, they tried to guess and then I told them what the molecule meant |
| | One person asked if it was a chemical formula for a bomb - I told them about the prevalence of synthetic scents. Another person asked what the scent smelled of, and whether it was in the T-shirt itself. I couldn't remember exactly the keynotes scent I had chosen, but tried to describe it from memory. |

# A.A  Post-research: *The Emo-T*™ *Global Wall* in collaboration with MindRheo®

*MindRheo*® is the brain-child of Dr Melanie Flory, founder of *PeaceHelix* Ltd., a company innovating neural technologies.  It is a neurocognitive-based educational and training programme which enables people to unfold new personal, professional and global realities.  The *MindRheo*® team are currently invested in the development of a range of mind-training services and products that help to consciously address and activate neural plasticity with a view to actualising changes in the brain.  The role of specific states of consciousness and deliberate engagement with these states is a key component in accessing new potentialities and unfolding new capabilities for groups and individuals.

The researcher was invited to join the *MindRheo*® team specifically because her work on probes has inspired a new product range for the company, e.g.:

a) Designing probes for pre-hypotheses testing and formulation;
b) Developing materials and toolkits that provoke engagement of specific neural networks.

The *Emo-T*™ *Global Wall* is a fun, participatory, and educational project to inspire the practice of exercising conscious emotional choices that feel good, wise, better, and beyond past and 'typical' emotional responses that individuals and groups are seeking to change.

The following is a collaborative poster that the researcher presented at the 2015 British Neuroscience Conference in Edinburgh (Scotland), to elicit response and engagement from related science and industry community.
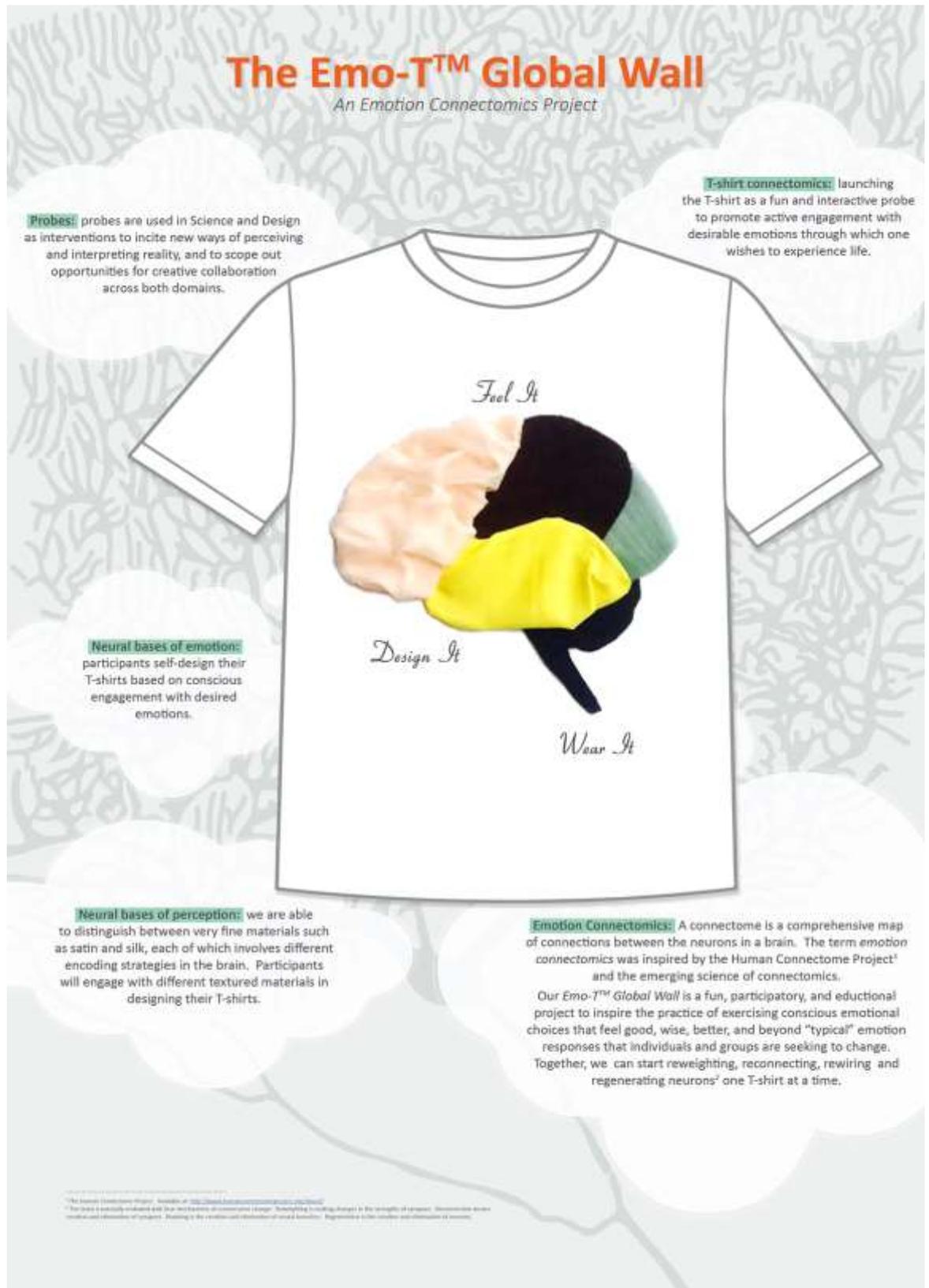
Figure A.A-1 Post-research: *The Emo-T™ Global Wall*. Poster design by the author, April 2015