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Woven Cultural Probes as Enablers for Multisensorial Design and Collaborative Practices.

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Abstract: The importance of addressing and activating some or all human senses while engaging with digital products has been established: designers offer haptic feedback in digital games, implement aural ways of enabling visually impaired users to navigate a website or interactions with products or services in varying light or colour settings. There is nonetheless little research yet as to how designers of products and services working mainly digitally – and not generally exposed to multisensorial engagement in their work – might be motivated to bring such experience into their work, and what benefits might result therefrom. The presented research aims to help fill this gap by proposing that the engagement of the human senses with woven objects as cultural probes can stimulate new, collaborative ways of experiencing, thinking, and creating in the research and design processes of designers who mainly work in digital environments, e.g., service or interaction designers.

Keywords: Craft, Cultural Probes, Multisensorial Design, Collaborative Practice, Weaving

1. Introduction

The senses are an essential part of our daily lives. They provide our awareness and understanding of everyone, and everything (Velasco & Obrist, 2020) be it when we follow traffic signage with our eyes, taste food, smell scents of a flower, listen to music, or feel our clothes on our skin. Biological and neurological research on the human senses has confirmed their importance for how we navigate our lives, learn new things and progress in our work as they create experiences for us, woven together by our brain's dexterous responses (Cerf in Velasco & Obrist, 2020).

Design offers potential to actively stimulate these senses (Cerf in Velasco & Obrist, 2020, Schifferstein, 2011), e.g., the sound of electric cars is designed (MacDonald et al., 2020) to recall that of a conventional car. Alertness to the senses is also evident in multisensorial exhibitions created by artists to sensorially stimulate visitors (Robertson et al., 2019) in which they can immerse themselves into experiences of touch, colours, and sound (Baum & Leahy, 2020). Technological development is

bringing ever more constant interaction with the digital (Velasco & Obrist, 2020). This will become even more commonplace with new technology that can transmit sensory information (e.g., to create seamless experiences in Extended, Augmented or Virtual Realities (Maier et al., 2020)). Designers play an integral part in creating interfaces for these environments. These include wearable interfaces such as virtual reality headsets (Maier et al., 2020) or smart textiles that transmit sensorial information and responses such as temperature or pressure changes (Guler et al., 2016; Tepe, 2021; Velasco & Obrist, 2020).

The above might convey the impression that design practices are closely involved in multisensorial design. Observations conclude that many of today's design disciplines operating in digital environments (e.g., Interaction and Service Design) primarily focus on the visual aspects of design and neglect most of the other senses during the design process (Devendorf et al., 2020). Most products, services and experiences do not appeal to or employ senses other than the visual sense (Lupton & Lipps, 2018), excluding e.g., those who need to use other senses to make their way in the world.

1.1 Craft, Design and The Senses

This section looks at craft practices that could be integrated in digital design, as a possible source of knowledge about the senses, and likewise the sort of practice that could help (digital) designers engage more sensorially, thus defining an interface between craft and design where this research is situated (see Figure 1, the highlighted area is the focus of this research).

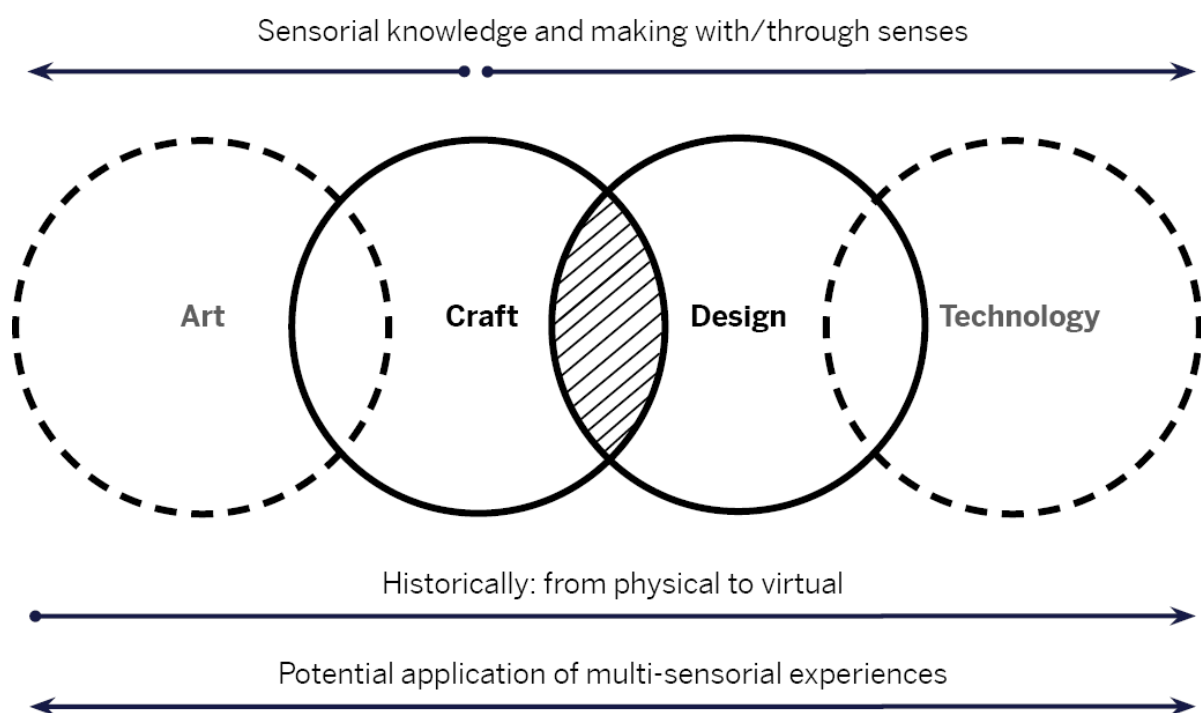


Figure 1. Contextual situating of the research (adapted and extended from Oaza Art and Design Organisation, 2020, p. 13) within the art-craft-design-technology spectrum of disciplines.

Craft is represented by objects made by craftspeople such as potters or weavers and as the “skilful making of things by hand” (Ings, 2015, p. 181), based on long appropriated experiences (Tsaknaki, 2021, p. 39). Adamson (2007) highlights the distinct sensory attributes materials can communicate to the maker of objects and the user: He outlines that in any craft, all of the creator’s ‘thinking’ and ‘making’ processes (and the usage of those by a user) benefit from having all senses engaged. From a design perspective, Devendorf et al. (2020) and Groth (2016, p. 1) critique that the ‘making’ of a

design idea is often left to later stages in the design process, separating craft from the ‘thinking’, while highlighting the impact of craft practices in terms of material exploration or enhancement of product usability.

Petrecu et al. (2015, p. 985) report that textile “designers use tactile exploration to simulate concepts and support the creative process”, and Groth (2016, 14,16) confirms that “body and sensory experiences” through “physical touch” play an important role in the “sense-making process” for design projects. Weaving and craftspeople in general share a strong sensorial expertise and utilization in their work (Devendorf et al., 2020; Tsaknaki & Fernaeus, 2016). This research was instrumental in the decision to use woven cultural probes (Gaver et al., 1999) as sensory objects of “craft”.

This study analyses to what extent the sensorial engagement with woven cultural probes may stimulate digital designer’s responsiveness to sensual influences in the design phases, resulting in a stronger capacity to work beyond the visual (Lupton & Lipps, 2018) and thus impact a designer’s way of design thinking and the process of designing digital products or services.

2. Methodology

The research builds on (a) secondary research (as outlined before), (b) the creation of woven textile probes guided by secondary research findings and a weaving master, and (c) action research to develop the final study execution protocol through iteration and learning.

2.1 Preliminary Study: Creation of Woven Textile Probes

A further important link between craft, design and the senses can be found in the weaving workshop of the Bauhaus school of design. Otti Berger (1898 – 1944), a student and teacher in the weaving workshop at the Bauhaus Dessau, developed an eminent focus on tactility and the sensory of fabric, inspired by her teacher László Moholy-Nagy (Varga, 2017). In her 1930 article ‘Stoffe im Raum’ (‘Fabrics in Space’), she writes a convincing pledge for the importance of tactile experience in the weaving practice: “[...] a fabric needs to be grasped [...] for one must listen to the fabric’s secrets, track down the sounds of materials...” (Berger, 1930, 143,145; English adapted from T’ai Smith’s translation (Smith, 2014, p. 97)). Her considerations on the sensorial qualities of textiles and materials acted as a guideline to create the woven cultural probes for the study, an autoethnographic effort (Groth, 2016) by the author (see figure 2). The probes, including material selection and the weaving itself, were done by the author in the spring of 2021 under the guidance of a master weaver in Germany.

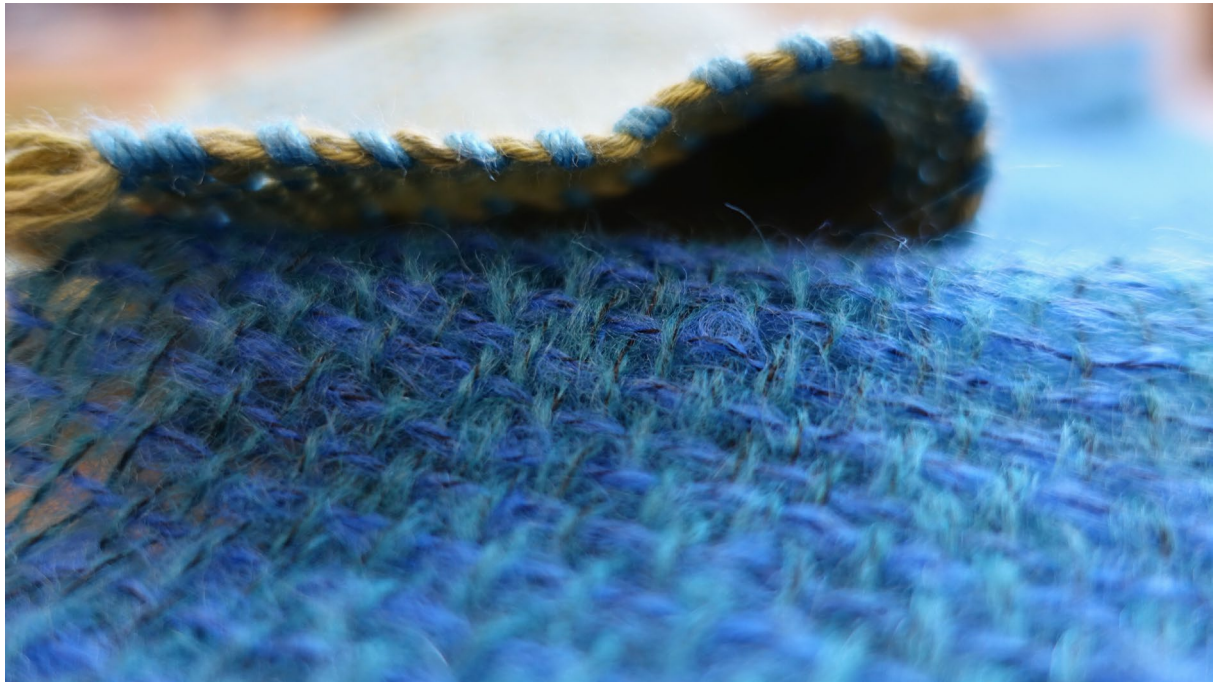


Figure 2: Two textile probes from the autoethnography study, which reflect the sensorial qualities described by Otti Berger: one woven from soft, shiny yellow silk with a bright blue cotton; the other a light, airy mohair in varying blue colour. Photo by Alexandra Matz.

The support of the weaving master and the open communication in the weaving studio influenced the decision to plan for a workshop format for public engagement and cultivate in the workshop an open atmosphere conducive to the sharing of thoughts and collaboration.

2.2 Empirical Study: Engagement Workshops with Designers

The goal of this main phase of the research was to analyse the extent to which the craft probes might stimulate a designer's sensual awareness, triggering changes in design thinking, process, and outcome; and, secondly, whether this results in a stronger leaning towards multisensorial design beyond the sole use of vision as a mode of interaction (Lupton & Lipps, 2018). The main study was conducted in a workshop setting, in summer of 2021. The key activity in the workshop was the sensorial exploration of the woven cultural probes by the participants.

Research Design

The research was designed according to the action research method (Swann, 2002), with constant reflection built in (see Figure 3) and required to determine the right study protocol and workshop setting. It encompassed a series of 2.5 hour virtual and in-person workshops, with participants recruited on the grounds that their mode of work was digital (see Table 1).

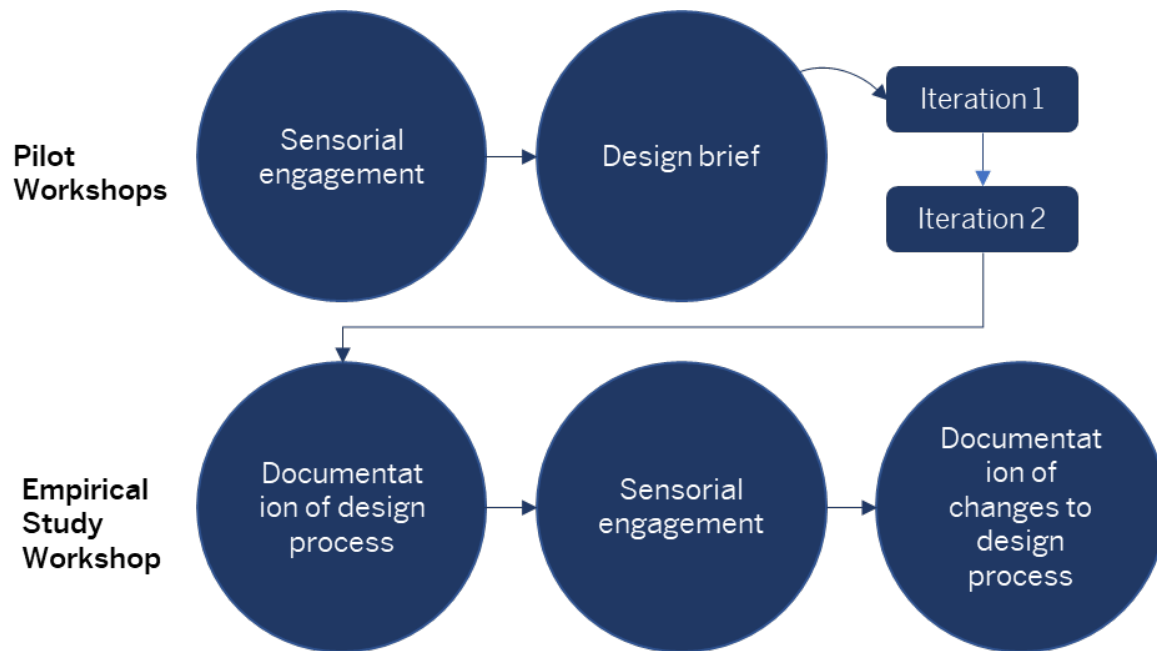


Figure 3: Overview of research design implementation with iterations after each research study unit's iteration Sequence of Main Study process, including iterations within the Action Research method.

Table 1. Overview of participant numbers and demographics.

No.	Workshop	Form of Delivery	Number of Participants	Participant's Main Residence (Number)	Design Discipline
1	Test workshop	Virtual	n=3	England (2), Italy (1)	Design students (Master's level)
2	Pilot1	Virtual	n=3	China (2), Thailand (1)	User Experience (UX) Designers
3	Pilot2	Virtual	n=3	Germany (2), Switzerland (1)	UX Designers
4	Main workshop (empirical study)	In-Person (Croatia)	n=7	Croatia (5), England (1), Italy (1)	1 Graphic Designer 1 UX Designer 2 Industrial Product Designer 2 Digital Editorial Designer 1 Creative Director

Sensorial Engagement

The sensorial exploration envisaged drew on Nithikul Nimkulrat's "material inspiration workshops" (Nimkulrat, 2010, pp. 78–79). Participants were encouraged to engage with their senses and share their experiences through a "verbal description of cognitive and experiential processes" (Petreca et al., 2015, p. 983).

Participants of the (virtual) pilot workshops were asked to bring own textiles that resemble the same characteristics of the woven textile probes. They were tasked to interact with their own textiles freely for three minutes to familiarize themselves with the situation and allow for an open-discussion atmosphere. Thereafter, in four separate units, they were asked to engage with their textiles using

the sense of (a) touch, (b) vision, (c) smell and (d) hearing. In each workshop, the order was changed to understand whether sequencing might play a role in the depth of the sensorial exploration. Following the sensorial engagement with the textiles and a detailed report about each participants' experiences, the participants were tasked to jointly work on a design brief prepared. Upon reaching a time-limit, participants were invited to share their experiences in the design process in relation to the sensorial engagement.

While the sharing of participant's sensorial experiences contained valuable insights, the work on the design brief could not deliver reliable results, as a before-after comparison was not possible to understand effects of the sensorial intervention. Further, participant feedback revealed that the design brief was too generic and thus created a learning curve for them. The change of the design brief for the second iteration of the workshop only helped marginally.

The main empirical study, conducted in person (n=7), thus had to employ a different study protocol.

To allow an analysis of possible effects of the sensorial intervention, an aspect of temporality was introduced to reconfigure the study as a 'before-and-after' analysis (Robson et al., 2001). This decision also addressed a significant problem that became apparent in the pilot workshops' analysis: it was hard to generate a response to the research question as the comparability of contexts and data was not rigorous (Esser & Vliegthart, 2017).

Based on these reflections, the main empirical research workshop flow was adapted to a before-after experiment setup:

1. Before the intervention:
Participants were tasked to document (map) their design process
2. The intervention:
Sensorial Engagement with woven cultural probes
3. After the intervention:
Participants were tasked to revisiting the design process from (1) and document any changes

Ad 1. Before the intervention: "Mapping your design process"

Participants were asked to document the design process of a recent project largely conducted digitally. Before the workshop they were briefed to re-familiarize themselves with this project simply to prepare themselves to share this in an unfamiliar environment and with a new audience (Laamanen & Seitamaa-Hakkarainen, 2014). No information was given about what was coming, including the focus on multisensorial research, to minimize risk of "participant response bias" (Dell et al., 2012, p. 1321), where participants who are over-informed become disposed to confirm a researcher's hypothesis. The form of a user journey map (Endmann & Keßner, 2016) was presented as guidance for the participants to adhere to when documenting their process.



Figure 4. A workshop participant documents her design process before the intervention. Photo by commissioned photographer Marija Gašparović.

Ad 2. The intervention: Sensorial engagement, group sharing of experiences and documenting these on the sensorial map

The woven cultural probes and a sensorial diary template (see figure 5) were introduced and handed over in a silk-screen printed tote bag as precautionary measure in the context of the Covid-19 pandemic. It was emphasised that participants should focus on their role as designers as they interacted with the textiles.

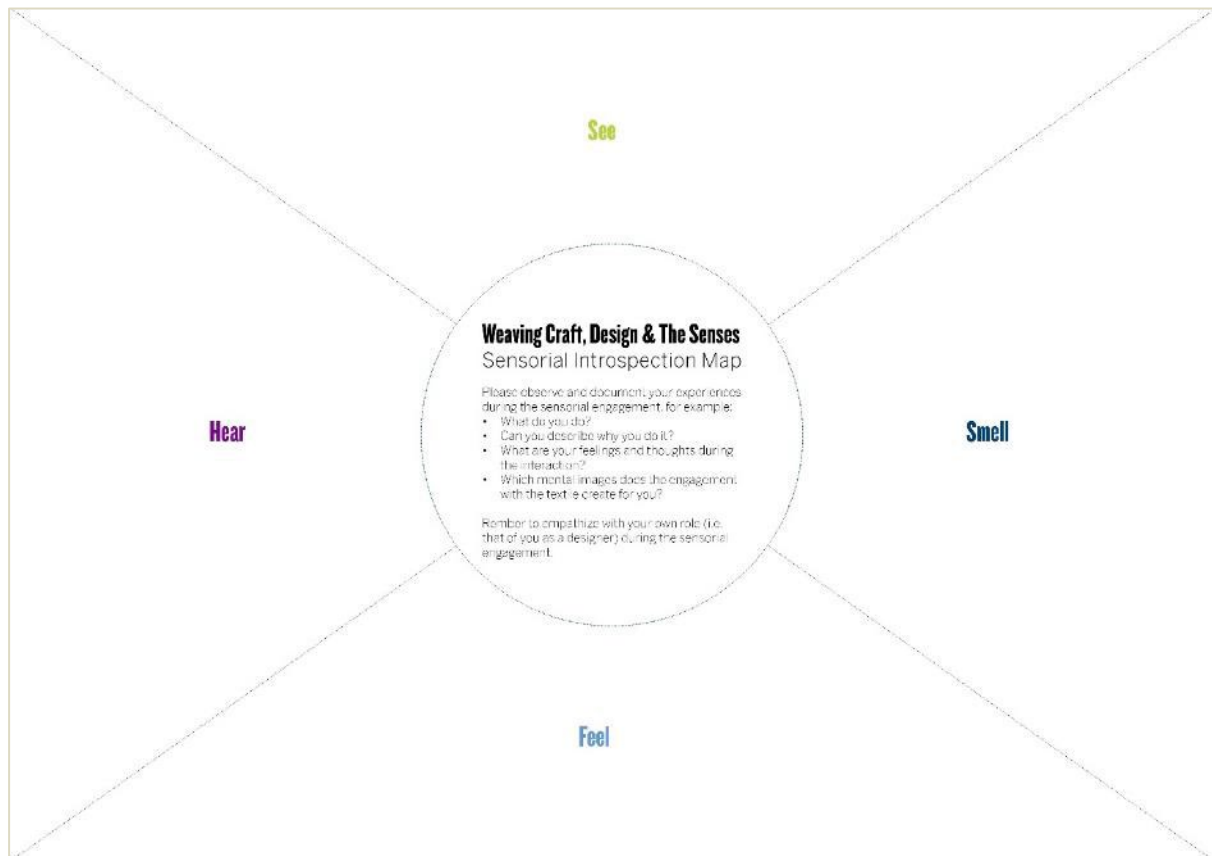


Figure 5. Template for the documentation of participant's sensorial experiences, designed by the author



Figure 6. A participant engages with the shiny-soft textile probe using her sense of touch. Photo by commissioned photographer Marija Gašparović.

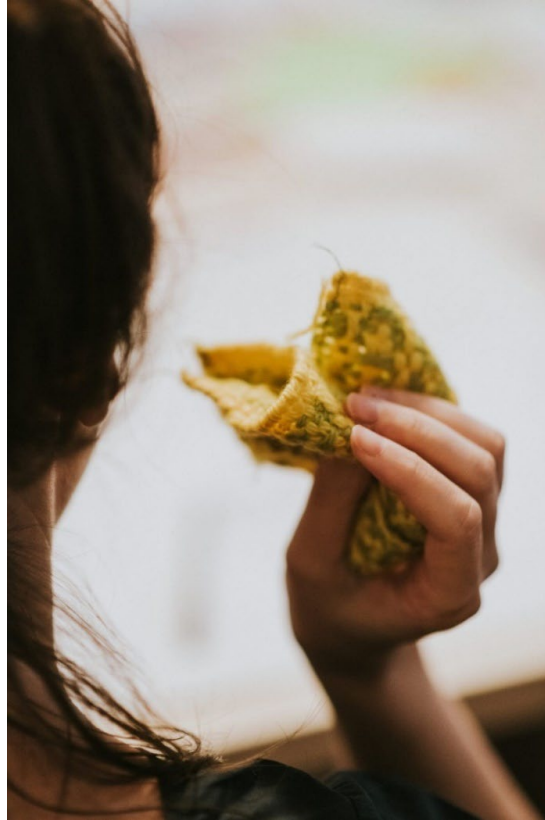


Figure 7. A participant engages with the brightly coloured, woollen textile probe using the sense of sound. Photo by commissioned photographer Marija Gašparović.

Ad 3. After the Intervention: Revisiting the design process

After the intervention, the participants were tasked with noting any change of plan or new ideas that they envisaged implementing in their design process. This allowed for a delta-analysis of participant's design processes before and after the (sensorial) intervention.



Figure 8. A participant documents changes to the pre-recorded design process after the sensorial intervention, while still in tactile engagement with the textile. Photo by commissioned photographer Marija Gašparović.

2.3 Analysis

As a first step, a quantitative analysis undertaken to ascertain where in the design process most changes were recorded after the sensorial intervention.

Participant's processes and documentation varied. To create a basis for comparison, standardized phases of design processes were used: "Analyse", "Define", "Design", "Finalise", "Implement", as defined by Bobbe, Krzywinski and Woelfel (2016, p. 1212). These labels were then used to give a framework for the degree of emphasis the participants allocated to each phase of their process: the more activities were described, the stronger the emphasis was anticipated (1=low, 2=medium, 3=high). The individual content of the documented activities was not rated to ensure comparability.

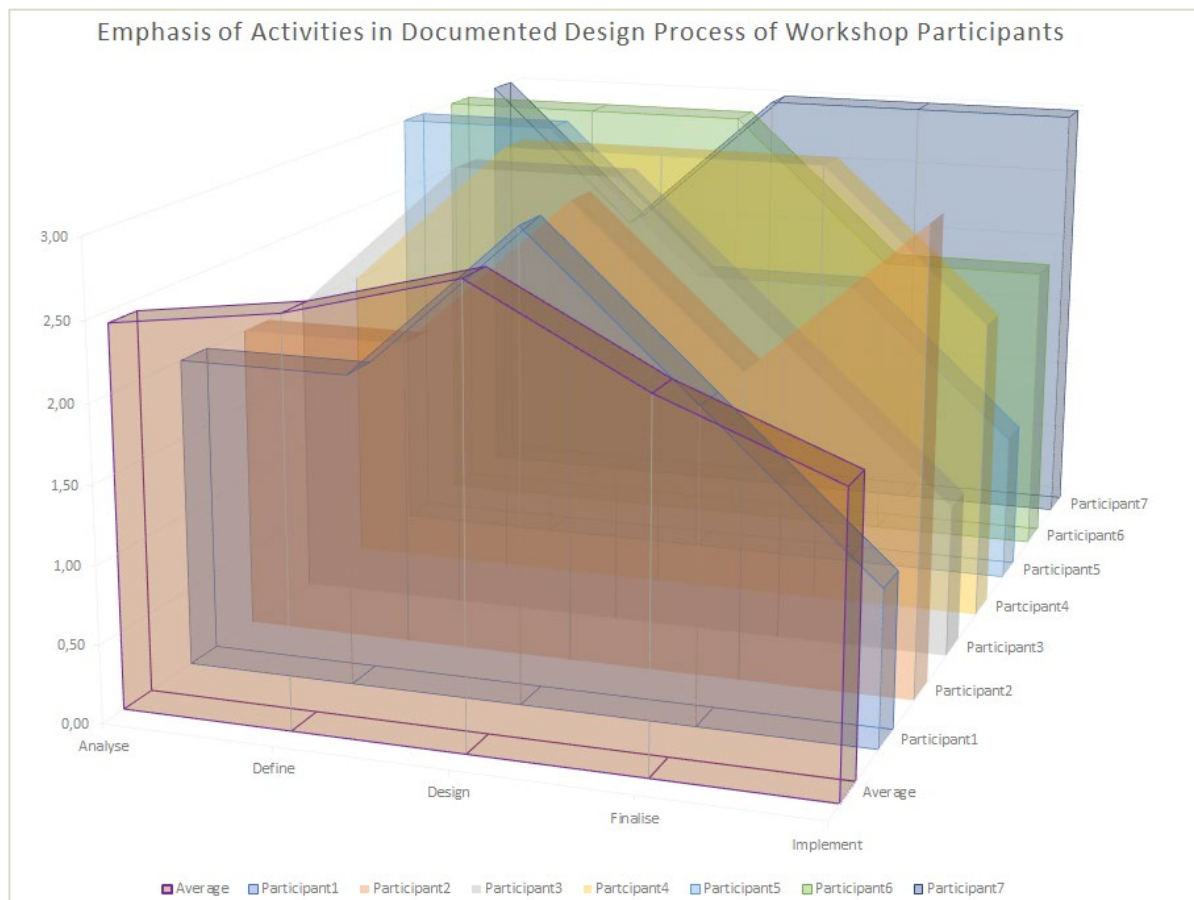


Figure 9. Emphases of designer's activities in the standardized design process phases.

The analysis shows that most participants gave comparable emphasis to all phases, except for implementation. The strongest emphasis is found in the Design (average: 2,86) and Define phases (2,57), closely followed by Analyse (2,43) and Finalise (2,29). Implement shows the least emphasis (1,86).

The next step was to look at the pattern before and after the intervention. The documented changes were assigned to the relevant phases and charted.

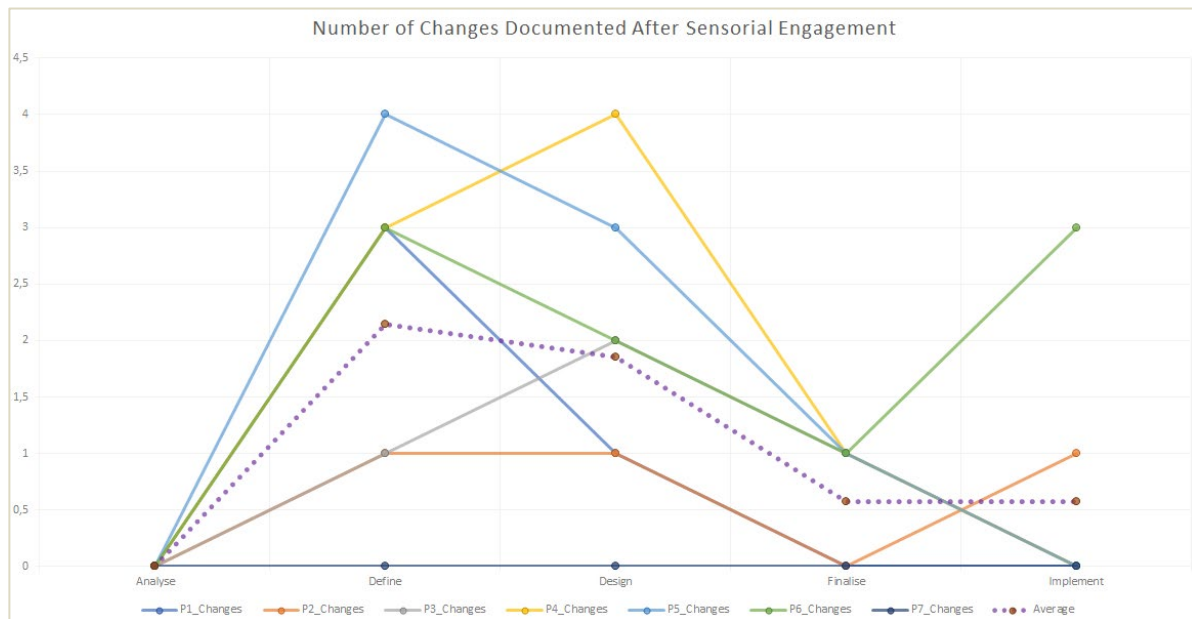


Figure 10. The number of changes documented by participants after sensorial engagement.

Most changes were recorded in the Define (average: 2,14) and Design (1,86) phases, which would suggest that the workshop method might be particularly useful for these design-process phases. Participant 7 recorded no changes after the sensorial engagement. In a post-workshop discussion, the participant noted exhaustion as a reason but also offered valuable critique during the workshop. For this reason, their results were not regarded as anomalous.

Qualitative analysis of the recorded changes

Also undertaken was a sticky-note based, iterative affinity mapping (Gkatzidou et al., 2021) of the recorded changes across all participants where several iterations of mapping revealed common themes. Amongst others, the following key themes emerged (see table 2). They strongly suggest that the sensorial intervention stimulated designers to reflect on their design process and envision different activities with a wider range of sensorial aspects.

Table 2. Key findings (themes), derived from the main empirical study.

Theme	Exemplary Responses (TP=Participant)	Notes
Creating empathy for others through sensorial mapping	TP5 specifically focused on this aspect for the Define phase and added the sensorial engagement exercise to her list of changes to “extract feelings people have while experiencing [a product]” and to use “senses to help a person elaborate choice, opinion, needs”.	This confirms that the recording of one’s own sensorial experiences could be a valuable addition for user-research activities
Senses as a source of design inspiration	This relates to changes recorded by participants concerning an extension of existing methods of inspiration gathering, which were reported as being mainly visual (TP 3, 4 and 5). A key example was the extension of the idea of the visual mood board (TP3) to include sound, touch and smell.	This offers a recommendation which can be communicated to other designers as best practice

	TP4 envisioned “brainstorming through engaging with materials” as a method of inspiration, but also in researching context or building prototypes (e.g., “making a physical model [even] when rendering in a 3D software”).	This relates to “thinking through making” described earlier and shows an understanding that making and sensorial engagement can contribute positively to the design process.
Including senses as characteristics in the specification of the design direction	TP3 envisioned that senses or sensory characteristics should be taken into consideration when choosing or testing a design direction: “choose (one or two) important senses for [a] project”. TP6 noted that a certain form of “sensibility” could be set as a “criteria for design” - for example “visual representation”.	This offers an interesting connection to results found by Vuillemot and others in their research on boundary objects, in which their “structuring artifacts” helped participants “setting design parameters and narrowing the design space” (2021, p. 355)
(Sensorial) Immersion during research	The sensorial intervention motivated TP5 to “see how people are immersed” when conducting user research, while TP2 would use “place of immersions, [like] walks, a choir, exhibitions, swimming pool”.	This resembles a form of 360-degree research, like TP6’s comment on “learning about [the] subject by visiting and seeing the [archive’s] collections”.
Revisiting one’s own design process / Refocussing one’s own mindset and viewpoints during the design	Four participants added additional activities into their process expressly to iterate and review their process and use a sensorial intervention (e.g., as opposed to “using too much brain for thinking about solutions” (TP5)). TP1’s recommendation “don’t take things for granted, question yourself” contributes to this self-reflective aspect.	This confirms Stacey and Lauche’s observation that “designers [...] reformulate the design problem, to add structure and to recast it” (2005, p. 213).
	Relatedly, TP6 documented changes which did not necessarily mention the senses but are new thoughts on additional steps or activities in the process.	This prompts the observation that the presented method can stimulate a designer to revisit their activities in the design process. It thus extends Stacey and Lauche’s finding that some “design methodologies encourage designers to look for a range of possible alternatives designs” (2005, p. 218) that were initially overlooked.

3 Discussion

The focus of the analysis has been placed on the changes documented in participants’ design process within the framework of the sensorial intervention study. The study was devised as a way of illuminating the research question: **To what extent can sensorially engaging with woven cultural probes impact a designer's process of designing digital products or services?** Nevertheless, the sensorial interventions revealed important ancillary findings too, and help draw an overall picture of how craft and design and their practitioners are interwoven with sensorial aspects.

Stimulating different thinking in design processes through woven cultural probes

The contributions from the study participants indicate that it is possible to stimulate designers to rethink and revisit their design processes, following a sensorial engagement with woven cultural probes. Petreca et al., in their research on how fashion, textile and costume designers engage with the sense of touch, noted that the “textile is present as an animator” (2015, p. 985). This research confirms this idea and carries their findings into other design disciplines, such as Product, Interaction and Service Designer where the work is largely realised in the digital environment.

The research yielded further very interesting findings which seem worthy of further research. For example, it points to the existence of a discipline-agnostic ‘language of senses’ and a way of ‘thinking through senses’ that weavers, textile designers and digital designers share. The rich narratives that dwell in this shared space spanning across disciplines contain a vocabulary that has the potential to support better articulation and implementation of sensorial characteristics in designed products and services. This research proposes that in the discussions about ‘thinking through making’, the focus on ‘thinking through sensing’ is equally valid.

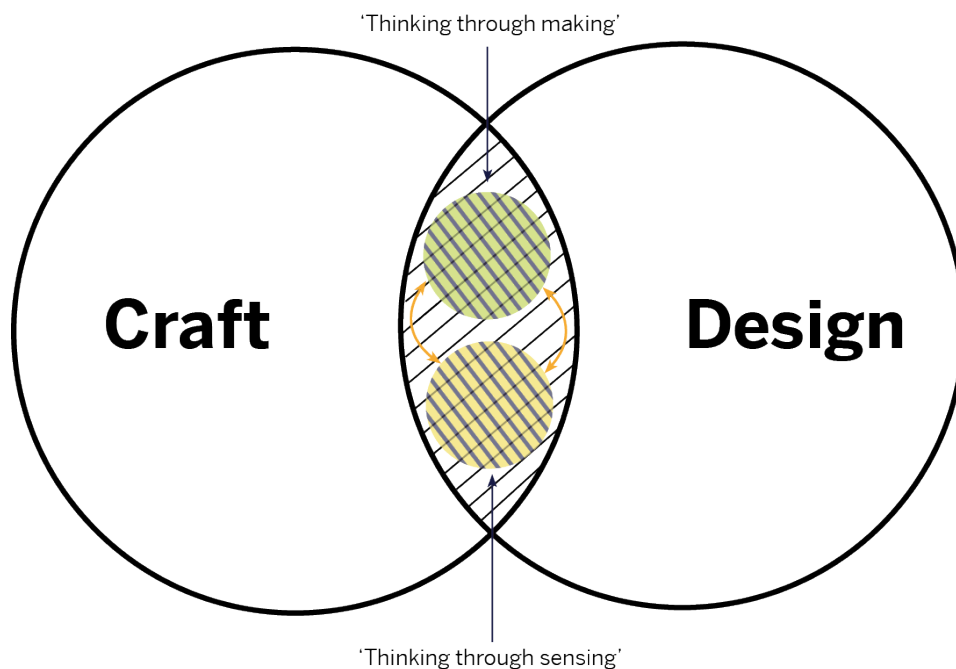


Figure 11. Contextualization of thinking through making and thinking through sensing as equally important players to connect craft and design. Design by the author.

The research has shown that the stimulation of changes in the design process were a result of ‘thinking through senses’ and indicates in this respect another important, collaborative link between craft and design. Future research might aim to bring further detail between the two.

Creating bodily awareness through sensitizing oneself utilizing sensorial introspection

This research suggests that sensorial intervention with woven cultural probes can help designers question and revisit the completeness of their activities within the design process. This encompasses aspects such as their own mindset, viewpoints about understanding their target group, sources of inspiration and design direction.

It is important to highlight that the key goal of sensorial engagement has as its first aim designers themselves, offering a form of ‘sensorial introspection’. The recommendation to designers is first to invest in this examination of one’s own senses before attempting to create empathy with a target

audience. It thus extends existing, critical discussion of widely practised strategies for gaining empathy in design, for example as discussed by Bennet and Rosner (2019) or Heylighen and Dong (2019) who posit that “in order to take the affective perspective of another, the designer must also take the bodily perspective of the other” (2019, p. 118).

4. Limitations and Considerations for Further Research

The limitations of the study are mainly related to sample size as well as the demographics of participants.

The sample size of the empirical study with $n=7$ was to provide a valid response to the research question. To provide more robust data, the workshop design and its findings should be validated in further iterations and greater geographical variance. None of the participants identified having a disability or impairment. Due to participant cancellations, 100% of the attendees in the empirical study were female. Future recruiting should thus incorporate a stronger gender balance and include participants with disabilities.

A limitation - yet also a source of potential future research - was the size and weight of the cultural probes. As in-person workshops were not always possible due to Covid-19, further research might investigate the potential of shippable sensorial introspection kits.

While the research focussed on woven textiles as cultural probes, future research plans to extend this to other crafted objects, which could be presented as a set of crafted cultural probes in a ‘sensorial introspection kit’. This offers strong potential for further craft-design collaboration in which both craftspeople and designers could co-create these probes. This could also strengthen the observation that the sharing and the utilization of the woven objects which cannot transmit the tacit and embodied knowledge of the making process (Devendorf et al., 2020) triggered the interest for a close collaboration with craftspeople who, a limitation, were not present in the engagement workshops. Equally, there would be scope for experimenting with staging the workshops in more immersive settings - where, for example, light and sound might be altered to enrich the effects of the stimuli being sampled.

5. Conclusion

This research has explored the potential potency of woven objects to act as fruitful stimuli for increasing sensorial engagement in the design process. The valuable contributions of the research participants in the empirical study gave indications that the stimulation was initiated and that a rethinking of their own design processes took place.

A mixed methods approach was employed to respond to the research question and was able to draw on contextual knowledge about the craft of weaving by learning about weaving practitioners’ sensorial knowledge. Utilizing an action research approach allowed the empirical study to be finetuned based on insights gleaned from the pilot sessions. The value of iterative research manifested itself in the quality and depth of data collected and unveiled through several rounds of analysis.

The findings indicate that the workshop concept could be a helpful tool for designers to employ in their practice, both individually and in a team setting. By unpacking the participants’ experiences of sensorial engagement, after the sensorial intervention, their ideas and methods could be extracted and analysed and then proposed to the wider design community, extending existing strategies

towards a multi-sensual approach. The use of the workshop method as a sensorial introspection offers rich potential for a sensorially focussed immersion during the research and design phases.

While the research chose to analyse designer's individual processes, we have noted that the workshop creates a collaborative and co-creative environment that suggests an extension of the workshop. This allows the participant not only to document changes in their own design process but also to jointly grow ideas evolving during this process. Further, the findings suggest extending the study protocol to move from rather asynchronous and sequential collaborative actions, i.e., the creation of woven cultural probes, towards joint and sharing transdisciplinary actions.

Author's Note:

This research cites and uses the study and results of the author's master thesis (Matz, 2021).

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