interplay of Space & textiles

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abstract

This thesis explores the interplay between openwork textile and architectural space. Our research focuses on gaining an understanding of how mesh and netlike textiles can give shape to a spatial realm, regardless of size, and investigates what its unique characteristics and signifiers are in today’s world. Our exploration gives particular emphasis to examining the role of handmade in crafting spaces by scaling textile techniques. We find that amplifying textiles for spatial realms, produces strikingly diverse spatial structures that have effects of surprise and awe, while also enhancing cross-cultural familiarity and associations with textiles, such as intimacy, belonging and human connection. We argue that the slow and rhythmic motion of the hand and the powerful dialogue between thinking & making, have special relevance in a hectic and stressful world. The practice-based part of the thesis concentrates on developing a design proposal that builds on these elements and envisions a space through reimagining an ancient textile technique that we consider as endangered, notable bobbin lacemaking.

key words
- textile
- space
- hands-on
- handmade
- craft
- architextile
- lace
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Introduction

· LOOKING BACK FOR THE SAKE OF LOOKING FORWARD ·

‘Beginnings mean exploration, selection, development, a potent vitality not yet limited, not circumscribed by the tried and traditional. Going back to beginnings is seeing ourselves mirrored in other's work, not in the result but in the process’. These are the words of Anni Albers, former Bauhaus student and weaver from the past century (Albers, 1965). Albers was the first textile designer with a solo exhibition in 1949 in the Museum of Modern Art in New York. In this thesis we will take Albers’ suggestion at heart. With a similar passion for textile and crafting space, the practice of looking back for the sake of looking forward will run as a common thread through our research.

Textiles are deeply embedded in human history and have been part of mankind since time immemorial. People around the world have constructed fabric to make clothes and protect themselves and to decorate their surroundings. Due to its transience nature, most textiles have faded over time, yet archaeological findings in different parts of the world suggest that textile has always played an important part in people’s lives (Gillow & Sentance, 1999).
Textile, however, has been used throughout history not only as cloth to make garments but also as protective layers for shelter, to partition areas for example or to construct dwellings. Knowingly or unknowingly, people across cultures have entertained a longstanding relationship with textile and physical space. This thesis explores the interplay between textile and architectural space. We are interested in gaining an understanding of the diverse ways that textile construction is instrumental in defining surroundings and in enveloping areas.

**SCOPE OF THE STUDY**

We aim to explore the role of textile in giving shape to physical space. Our research objective is twofold. We will be looking at textile and its fabrication techniques in their form generating capacity, how they construct structures and give shape to a space. We like to know how textile envelopes a space, this will be our first angle. What are the unique structural and surface qualities that generate form and give rise to spatial textile-like structures? How does changing the scale of textile alter the perspective of viewers and users of space? When we refer to physical space in this document, we do so regardless of the dimensions of a space, which could be relatively small sized like for instance an urban pergola (Fort, 2018) or a hammock and alternatively can have much larger dimensions.

We will also explore the role of textile in defining space as a signifier, which is our second angle. We are interested in textile as a metaphor, as a carrier of cultural meaning or symbolic significance. What values can be transmitted through textile? What ideas can be conveyed? Textile touches on many aspects of people’s lives and represents a medium that has transcended centuries of knowledge and passed through generations of hands. It spans a world of collective meaning, cultural identification and personal emotion.
While researching openwork textile techniques, such as for instance crochet and lacemaking, we found that textile construction and craft are deeply intertwined. The fabrication of textile through various ways of interweaving (multiple) threads, is historically craft based. We also learned that craft today continues to play an important role in constructing textiles for spaces. This being the case and within the overall scope of the study, we decided to research in more detail what the role of the hand is in giving shape to forms and structures and wonder what the meaning or significance to consider the slow motion of the hand for contemporary purposes. Our research focus then encompasses an exploration of what the human hand can do in today’s highly technological world. Discussions on craft often entertain a romanticized view of craft or have been framed as the hand versus the machine (read: technologies), approaches and perspectives that we do not consider relevant for our purposes. Rather, we propose to orient our research question to examining if the active involvement of the hand in constructing spaces through textiles still makes sense and if so, why it matters in contemporary contexts. Within the overall scope of our research about the relationship between textile and physical space, we will orient our attention to discerning unique characteristics and contemporary relevance of hand-made textile for spatial surroundings.

Our investigation will seek to examine how textile as constitutor of physical space, also performs as a signifier. In other words, we like to gain insight into the question of what the relevance of textile expressions in the spatial realm has been, looking back, and looking forward: what the relevance is for today’s world. Our hypothesis is that textile has renewed significance for contemporary spaces.

The intersection of textile and space is a wide-ranging topic encompassing many fields and crossing various disciplines and produces interdisciplinary meshwork. The increasing prominence of this meshwork that is sometimes called ‘Architextiles’, is also the result of innovations in materials science and technology, that include high performance textiles, new materials technologies, advanced textile manufacturing processes and CAD technologies, researcher García (2006) notes. Concomitantly, there are very many ways that space and textile can intersect. We will narrow our scope of the study by focusing primarily on openwork textiles that create webleke fabrics and netlike forms and structures, require few tools to construct and that are predominantly handmade.

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*** METHODOLOGY ***

Our research methodology combines desk research with practice-based research and can be divided in two distinct phases accordingly. The first phase is based on a literature review that draws on architectural and anthropological research as well as contemporary craft and design studies. This part of our research also includes the study of contemporary references of spaces that have been envisioned through openwork textile. Through this review we aim to get an overview of how textile as a craft intersects with space and how this relationship has evolved. We also pretend to gain insights in our research questions about how textile craft shapes physical spaces and what sense (significance) this makes in today’s world.
The second part of the research methodology consisted of developing and conceptualizing our design proposal of a textile-like space which has been characterized by a hands-on orientation. Given that the field of openwork textiles is wide and spans various techniques, we have opted to orient our proposal to one openwork fibre technique in particular, notably bobbin lacemaking. Our aim was to design a contemporary space envisioned through lace.

The complexity and versatility of lace constructions, its visual capacity and its status of ´endangered´ textile, sum up our interest and motivation to focus on this ancient technique. Without any prior practice and in order to acquire first-hand and tacit knowledge about lacemaking, I decided to immerse in the realm of bobbin lacemaking as a novice in one of the Barcelona-based lace making associations. In so doing I opted for participant observation, an anthropological research method which anthropologist Tim Ingold (2013) describes as ´a way of knowing from the inside because we are of the world and we are part of its differential becoming´.

Over a period of several months, I managed to master the basics of lace techniques, gain rudimentary insight in lace design and began to explore its potentiality for spatial structures; this entailed experimenting with making three-dimensional pieces in lieu of flat two-dimensional ones.
The structure of the document follows the two research phases that we just described, and the document is divided in two parts accordingly. Part one has three chapters. The first chapter focuses on envisioning space through textile. This chapter looks back in history to get insight about the role of textile in physical space across time and also looks forward to textile being an innovator of crafting spaces. The following chapter zeroes in on the reflections about the role of the hand and discusses the relevance of what the hand can do in today’s world. The third and last chapter of part one presents case studies of contemporary spaces envisioned through openwork textiles that are predominantly handmade and discusses salient features and insights of the references that also inform our design proposal.

Part two focuses on the development of the design proposal of a space conceptualized and constructed through lace. This section has four chapters and begins with a brief presentation on what lace is and why we consider it relevant to put this ancient technique in the spotlight. The next chapter highlights considerations of different design theories that shape our thinking about contemporary design: we draw on Victor Papanek, the Actor Network Theory and Design for Social Innovation as a background for our proposal. In the subsequent chapter we present our design proposal named OUT OF HAND. The final chapter of part two details the design process that we followed.
part one envisioning spAce through textiles

In this chapter we will first define the meaning of ‘space’ and describe what is meant by ‘textiles’. We will then briefly look back in history to gain a basic understanding of the role that textile has played in inspiring and defining space and what meaning has been conveyed through textiles in relation to physical space over centuries. Within this context, we will also look at how textile making has been perceived and (under) valued for long because of its feminine associations.

**THE MEANING OF SPACE**

What seemingly and at first hand may be a simple term that is commonly used in design and architecture, space can have many different meanings and varying interpretations originating in more complex epistemological connotations. Space is about constructed environment.

When referring to space, quite readily physical properties and structural elements come to mind, including what material the space is made of, the scale and dimensions, textural qualities, lay-out, etc. When we look at space this way, we understand construction in an architectural built-like sense. Space, though, can also be seen as a construction that is more of a social rather than physical nature. According to Proshansky (1970) for instance, the physical environment that we construct is more a social phenomenon than a physical one. For Lefebvre, space is mediated and modified by social relations, while Lawson interprets space as settings which organize our lives, activities and relationships (quoted in Dursan, 2009).
At a more philosophical level, space can be considered as an ´a priori form´ that allows us to know our external reality. In space, we represent to ourselves the objects on which we act: that is where we determine their shape, their magnitude and the relationships between them. Space as form a priori structures the extent in which our own body moves, and objects are placed (Pellegrino & Jeanneret, 2009). In space, objects are not merely perceived by a reading of their respective properties, but gain meaning through the actions applied to them (Piaget quoted in Pellegrino & Jeanneret, 2009). Thus, space is also semiotic. In the words of Vitruvius: ´that which is signified and that which signifies´.

In brief, the shape of a space insinuates itself between what is contained inside and what is maintained outside; it is a threshold that expresses a relationship, not merely a spatial quantity (Pellegrino & Jeanneret, 2009).

**DEFINING TEXTILES**

Textiles are associated with fabrics and cloth making. The word textile is derived from the Latin verb ´texere´, meaning to weave, connect and/or construct (García, 2006). Textiles may be used in a narrow sense to describe the finished product of fabrics or may also encompass the fibres (string, thread, cord) that are used to make cloths (Gordon, 2011). We will refer to textiles with such a broad scope in mind.

Textile-making techniques are extremely diverse all over the world yet generally may include weaving, knitting, embroidery, crochet, plaiting, lacing, stitching, knotting, patchwork, braiding and macramé. Many more and highly specialized textile techniques, sometimes also called fibre techniques, can be found across cultures. Some authors also include basket-making as a textile technique because of the similarity of fibrous linear elements and interlacing techniques (Gordon, 2011). Interestingly, basketry is thought of by some to be a direct ancestor of weaving (Albers, 1965). We agree with an inclusive approach to textiles. Moreover, we will use the words textile techniques and fibre techniques interchangeably to avoid repetitive language.

Classical textiles materials comprise animal and plant-based fibres especially cotton, linen or wool fibres alongside synthetic and glass fibres. Today, advanced manufacturing processes and material innovations produce super textiles such as nanotextiles, bio textiles and smart textiles. These postmodern and technologically advanced textiles increasingly blur the boundaries with other material groups (García, 2006) and the level of technological innovation in this wide field is unprecedented.

TEXTILES & GENDER: WHAT HISTORY HAS DONE TO WOMEN

Textiles have been part of mankind since time immemorial. The visibility of textile-making decreased considerably after the Industrial Revolution. Textiles became, at least in the Western mind, increasingly seen as something domestic and feminine and textile-making as a primarily frivolous pastime pursued by women who were confined to the home. Textile history researcher Gordon (2011) notes that textile was either identified as women´s work, or, especially in the 20th century, as a kind of ´non-work´; an old-fashioned activity as opposed to ´real work´, such as medicine or law. Consequently, the varied historical meanings and significance of textiles faded from view and they were generally left out of the broader historical narrative (Gordon, 2011).

Likewise, Mark García who researches textiles in architecture as an emerging field of Architextiles, also sustains that textiles have traditionally been associated with crafts, the feminine, frivolity, ephemeral that has been trivialized in mainstream architecture. The tacit, physical and object-embodied materials and knowledge of tentmakers, weavers and textile designers, for instance, meant that such vocations were viewed as more ´manual´ and prosaic pursuits in comparison with the more ´intellectual´ disciplines of art and design, such as engineering, sculpture and architecture. In a similar vein, Glenn Adamson argues that ´objects that are associated with craft have been unfairly undervalued since the beginnings of the modern era and that with its ethnic and feminine associations, craft has always been subordinate to art (Adamson, 2007).

Textiles are deeply intertwined with the question of gender. Illustrative of this is that the status of textiles at the Bauhaus for instance, was largely problematic and often contradictory given the fact that it was associated with women´s work.
The female population of the Bauhaus was segregated from ‘masculine’ workshops such as metalwork and furniture which held more direct links to architecture as opposed to so called women’s work such as weaving. Weaving’s feminized identity in the Bauhaus was reinforced with policies and statements such as the words of Bauhaus master Oskar Schlemmer: ‘where there is wool, there is a woman who weaves, if only to pass the time’. Johannes Itten was convinced that women were unable to see things in three dimensions. Paul Klee considered genius to be an exclusive male quality (Radelhof in Bauhaus Magazine, 2019). So, the very craft was regarded as a pastime accomplished with little mental concentration and disregarding the mathematical structural organization that it is based on. Textiles materials and practices were considered subordinate to the more fundamental practices of form and colour theory and the functionalist logic of architecture. Former Bauhaus student and textile designer Anni Albers realized that her works on paper were categorized as art, but that a similar motif in textile design was suddenly regarded as craft (Smith, 2014).

T’ai Smith (2014) has investigated the Bauhaus weaving theory and points to the fact that weaving could not reference a long history of inquiry as found in painting or architecture, which contributed to its feminine role. Putting this gendered signifier more into context we may recall Adolf Loos’s infamous essay of 1908 ‘Ornament and Crime’ about modernist architectural thought in the twentieth century which situates the applied arts and ornament in a homologous relationship between femininity and degeneracy (Smith, 2014).

Textiles have always suffered as an artform because of its association with domesticity and femininity. Historically, textiles have been labelled women’s work and dismissed as inferior to pursuits such as painting and sculpture. During the Renaissance, the separation of art and craft became more apparent and a hierarchy developed that saw fine art – with its masculine associations – prized over the craft of stitching. This was accelerated in the 18th century with the academization of the art world (Butchart, 2018).
Architectural historian Labelle Prusin, who pioneered work on African nomadic architecture, found that women are the builders of the nomadic home. They are the ones who designed the space and are also the users. When women were acknowledged as the builders of the tents, the design was characterised first as ‘vernacular’ and then as ‘feminine’ terms that lessened the significance of their achievements (Majeed, 2017).

To sum up, the way history frames textile knowledge, skills and women engaged in making artisanal designs, has consistently undervalued women’s creativity and relegated the fabrication of extraordinary textiles that require mastery of intricate techniques, to domestic and largely non-professional realms. Perhaps even up to now, a deeply ingrained inferior perception of fibre techniques perdures in the minds of many people. Notwithstanding, craft is currently witnessing a revival, also academically, as evidenced by increased interest in artisanal practices and ‘makers’, although it still tends to be more readily identified in the realm of the artisanal ‘handcrafter’ (Stein, 2019).

Image 8: Rendille dwelling in Northern Kenya.

•••• TEXTILE & SPACE: LOOKING BACK ••••

Textiles have a long history as architectural material, sparking a tradition of portable habitations and porous buildings several thousand years ago. While early textile structures afforded protection from elements, they also featured symbols and inscriptions that represented a mode of belonging identifying whole groups and forging indissoluble links between architecture, individuals and communities (Quinn, 2015). Textiles continue to be loaded as signifiers today and their role in apparel have always made them familiar as a second skin. Textiles are more tactile than other conventional construction material.
The words textile, texture and architecture are believed to have a common origin, according to French architect David Georges Emmerich (Kozlov, 2008) and are all derived from the Latin verb *texere* that we mentioned earlier. Emmerich distinguished two directions in the history of building art. The first was based on structures of heavy massive elements, made, as a rule, of stone. The second was as ancient as the first one and consisted in lightweight structures created from branches and reeds connected with knots of flexible materials. This art was very close to such crafts as basketry and weaving. The first direction has preserved numerous monuments, starting with dolmens, which constitute the main content of the present history of architecture, and from the second direction there is practically nothing left. At the same time the woven building structures of lightweight materials gradually became the source of the origin of the woven decorative ornament in architecture (Kozlov, 2008).

Several authors allude to textile’s perishability. Due to the transience of textile materials, little physical evidence has been preserved (Kruger, 2009). Many of the historical examples of textile-based architecture have perished due to the lack of durability of the materials used (Garcia, 2006). Archaeological finds though, point to a high level of skill and sophistication at an astounding early date of human history (Gillow & Sentance, 1999).

According to the architectural theory of Gottfried Semper outlined in ‘The Four Elements of Architecture’ of 1851, Semper argued that walls derived from woven panels, and the weaving and knots therein derived from ritual expression and dance: Semper claimed that the beginnings of building coincide with those of weaving. This principle of encompassment is imitated in each age and culture (Buchli, 2013). Semper dismissed the notions of the originary primitive hut that had previously been proposed by Violet Le Duc. Textile wall cladding (Bekleidung) was one of the four fundamental elements from which ‘primitive architecture’ evolved (Eggler, 2009). Semper redefined the wall as a spatial enclosure, as the visible boundaries of space and referred to a building’s envelope as a ‘clothing, and to build surfaces as ‘veiling’. Also, Semper describes the knot is the oldest tectonic joining point in history. His theories of architecture have influenced later 20th century postmodern theories of space (Garcia, 2006).

Fences for animal pens, woven with branches were the earliest manmade partition walls and thus the first vertical space definers. As time passed by, the branches were gradually replaced by plant fibres and by threads spun from animal wool to produce textile mats. To this day, communities in various places of the world, use curtains as partitions in interior spaces that protect against cold, sun and insects (Krüger, 2009).
Interior spaces have been ornamented with textile fabrics since time immemorial. The interior spaces for temples and secular buildings were temporarily clad in wall hangings for festive occasions and moreover to make spaces more habitable. Textile has also had a significant role in mediaeval living space. In mediaeval times, apart from serving as decoration and representing religious imagery, wall hangings provided protection from cold stone walls. Spaces between columns and pillars were closed using curtains that were knotted together as pulling devices had not yet been developed. In ancient Peru, the most important Inca temples were decorated inside with fine woollen fabrics. The classical civilizations already used the curtain to create interplay between concealing and revealing – as a way of separating the holy from the unsanctified.

The Romans used large curtains as decoration and as space definers. According to Semper, the atriums of residential buildings were divided using draperies that were rich in pleats or carpets that were hung on movable scaffolds in order to open or close a space as required. Similarly, doors inside private Roman houses were often closed using curtains, known as portières, while the use of stage curtains in theatre was also common. Curtains were used to alternate between withdrawal and appearance by rulers (Krüger, 2009).

Partitioning curtains were used as flexible closings well into the 19th century, where after textile partitions were increasingly replaced in Europe by solid materials. The bed curtain was a ‘room in a room’ referring to a space that could be opened and closed using vertical expanses of textile that are mounted inside solid built spaces. In mediaeval times, the use of bed curtains became common practice. Since there was no separate bedroom and the bed stood in the living room, the closed bed curtain created a certain private sphere. The bed curtain has been used in Europe up to the beginning of the 20th century.

Image 10: ‘Café Samt & Seide’ by Mies van der Rohe and Lily Reich, Berlin, Germany, 1927.
At the Bauhaus Dessau, light curtain fabrics were developed as space-defining elements that could also be changed quickly if required; this was compatible to a desire for a flexible way of life (Krüger, 2009). In this regard, it is worth highlighting that in ´Exposition de la Mode¨ that took place in Berlin in 1927, Ludwig Mies van der Rohe and Lilly Reich exhibited ´Café Samt & Seide´, an exhibition stand which also worked as a café at the end of the main hall. This ´room in room´ portrayed an interior space that was divided using lengths of fabric. These curtains were slidable and movable space dividers to be able to make temporary spaces as required. The partitions acted as framing devices that tactiley invited viewer interaction. Their free-hanging design embodied movement and held a functional promise: to enable each inhabitant to transform architectural space (Eggler, 2009).

Weaving, a global practice that spans cultures, eras and landscapes, was reclaimed by Buckminster Fuller as a modern means of creating self-supporting lightweight lattices. Fuller drew comparison of Anni Albers´s ´woven fabric surfaces´ with the multi-dimensional geodesic domes. Complexities of ´earth cities´ as seen from ´aeronautical altitudes´ (spaceships, televisions, architecture and Peruvian textiles) similarly collide in Albers´ writing (Smith, 2014). Part surfaces, part join, weaving is essentially a system of continuous links and a technique that can integrate a number of operating systems into a single structure (Quinn, 2015). Just as a broken thread can be pulled and replaced, so can a cable. Whole components can be removed and exchanged and the whole system seamlessly expanded.

Folding, plaiting, weaving and braiding exemplify anthropologist Levi-Strauss’s theory of ´bricolage´, a form of production-oriented activity that does not rely on traditional methods to produce form. Bricolage recalls the activities of children as they ´build´ houses of mud or recycled materials, fashion dresses for dolls from scraps of fabric or fold paper into structures that mimic buildings (Quinn, 2015). Textile researcher Bradley Quinn points out that historically architecture was based on craft practices (i.e. metalwork, carpentry) and renewed interest in textile architecture interestingly also imbues a renewed craft dimension triggering research in material science and computer-aided engineering.

Textiles have revealed a surprising history of modularity and multifunctionality and an essential narrative function. While early textile structures afforded protection, they also featured symbols and represented a mode of belonging. Today, textiles continue to be loaded with signifiers and can endow built structures with meaning that extend far beyond the occupation of territory (García, 2006).
Image 11: the making of a small space, a hammock by the Huni Kuin people, Purús, Amazon of Peru, 2015.
The world of today is marked by rapid changes in society and nomadic lifestyles of many people. This has also increased the interest in and demand for architextiles as they are particularly suited as temporary, transportable, malleable and ephemeral structures (Garcia, 2006) and moreover as a signifier (Quinn, 2015). There is a growing interest in textiles for spatial use and expression, largely due to these unique characteristics of being lightweight, portable and transient in nature. Not only architects and designers are drawn to textile materiality but also its extensive and versatile techniques including weaving, braiding, knitting, lacing among others.

Opposed to the historical paradigm and the conception of architectural space as permanent, finished, durable and static, the intersection of space and textiles articulates a new space-one that is never finished, dynamic, provisional and transitional in nature and in a continuous state of becoming. Textiles are energetic with their common properties of surface continuity, softness, flexibility and fluid-like dynamism (García, 2006).

Image 12: Ideal House by Spanish designer Patricia Urquiola, Cologne, Germany, 2005. The fabric wrapped around the scaffolding is like a second skin.
Space affects people’s emotional well-being (Csikszentmihalyi, 1996). A textile-like space has often been associated with a second skin or as an envelope or veil, thereby making it a temporary enclosure of a transitional nature. Carsten and Hugh-Jones (1995) note that the relationship between the body and built form is difficult to disentangle; it may be impossible to clearly say where the body ends and built form begins.

Due to its unique properties, textile can conduce an interesting interplay between concealing and revealing. The basic spatial and living feeling of ‘isolation’ is being alone but always feeling a sense of belonging to a larger whole (Kruger, 2009). Notably, the physical enclosure enabled through textile, exhibits a dynamic character that is never static and ignites interaction of the viewer or user.

‘Textiles have always held the promise of the future’, affirms Bradley Quinn (2009). He qualifies this interesting point by saying that rarely we remember that woven fibres were a technological breakthrough for early man, and we easily tend to forget their radical past as sources of progress and emblems of rebellion. In today’s fast-moving times textiles are as indispensable as they were five thousand years ago. Many of today’s cutting edge architecture, interior textiles and fashion, for instance, consist of fibrous forms; although humanity has advanced dramatically, simple textile forms have carried us every step of the way (Quinn, 2009).

Against this background, textile’s engagement with contemporary architecture, product design and technological innovation are hardly surprising and the hybrid forms that result, forge new connections between disciplines, push boundaries and can even be ground-breaking. At present, the relationships between textiles and space are continuously being reinvented and are always evolving with much emphasis on the structural dimension of textiles, innovation of materials and the unfolding of new narratives that make way for newly emerging (social) interactions of people.

In a subsequent chapter we will turn our attention to contemporary references of spaces envisioned through textiles. We will look at diverse case studies where open-work and largely hand-made textiles that produce mesh like constructions, define spatial surroundings and employ different narratives to involve users of the space. Before discussing the case studies, we will first explore the dynamics of the human hand in textile craft with a view to gaining an understanding of the motions of constructing by hand and its (potential) contemporary significance.
Toshiko MacAdam is a designer who creates monumental playscapes that she meticulously crochets by hand. She comments on her textile handwork as follows: “Each work is one-of-a-kind. As I work the image takes shape in my mind’s eye. It is as if the image is telling my hands what to do - which is why it is difficult to use other people’s hands. ‘When I am using my hands, my brain focuses, the image becomes clearer, technical solutions come to mind’” (interview in ArchDaily, 2012). With these words, MacAdam illustrates insightfully what making by hand does: engaging the hand helps to construct thoughts and shapes people’s imagination.

Image 14: Toshiko MacAdam crocheting a large installation.
Our research focuses on the interplay of textile and space. In the last chapter we have learned that the intersection of textile and space articulates a new space, one that is flexible and dynamic and always in a state of becoming. We would like to deepen this perspective about textile giving rise to a new kind of space by looking into the role of the human hand. Craft has always represented a significant dimension in textile creation. In this chapter, we seek to understand what the motion of constructing (textile) craft by hand entails and what signifiers this may generate for present-day purposes. We set out to inquire about the connection between thinking and making, tactile sensibility, embodied practice and slow rhythm. We pose the question: does the active involvement of the hand still make sense in the face of our high-paced digital society marked by unprecedented technological advancement?

**HAND & BRAIN IN DIALOGUE**

Of all the human limbs, the hands are capable of making the most varied movements. This physiological feature alone makes the hands a vastly interesting subject for study. In his book ‘The Thinking Hand’, architect Juhani Pallasmaa (2009) describes how the human hand has evolved through history and examines the connection of the hands with the brain. The evolution of human brain activity, he says, may very well have been the consequence of the evolution of the human hand and not vice versa. Pallasmaa quotes neurologist Frank Wilson who regards the hand as an essential constituent of the evolution of human intelligence that is moreover widely represented in the brain. The physical opposition of thumb and flexible fingers became articulate and the strengthening of index finger enabled precision grip in tool handling and led to further development of the brain’s circuity. The decisive development of the human brain began three million years ago with tool use and further refinement of the hand. In accordance with recent theoretical views, the modern human brain was completed 100,00 years ago or perhaps even earlier (Pallasmaa, 2009). Today we know that, in the near history of our species, the physical structure of the hand has itself evolved. Such structural changes have allowed our species a distinctive physical experience of grip. Expressions like ‘get a grip’ or ‘coming to grips with an issue’ are illustrative of this evolutionary dialogue between the hand and the brain (Sennett, 2008).

Regarded anatomically, the hand is an intricate arrangement of skin, bone, muscle tissue and nerves, fed with blood that pulses through the arteries of the wrist (Ingold, 2013). Given the evolution of the hand’s motions, it is perhaps not surprising that the hands are the part of the human body that appears most in symbolisation across cultures and throughout history. In this regard it is interesting to mention that Sir Richard Paget, who developed a universal sign language in 1939, demonstrated that it is feasible to produce 700,000 distinct elementary signs making the human hand extremely versatile for gestural communication all-over the world.
Intriguingly, the hand’s motions affect how we think. Thinking emerges in the manual process. The thinking process occurs as much in the hands and fingers as in the head; it becomes a dialogue between hands and brain, explains Pallasmaa (2009) who illustrates what happens when drawing by hand. ‘The drawing is a process of thinking, not a projection of thought. Sketching and drawing are spatial and fully haptic exercises that are simultaneously corporal experiences. When sketching an imagined space or an object to be designed, the hand is in interplay with mental imagery. It is impossible to know what comes first: the line on the paper or the thought or intention. In a way the image seems to draw itself through the human hand. The deep engagement of the act of making appears to give rise to a sketch or an idea. The artist’s entire body participates in the physical act of drawing. The images are not mere visual renderings; they constitute a multi-sensory reality of imagination. Instead of dictating a thought, the thinking process turns into an act of waiting, listening, collaboration and dialogue in which one gradually learns the skill of cooperating with one’s own work. This thinking, this imagining goes on as much in the hands and the finger as in the head. Likewise, when writing by hand, it is the process of writing that gives birth to unexpected ideas during a fluent mental flow’ (Pallasmaa, 2009).

We have just shared an extensive quote of Pallasmaa: the precise way he describes the dialogue between hands and brain in the case of drawing is illustrative of what happens when creating something by hand, be it sketching, pottery making, embroidery or lace making. In any activity or process that involve hand motions and is generally considered ‘craft’, typically, thinking and making are intricately intertwined. The use of tools expands the faculties of the hands and alter the hand’s natural capacities. Likewise, sociologist Richard Sennett (2008) sustains that craft is a physical experience that forges a tactile connection between maker (and his/her imagination) and object.
**TACTILE SENSIBILITY**

For philosopher Martin Heidegger, the hand is the cradle of our humanity. In his unequivocal stance on the question of human uniqueness, the hand is an active instrument of processing ideas. According to Heidegger, the hand and the body produce distinctly different ideas than the head. The latter tend to be conceptual, intellectual and geometricized ideas whereas the former usually project spontaneity, sensuality, feeling and tactility (Sennett, 2008).

Touch is the mother of all senses and the primacy of the haptic realm heightens the significance of the hand. The tactile sense of the hand is like having ´eyes at the fingertips´ (Wirkkala quoted in Pallasmaa, 2009). Hellen Keller wrote about the centrality and significance of touch at the beginning of the 20th century. Our language, she pointed out, is full of haptic metaphors: manufacture, manoeuvre, manual, first-hand knowledge. ´All life´, she noted cleverly, ´is divided between what lies on one hand and the other´ (Adamson, 2018).

Scholars Juhani Pallasmaa (2009) and Richard Sennett (2008) sustain that there is significant loss of touch of the human hand in our mechanically mass-produced products and high-tech modern environments. Both authors agree that this loss of tactility is regrettable. Being out of touch with the human hand implies being out of touch with the feelings and wisdom that the human hand transmits, while it also creates a distance between maker and products as well as consumer and objects.

Concern about people´s loss of tactility is not reserved to contemporary life and dates back to much earlier times, notably the first Industrial Revolution. English art critic John Ruskin already claimed in the 19th century that the quantity of modern waste and consumerism diminished the tactile qualities of materials things. Much later, in the mid-20th century, textile designer Anni Albers observed that people had increasingly grown insensitive in their perception of touch. People´s contact with material was rarely more than a contact with finished products; ´no wonder a faculty (tactile sense) that is so largely unemployed in our daily plodding and bustling is degenerating´, Albers noted. No need to touch materials to test their consistency, lightness, density, smoothness etc. ´If we reduce their range, as we do when we reduce the necessity to form things ourselves, we grow lopsided and we fall short in providing a stimulus that may touch off our creative impulse, such as material ´in the rough´. The sense of touch stimulates our formative qualities, she reasons. ´Tactility, just like colour, cannot be experienced intellectually and must be enjoyed receptively and approached non-analytically; it takes tactile sensibility to be valued´ (Albers, 1965).

In a similar vein, Glenn Adamson (2018) argues that in today´s world, people do not engage anymore with the objects around them, are out of touch with materiality: people are losing an intimate connection with physical artefacts that have nurtured human development for thousands of years and that embody accumulated wisdom. Being out of touch with things, distances us from the many life stories and intelligence that has been carried over from one generation to the next, that the hands can tell through its gestures and drawn traces they yield.
The theme of tactility has great contemporary relevance. As we know, touch is a key element in technological developments and many recent digital innovations are touch-based. This in a way may sound like a contradiction in terms. On the one hand, people increasingly lose tactile sensibility understood in the way that Albers defined it, while entire generations grow up nowadays in a world reigned by digital touch. Anthropologist Tim Ingold (2013) clarifies this issue by pointing out that the current drift of technological enhancement has been to substitute touch sensitivity at the fingertips for the sentient correspondence of telling by hand. In this substitution, handling, reach and grasp become metaphors of understanding, modelled on bodily experience, rather than animate movements in their own right or doing anything constructive with our hands.

*** EMBODIED KNOWLEDGE  ***

Historically, craft knowledge was acquired `on the job`, guided by rules of thumb; it was a matter of learning by doing, and passed on as a living tradition, in the spoken words and manifest deeds of practitioners. This is also the reason why it has scarcely left documentary trace and cannot be articulated without great difficulty (Ingold, 2013). Craft is intuitive and embodied (Adamson, 2018). In traditional cultures, the entire life world is the product of human hands and the daily sphere of work and life means an endless passing of the hand skills and their products on to others: a traditional life world is a continuous meeting and joining of hands of successive generations. The traditional cumulative practices of the human hand around the world represent an immense stock of unverbalized knowledge in need of being maintained and restored (Pallasmaa, 2009).

Image 16: An example of embodied knowledge that has been carried over from generation to generation: Shipibo artisan from Pucullpa, Peru, handpainting textile. 2014.
As bearers of embodied knowledge, craftspeople constitute years of accumulated know-how, something that philosopher Michael Polanyi has called tacit knowledge: a form of implicit knowledge that involves direct experience on how things are made and done (Spuybroek, 2008). Richard Sennett (2008) refers to this special practical connection as material consciousness: a craftsperson represents the special human condition of being engaged practically and is anchored in tangible reality. Craftwork establishes a realm of skill and hands-on knowledge and these physical movements of the human body cannot necessarily be well explained through language, Sennett explains. How exactly hands and eyes coordinate, for instance, is difficult to express in words. This is why active and experiential involvement in a practice, or as modern educators may call it, learning by doing, is essential to acquire ‘hands-on’ knowledge and over a period of time, obtain mastery. ‘Craft is a two-way street: ‘As you shape the material, it shapes you right back. You are learning the process the whole time that you are engaged in it’’ (Adamson, 2018).

Craft & design curator Glenn Adamson (2018) has more recently coined the term material intelligence denoting a deep understanding of the world around us, the empathy that is bound up in tangible things, and the know-how required to give it form. ‘As a culture we are in danger of falling out of touch, not only with objects, but with the intelligence they embody’, he claims. Growing up in an overwhelmingly digital and technological world, children may be losing an intimate connection to physical objects, which has nurtured human development for many thousands of years. ‘When we overemphasize the promise of the digital information economy, we not only express an irrational preference for the new over the old, we also miss the physical know-how that binds our society together’, Adamson argues. With the overabundance of things in the world, the problem is that we do not value things enough. With a greater awareness of the things we hold in common across cultures, Adamson says, we can bridge shared experiences as humans that bind us together. Every object represents a potential social connection. By better understanding the tangible things in our lives, we better understand our fellow humans (Adamson, 2018).

... CONTINUED AMBIVALENCE ABOUT MAN-MADE ...

We have just seen that hands-on immersion and embodied knowledge lie at the heart of craftsmanship. We have also learned that the movements of the hands and brain are in fruitful dialogue. Nevertheless, ever since the Renaissance, mind and body have been segregated and the head and the hand have been separated intellectually and also socially breaking a previous intimate connection between thinking and making. This separation has had enduring implications that society still grapples with today. Conceptual, intellectual and verbal knowledge have been valued over the tacit and non-conceptual wisdom of our embodied processes (Pallasmaa, 2009). The rise of Cartesianism in European thought since the 17th century, favoured reason and viewed the mind as separate from the corporal body. As a consequence of disembodiment, Western culture has had a long-standing ambivalence about man-made and particularly manual things. Craftsmanship has been poorly understood and negatively perceived as manual labour at various intervals in history and perhaps continues to do so. Craft has been unfairly undervalued since the beginnings of the modern era.
This is even more so the case with crafted objects that have ethnic and feminine associations (Adamson, 2007). Fibre crafts in particular have long suffered from deeply ingrained negative perceptions, as we have seen in the previous chapter.

In his book ‘The Craftsman’, Richard Sennett (2008) explains that craftsmanship evolved alongside Christian morality in mediaeval Europe. During the early Middle Ages, needlecraft (including embroidery and lace making) in particular was stimulated as a remedy for female idleness and female temptation: women were better kept busy doing needlework. Even though needlecraft was also considered a source of honour, men excluded women from formal membership in craftsman guilds. Following the separation of hand and mind during the Renaissance, there have been significant attempts to revert this unfortunate disconnection. French writer and philosopher Denis Diderot put manual pursuits on an equal footing again with mental labours as principal editor of the Encyclopaedia of Arts and Crafts, an unorthodox work of 1751 that portrayed craftsmanship as an icon of the Enlightenment. In the face of flawless perfection of machines, Diderot’s Encyclopaedia echoed the virtue of the imperfections of handmade: namely irregularity, distinctiveness, and ‘character’. While the Renaissance celebrated the artistic genius and was responsible for the head and hand separation, the Enlightenment celebrated craftsmanship and individuality. By the mid-19th century, English writer John Ruskin critiqued modern industrial society and openly lamented the loss of traditional craft methods in his famous essay ‘Seven Lamps of Architecture’ (1849). Ruskin wanted to instill a lost space of freedom; a free space in which people can experiment; he believed that the industrial age worked against experiences of free experimentation and salutary failure (Sennett, 2008). Considered a romantic, his writings greatly influenced William Morris and the Arts and Crafts Movement that flourished between 1180 and 1920 in Europe and America.

The Arts and Crafts movement coalesced in a concerted looking-back to historical models of making as a way to escape the mental, physical and environmental stresses caused by the massive changes in design and production as a result of the industrial revolution. This movement laid the foundation for a conception of modern craft that rejected the machine as potentially dehumanizing and prized work made by the unadulterated hand, a view that continues to inform how we think about and value craft, highlights curator Emily Zilber (2015).

Contemporary notions about craft continue to be fraught with ambiguity. The relative hierarchy of value between handmade and the machine (read: technological developments) is still part of modern perceptions about craft as moreover, a static construct of objects that lacks innovative capacity. Yet, innovation in craft has often come about through expanding the physical and conceptual possibilities of materials and tools. Zilber (2015) sustains that dramatic shifts have taken place across the landscape of contemporary craft. Not only has the conversation about craft become more interdisciplinary, embracing new hybrids with fields like design, fashion and architecture, yet also demonstrating radically different responses to technological advancement pushing boundaries of handwork with the incorporation of new fabrication methods.
‘Making things with my hands means a lot to me, it almost has a therapeutic effect. They lead me on to new experiments. They transport me to another world’. - Finnish designer Wirkkala (quoted in Pallasmaa, 2009).

‘My hands are curious: you are making something as it is happening and it can be changed at any moment. The genesis is in the doing, working and thinking, which is a universal language that crosses cultures and language barriers’. - fibre artist Sheila Hicks (interview wsj.com: 2019).

Hands can do almost anything. Every kind of manual gesture admits infinite variation. The creative craft state is a haptic immersion where the hand explores, searches and touches. Hands get to know materials and acquire a ‘feel’ for them and the forces and energies bound into the materials through the gestural movements hold them together. Manual skill requires endless practice and repetition. The example of bobbin lacemaking for instance is illustrative in this regard. Lacing requires a rather equal coordination between left and right hand using most of the fingers. The two hands work together and engage the fingers in continuous and rhythmic motion; it is like the fingers are dancing with the bobbins as tools multiple threads that is used for lac- er, which is consid- are accompanied sound of bobbins some people. The flow and tension bobbins with usual- require extreme- and concentration. to become skilful depending also on the patterns.

During my own immersion in lacemaking, I experienced from the onset this intimate connection between head and hands, characteristic of craftsmanship. The multiple conversations that I entertained with experienced lace makers over the past months, revealed that the extreme focus that the construction of lace requires, both engages the mind and also relaxes the mind at the same time. Lace makers, mostly women, induce a continuous motion of the body and mind that in addition to being a highly structured creative act with mathematical precision and insight, can simultaneously be considered a mindful practice.

In this regard it is noteworthy that Sennett (2008) associates craft with rhythm. Every good craftsman conducts a dialogue with materials and between concrete practices and thinking that establishes a rhythm of physical sensations. This is a rhythm of routine that is playful and may even draw on childhood experiences of play. The sheer movement of repeated practice is a rhythm that becomes a pleasure in itself, Sennett (2008) explains. Built into the contractions of the human heart, the skilled craftsman has extended rhythm to the hand and the eye. This craft rhythmic skill of ingrained hand motions is itself engaging. Craftspeople take pride in their skills that mature and evolve. The slowness of craft time serves as a source of satisfaction for making the skill one’s own. Slow craft time also enables the work of reflection and imagination, something which the push for quick results cannot (Sennett, 2008).

Rhythms are the creators of form, according to anthropologists Leroi-Gourhan and Franz Boas who argue that the actual form emerges from the pattern of rhythmic movement, not from the idea. The human hand is human because of what it makes, not of what it is; the humanity of the hand is a compendium of capacities, each particular to one of the many tasks in which it is brought into use and to the gestures it entails. Concentrated in skilled hands are capacities of movement and feeling that have been developed through life histories of past practice. Hand and tools are brought into use through their incorporation into a regular pattern of rhythmic, dextrous movement, which arises as an emergent property of the entire form-creating process comprising the gestural synergy of human being, tool and material. Hands, in other words, can tell, both in their attentiveness to the conditions of a task as it en-folds and in their gestural movements and the inscriptions they yield (Ingold, 2013).

Society sometimes perceives the manual routine of craftsmanship as mindless labour and some people equate routine with boredom. Interestingly, the experience of slow time and boredom initiates meditative mental activity that spark imagination and trigger curiosity. Experiencing some level of boredom is conducive to imagination, according to Pallasmaa (2009). He cautions against the current tendency of people especially parents and teachers to overstimulate children for instance: this may negatively impact children’s capacity of imagination and invention and may even weaken social interaction, he argues (Pallasmaa, 2009).
So far, we have argued that craft induces a rhythmic movement that engages both hands and the brain in the act and flow of creation, sparking imagination as well as reflection, while giving a sense of joy and satisfaction. The slow rhythm of craft is of critical importance and is conducive to producing this combination of positive emotions and corporal experiences. When people are relaxed and in a positive emotional state, their thought processes expand, becoming more imaginative and creative. Positive emotions broaden people’s thought-action repertoires, encouraging them to discover novel lines of thought or action, psychological research confirms. Joy, for instance, creates the urge to play, interest creates the urge to explore and experiment. Play builds physical, socio-emotional and intellectual skills and fuels brain development. Similarly, exploration increases knowledge and psychological complexity (Norman, 2005).

The continuous rhythmic movement makes craft by its very nature, kinetic. In the act of making the artisan couples his own movements and gestures –indeed his very life– with the becoming of materials, joining with and following the forces and flows that bring work to fruition, always desiring to see what the material can do (Ingold, 2013). Thus, bodily kinaesthesia interweaves with the flux of materials within an encompassing field of forces, explains Ingold (2013). It calls for finely honed manual-gestural skills that carry forward a mindfulness that is imminent in the action itself, in its attentiveness to surrounding movements and both create sinuous forms.
This chapter has explored what the hand does when it engages in creating textiles or other crafts. We have seen that craft is a kinetic experience; clearly, the hands-on nature of craft demonstrates that body and mind are connected. The hand induces a rhythmic and form giving motion of making and thinking, engaging body and mind in giving rise to imagination, concentrated focus as well as reflection. Craft is indeed always in motion marked by continuous movement that makes creation possible. Slow time of the involvement of hands in making is in stark contrast with the hectic demands and high-paced society of today. Yet, the combination of slowness and rhythmic motion, we like to argue, gives the hand renewed meaning in the modern world. The movements of the human hands as applied in handmade textile and other crafts, is associated with a range of positive emotions and opens new pathways to slow down hectic rhythms that modern life imposes on people, more often than not with negative consequences for health and well-being. Societal problems related to stress, anxiety and overwhelm are globally reaching unprecedented levels.

Considering these insights, we suggest perceiving craft based practices with fresh eyes and propose to nurture and augment the cited qualities of the human hand in the face of the digital age. Rather than pursuing a further disembodiment, we suggest that the slow pace of craft can be a soothing, joyful and nourishing counterbalance for modern life, a concept that we will manifest in our design proposal.

The emergence and advancement of digital tools and new fabrication technologies provide enhanced means to experiment with and innovate craft practices. Technological progress may in many instances, broaden the scope of textile craft based design. We embrace the viewpoint of Tim Ingold (2013) who proposes to get the best of two worlds and envision a future whereby new digital and technological tools will be brought into service of hands-on engagement rather than further eroding it. Augmenting hands-on practices with the help of technologies, would enlarge the scope of humanity, Ingold sustains.

In his book ‘Thinking through Craft’, Glenn Adamson (2007) asserts that craft only exists in motion. It is a way of thinking and doing things rather than a fixed category of objects or classification of people, he reasons. We embrace such a dynamic and broad perspective about craft. It is only now at the end of this chapter that we define craft as a ‘skilled making by hand’ that is always in motion with an engaging and transformative capacity to act in the world and in a state of perpetual flux between past traditions and future innovations (Zilber, 2015).
Image 19: SpaceLoom of Interlace, textile - tactile research installation by Hella Jongerius in Lafayette Anticipations, 2019, Paris, France. The weft threads form three-dimensional spheres and patterns which take shape within different layers of the building’s vertical space.
This chapter presents five contemporary references of indoor and outdoor spaces that have been envisioned and constructed through various openwork textile techniques. They represent recent case studies of spatial surroundings that bring out the versatility of textile craft in unexpected and even transformed ways. They challenge conventional perceptions about space as static and fixed. Following the description of the references, we will analyse the referenced cases to the end of discerning design elements that can also inspire our design proposal.

- **Toshiko MacAdam: playscapes** -

Image 20: Harmonic Motion by Toshiko MacAdam, Enel Contemporanea 2013, temporary installation in museum of contemporary art in Rome, Italy.
Toshiko Horiuchi MacAdam has been making sculptural playscapes for children for decades. Using crochet technique, her work is characterized by open and expansive net-structures that are elaborated by hand. Her textile forms are very interactive and meant for children to play with so that they grow emotionally and imaginatively. Children can touch tactiley and experience it with all their senses. Physical movement, fun and laughter are considered essential to develop social skills, according to MacAdam (Archdaily, 2012).

These ‘knitted wonder spaces’ draw a lot of people and especially make a connection with children. MacAdam explains that her crocheted sculptural forms resemble the womb and mimics the rocking and floating motion of a baby in a mother’s womb. The net membrane is soft and sensitive to the slightest movement of children whose energy is captured. The wave-like motion encourages kids to play with other children. Kids can explore new ways of playing without posing a risk.

The original Woods of Nets pavilion of the Hakone Open Air museum was created in 1981 and was elaborated over the span of a year; in 2009 a new structure was designed named Knitted Wonder Space II and installed at Hakone Open Air museum in Japan. The wooden frame (the largest wooden structure in Japan) was developed by Tezuka Architects and was inspired by traditional Japanese temple architecture. The support structure included wedges and pegs as joinery and has no mechanical fasteners. With the help of CAD software, new solutions to frame and load the net membrane were found.

MacAdam has a keen interest in how textile form is created through tension and the force of gravity. The textile technique, the weight of the yarn and gravity work together to create natural forms (Archdaily, 2012). Her works are predominantly handmade using primarily crochet and knotting techniques with selected machine-knotted elements of braided nylon cord. Toshiko MacAdam has mentioned the inverted models and curved forms of Antoni Gaudi as an impor-
Toshiko’s webs celebrate fun and enjoyment as well as relax and reflection. In ‘Enel Contemporanea 2013’, an ephemeral installation for MACRO, the Museum Of Contemporary Art in Rome, she suggests a deep connection between a person’s energy and a person’s intimate personal space. Her webs aim at creating energy (Bonami, 2013). Her choice of medium, crochet knitting, involves repeating gestures over and over again. This is an expression of homogeneous flow of inspiration that originates from movement that directly results in other movements (Bonami, 2013). Tactile touch and the interaction between the human body and space are being prioritized. The knitted wonder spaces can be considered a cosy hide away of body and mind (Bonami, 2013). Her playscapes offer a place to feel sheltered and energized at the same time.

The New Children’s Museum in San Diego recently opened their newest art installation, Whammock! A 28 by 20-foot, three-dimensional textile structure resembles a giant hammock of crocheted circles, open pockets and hanging pendulums. Within this play-structure, children are able to move upwards through one pocket after another until they reach a vibrant expanse where they can climb, slide, bounce and rest. It took nearly 3,600 hours to crochet the 40 miles of hand-braided nylon and 1,000 pounds of net that make up Whammock!. The visually stimulating, giant structure bends, shakes and morphs when children play inside it, and comes alive ‘like a monster’, describes MacAdam gleefully. The 14 hand-dyed colors are also unique to Whammock!, reflecting MacAdam’s impression of the San Diego environment and landscape. ‘The concept of Whammock! is to connect with others through the waves of vibration in the net. If a child climbs, jumps or crawls in one place then another child will feel the vibration and respond and in this way, they are naturally communicating to one another.’ comments MacAdam (https://thinkplaycreate.org).
A train station is always a busy place where thousands of persons hurriedly pass by each day. For that reason alone, Ernesto Neto’s recent installation GaiaMotherTree in Zurich’s central station by Fondation Beyeler in July 2018, has been noteworthy. This ephemeral installation was composed of a 20-meter-high sculpture resembling a majestic tree with a crown extending over an area of 40 x 28 meters, reached the ceiling of the station.

GaiaMotherTree placed concerns about ‘Mother Earth’ at the centre of attention in a least expected and hectic venue: one of the busiest railway stations in Europe. Passers-by of the crowded station were invited to touch the work and engage with the walk-in sculpture and experience its sensorial qualities that included aromatic herbs and seeds from the Amazon. The physical encounter (and spiritual for some) with the intricately hand knotted tree was meant to draw people’s attention to sustainability and rethink modern man’s preoccupation with material wealth and lack of relationship with nature.
The interior was designed as a community space to facilitate the exchange of ideas on topics of collective awareness and offered a place to meet and discuss, linger, rest or meditate. GaiaMotherTree prompted people to pause their busy lives for a moment and engage with the threaded installation. ‘The idea is to slow down our time, for us to have time to breathe and feel life inside us’, Neto commented about the installation (designboom, 2018). Inspired by the Huni Kuin people of the Amazon Rainforest, the installation design echoed their alternative worldview that is community-oriented and deeply connected with nature.

GaiaMotherTree was made entirely by hand. The slow rhythm and repetitive nature of hand-made underscored and reinforced the installation’s call on people to pause their busy lives for a moment of contemplation. Elaborating a monumental structure by hand is naturally a very slow process. Curator Michiko Kono explains in his curatorial statement (2018) that GaiaMotherTree took three months to produce. Cotton fabric extending 10,220 meters in length was cut into strips and dyed with natural dyes. The strips were knotted together by Ernesto Neto and his team using a finger-crocheting technique characteristic of the Amazonian Huni Kuin people. The giant structure was shaped and stabilized by drop-shaped counterweights, suspended from the tree. These elements were filled with ground spices, including turmeric, cloves, cumin and black pepper, weighing a total of 600 kilograms. The central counterweight contained 30 kilos of plant seeds. As the counterweights hanged over the metal ceiling girders above the concourse, it was unnecessary to drill a single hole or hammer a single nail in Zürich’s Main station to support the installation.

The work was also secured from below with 840 kilos of earth and anchored at points in the floor around the sculpture.

The use of textile materials whose surfaces are characteristically elastic and transparent, have associations of fragility and impermanence and convey intimacy (designboom, 2018). Neto insists that the viewer must be allowed to touch his works and experience them in direct physical terms. But at the same time, his intention is to provide the viewer with an enjoyable experience. The message, in his own words, is: ‘Take off your shoes and feel free to walk in, lie down, take a nap, dream’ (quoted in Kono, 2018).
Choi + Shine Architects have made several hand crocheted lace installations, two of which we will look at now. Lace symbolically weaves different people and cultures, weaves different urban textures and weaves the past with the future, comment Choi + Shine. Used as an embellishment, a special celebration of milestones of life, lace is associated with feminine and delicate, private and often the intimate. An encounter with lace at a monumental scale in unexpected public space creates an element of surprise which contributes to the memory of time and space. It makes the viewer pause the mundane routine of our life for a moment and give us an opportunity to find poetry around us (choishine.com).

Installed in Singapore for the iLight Marina Bay Festival in 2017, Choi + Shine created a trio of installations above the water of Singapore which had the theme of biomimicry and sustainability. In between imposing skyscrapers, the installation invited people to stop for a moment and take time to look again. The installation had a length of 17 meter and weight of 100 kg each. The giant crochets interacted with natural light during daytime and glow when lightened during night. Inspired by sea urchin shells, which are enclosed yet lightweight, delicate and open, their textured and permeable surface interacting with light created openness, while the pattern’s mathematical repetition brought visual rhythm and harmony.

Against light, the sea urchin natural form reveals one of the most spectacular patterns found in nature. When being close to lace, one can understand that every part of the lace is touched and made by hand. In the Urchins, the intricate detail and mathematical patterns are creating new windows to a familiar landscape, juxtaposing the old with the new, feminine lace with masculine urban scape and nature with man-made, Choi + Shine explain (choishine.com/urchins). The Urchins are composed of a firm membrane made from strong marine grade cord held rigid in metal construction, yet nevertheless, they embody an illusion of lightweight lace, gently moving.
Handmade lace represents a cross-cultural and universal design language, according to Choi + Shine. The Flying Mosque was conceived as part of 20th Islamic Arts Festival in the United Arab Emirates. Flying Mosque lace was crocheted in geometric shapes and composed of patterns that are used both in the East and the West. Geometric patterns from Islamic architecture that reflect spiritual contemplation, were blended with a minimalistic approach to forms and the abstraction of the surface treatment from contemporary Western design. The repetitive patterns signified infinity and its quiet impact produced a meditative feeling. Flying Mosque was meant to bridge contemporary and tradition and diffuse the boundary between the East and West (choishine.com).

The collection of forms appears floating, allowing visitors to meander between and through each form, touch their surfaces, exploring and interacting with the detailed hand work. This project intended to emphasize the meditative process of finding the whole, while providing a new way of looking at the old and familiar, with one of the most recognizable structures of Muslim world, seen glowing and taking a flight into the sky. Generally, lace is small and often private. Shown in a large scale and in a public place, lace creates a visual impact that is unexpected and memorable.

The design process involved pattern development for crochet as well as design and fabrication of frame structures. The Urchins and Flying Mosque forms consist of hand crocheted fabric panels, made entirely from thin crocheted cord. Each panel was fastened to lightweight preformed structure to create the geometrical volumes. Once the design of each pattern was completed, the pattern was drawn in CAD to accurately incorporate the material’s dimension and method of crochet.
The drawings and diagrams were distributed to a team of crocheters from different parts of the world who crocheted the lace by hand with double braided polyester cord. They shared their progress and pictures on a dedicated social media page, forming a strong community supporting each other and to meet a tight schedule. A typical individual geometric form from the Flying Mosque was one meter or two meters wide, yet the collective work occupied an area of 10 x 30 meters. For the assembly, the various pieces of individual crochet makers were pieced together and hand stitched.

The structural framing system of The Urchins was lightweight and collapsible, strong enough to hold the lace membrane yet visually minimal. Fifty people created this all in a period of two months. In the case of the Flying Mosque that was installed on an artificial island in Sharjah, the frames were also lightweight and included nylon connectors (3d printed in London prior to installation) on the ground. The lace membrane was attached to the frames and hoisted up to the final height at the designated position. The panels and structure were suspended with cables to secure structural anchors holding the forms in place (http://choishine.com).
Jenny Sabin Studio spans practices and disciplines in an exploratory approach to new architectural materials, merging technology and nature. She works at the intersection of architecture and sciences and applies insights from biology and mathematics to the design of material structures. She specializes in adaptive, responsive architecture that is bio-inspired through material computation and advanced technologies, a process she refers to as digital handcraft.

As part of the Young Architects program of 2017 won by Jenny Sabin Studio at the courtyard of Museum of Modern Art (MoMA) in New York, Lumen was a temporary installation to provide shade and seating for visitors. This dynamic installation was meant to be touched and interactive: the woven fabric was responsive to human touch. Fabricated with high tech fibres that absorb energy from the sun and provide varying experiences by day and night; photo-luminescent and solar responsive fibres glowed brightly at night and produced subtle colours in direct sunlight. In other words, the structures visually evolved over the course of the day. Also, the installation had sensors that triggered a misting system that, together with a breeze, encouraged people to `dance` with it.

The huge woven membrane spanned over both an indoor and an outdoor cellular canopy that was held in tension within the walls of MoMA’s courtyard and was further supported and raised by tensegrity structures of steel and fishing rope. The main area of Lumen had a wooden dance floor with recycled wooden spools with fibre skins woven by a robot, to host musical shows and is for gathering of people, while a small inner courtyard also offered a space conducive for pause and reflection. An inner structure of soft textile based whole garment knit elements absorbs, collects and delivers light as the materials reacted to the presence of people. This installation’s adaptable sensitivity and flexibility mirrored the human form. The intention was for people to create their own experiences: through their own energy, space was produced through people’s interaction, according to Sabin (www.jennysabin.com).
The body, or more specifically, the body in motion -pure performance itself- was the starting point of Jenny Sabin’s project. She transformed patterns of biologically inspired data into the geometry and material of knitted structure. Taking advantage of formfitting nature of knitted structure, the surface patterns were generated via 3D modelling to form a material construct for a unique response to formfitting. The woven membrane was knitted digitally by a robot. The digital fabrication process was slow nevertheless and time-consuming: the project took three months to fabricate all of the components and six weeks to install the piece with more than a million yards of fibre and 1300 digitally knitted components, which were stitched together by hand.

The spatial arrangement does not have edges, does not have boundaries, Sabin explains. Lumen and other projects by Jenny Sabin Studio could be seen as a kind of portable architecture. She further clarifies that architectural form and space is shifting on a meta level from male manifestation to a feminine one where it is about interiorities and networks that resonate with us as humans; ´it breathes, it changes, it emits light; the structure moves as the wind comes through´ (www.jennysabin.com)
Loop.pH is a London based design studio that works at the intersection of design, architecture and sciences. Textile-based responsive environments are designed that take inspiration in living cells and molecular structures found in nature. Loop’s vision for future textiles is to conceive them as live membranes formed by living fibres that grow organically and weave whole structures, in other words, textiles that mimic an eco-system. Since 2003, Loop.pH has developed and refined ArchiLace, a unique technique that fuses the practice of ancient crafts, advanced fibre technology, digital tools and architectural design. Archilace combines a parametric design process with a hands-on crafting technique. Composite fibres are woven into complex geometries based on carbon nanoscience to create strong, lightweight and flexible adaptive structures. ArchiLace takes shape through a dodecahedron weave technique that interlocks 1 mm thick fibreglass rods. Twelve rods are bent into circles and woven together to make the basic ‘building block’ component of which six are then woven into a closed ring pattern (Quinn, 2009).

ArchiLace is inspired by bobbin lacemaking and is considered by Loop.pH as lacemaking on an architectural scale. The act of making lace is an endless process of cyclical movements, twisting and untwisting, constructing and reconstructing, repetition, reproduction, patterning and layering. Cutting edge digital tools were seamlessly combined with this ancient art, forging a path between antiquity and the present.
Loop.pH refers to lacemaking as a highly complex and computational method of manipulating many fibres into a cloth, which, they highlight, is a dying textile tradition in the UK. They further point out that lacemaking and weaving fibres can be described as the precursor to the modern day computer as it was the logic of the Jacquard loom that inspired Charles Babbage in the early 19th century (http://loop.ph/).

The technique of ArchiLace allows for large scale, self-supporting structures to be constructed and builds on the unique ability of textiles to create configurable, flexible and adaptive environments. The technique involves forming doubly curved thin shells from a series of interlocking glass fibre-reinforced plastic (GFRP) hoops. The shell surfaces are strengthened with either additional GFRP or carbon-fibre laces that weave between the hoops in a prescribed pattern. When shaped into doubly curved forms, the structures become stiff and able to resist significant imposed loads. There are no mechanical fixings used to fix the rings together. The woven fibres create a balance between the rigidity of sheet material and the flexibility of a textile. The overall stability of ArchiLace structures is provided purely by the constraint provided by adjacent hoops, the in-plane stiffness of arch and by ballast within its feet. The structure is based on the principle of self-similarity, enabling it to work from the nano to the macro scale. Structures like it are also found in the formation of bubbles, living cells and water molecules (Quinn, 2009).

ArchiLace combines research into resilience theory, topology, new composite materials and traditional textile techniques and aim for self-supporting, textile membranes of complex geometry without specialist machinery only using a small number of modular parts. This is facilitated by a continuous workflow from parametric drawing to physical simulation to material fabrication by hand.

Weaving composite textile structures allows for virtually any imaginable surface to be created from a small number of parts. Recently discovered structures that were previously unbuildable can be fabricated by hand using a textile, curvilinear approach. This is considered a further development on Buckminster Fuller’s work on geodesic domes where the solid rods are replaced by a single tubular membrane (https://www.dezeen.com/2013).

Loop.pH has created several spaces based on ArchiLace, including domes, pavilions, fibrous biowalls and lightshow sculptures. A showcase of the strong and flexible nature of the ArchiLace construction technique, was Futuro Textiles 3 exhibition, held in Barcelona in 2011 and commissioned by Lille3000. Loop.pH designed a double walled ArchiLace tunnel for outdoors to attract visitors to the exhibition.
The structure of the entrance piece was handwoven over two days by four people with electro-luminescent fibres that were bundled with fibre-optics capturing energy from the sun (http://loop.ph/).

Digital technologies are allowing a rediscovery of the traditional (textile) crafts, according to Loop.pH. As computer aided modelling technologies are becoming more open to high levels of complexity and technologies for tooling (computer aided manufacturing) enable nonstandard production, which are increasingly able to develop bespoke and highly crafted surfaces. Their lightweight structures designed are typically woven by hand. Interestingly, cellular growth and self-organisation in nature are being expressed through manual craft and ingenuity in the making (http://loop.ph/).

Loop.pH explores a new role for designers to intervene at an urban scale and develop collaborative tools for public engagement initiatives and multidisciplinary approaches. They envision an architecture whereby the inhabitants can actively participate in its shape, form and function. ArchiLace is an open-ended design process, that forges a dialogue between people and materials giving shape to a (co-authored) space that builds on the unique ability of textiles to create configurable, flexible and adaptable environments. ‘Architecture should only provide a framework, in which the inhabitants might construct their homes according to their needs and ideas, free from any paternalism by a master builder.’ (Yona Friedman, quoted in http://loop.ph/).
We may recall that our main interest is to gain insight in the versatility of openwork textile for form generation and meaning of contemporary spaces. The case studies under review have in common that they are based on or inspired by openwork textile techniques that the designers and architects have used in conceptualizing a space, encompassing both indoor and outdoor environments. Interestingly, this commonality has produced strikingly different spatial structures in terms of for instance shape, dimensions, function, materials, use of techniques and technical implementation. In this paragraph, we will revisit the case studies with a view to defining design elements or design values that can help to inform our design proposal.

. scale and perception .

Modifications of spatial relationships and scale can amplify the inherent material qualities of fibre and alter common perceptions about textile as a medium in the construction of craft objects (Zilber, 2015). In all their variety and diverse expression, the case studies invariably demonstrate that dramatic upscaling of fibre techniques not only reconsiders the relationship of textile with architecture, it also changes the perception that people have of textiles. Once elaborated at a big scale, textiles are no longer tied to the domestic environment and the conventional conception of textiles alters. Scale changes the perception of people and opens up new ways of thinking about textile and people suddenly experience it very differently from what they are used to. Spanning crochet, knotting, knitting and lacework, the fibre techniques used in the case studies are commonly associated with the domestic and private domain rather than with a public sphere or shared space. Applying fibre at a monumental scale, makes it possible to experience it in previously unexplored ways. Interestingly, fibre techniques convey a sense of familiarity and a degree of intimacy yet create effects of surprise and awe when transformed into larger installations and unusual structures, rendering the experience more intriguing and wondrous, even more so when transmitted light-heartedly and in a poetic-like manner. Scale also amplifies the very qualities that we associate with textile.

.. interactivity and emotion ...

A distinct common thread that we have found across the case studies is the active participation of the audience, the visitors of the novel spaces. People visiting or viewing, are gently coaxed to interact with the space installation: to initiate movement through touch; to set the space in physical motion through playful exploration and fun bouncing; to spark debate, to entertain a discussion or have an exchange about global issues; to have a moment of soulful reflection or to become an active co-creator of a space. Movement of the human body is essential to exploring the space, to touch it and to be touched by it; the textile-like spaces evoke a range of positive emotions that span joy, awe, playfulness, relaxation, creative energy, among others. People are incentivized to be in physical and mental activity and to interact with other persons. So, being in movement and experiencing positive emotions are inextricably intertwined, sensations that we would like to refer to as emotion.
Thus, interactivity runs as a common vein through the contemporary references and so does enhancing people’s senses. Some have a technological sensory component (Choi+Shine, Sabin studio and Loop.pH) while others rely on natural means to trigger the senses (Ernesto Neto, Toshiko MacAdam).

... textile connects, space is enabler ...

A salient feature of the case studies under review, is that the space encourages a physical encounter that connects people across cultures. The visitor is perceived as an active user of the installation who ‘appropriates’ the space according to his/her own interpretation and gives it meaning, which, as we have seen, could be of a playful, social gathering, relaxation, contemplative or even of an existential nature. Textile techniques like crochet, knotting and lace are familiar to many cultures and will remind people of similar fabric expressions from the place they call home. People of diverse backgrounds can easily relate to textiles because they are found everywhere and textile making has historical roots in many places across the globe. Textiles may cherish personal memories from a distant or more recent past, people may have cultural association or recall shared histories, for instance. Thus, textile can be a significant connector of peoples and cultures. This connection is likely to be an emotional bond and the association of an affective nature. It may be a treasured handkerchief laced by a grandmother, a tablecloth shared by family members for special ceremonies, a precious cloth that is passed on from one generation to the next, a rug that is used for prayers or an embroidery that signifies the birth of a baby.

The space installations that we referenced can be regarded as novel spaces exhibiting innovations in concept, form and techniques. They also retain a degree of relatedness. The spaces, by design, play with notions of familiarity and non-familiarity, acquaintance and novelty. The intimate character of fibre that people quite readily identify with emotionally, is enhanced in a large-scale spatial setting, and induces people (visitors and users of the space) to discover newness and become curious about the unknown. People are invited to look at things from a different perspective; boundaries suddenly become fluid and flexible (Choi & Shine); pillars are soft and tactile (Jenny Saben); surfaces bounce and react to people’s motion (Toshiko MacAdam); surroundings are transparent and scented (Ernesto Neto) and even inhabitants or urban citizens can become co-makers in actually building the space (Loop.pH). We can affirm that these textile space installations challenge conventional perceptions about space as static and fixed. Each one with its own particular design conception and narrative, acts as a catalyst for new ways of thinking about the relationship between people and physical space as dynamic and in a state of becoming by the very people that inhabit or make up the space.

In this regard and in addition, it is also worth highlighting that space can be considered an actor that puts the framework in place for people to interact and move about. Design of space then, has the capacity to act in the world, influence what people do and how they act, and as such, can be transformative. By magnifying (and transforming) textile to a spatial scale, its visibility as a connector of people is also being amplified.
The intersection of space and textile is capable of generating strikingly diverse structural forms and concept development as we have seen with the cited references. They span self-supporting and non-invasive crocheted and knotted structures that take advantage of gravity (playscapes, GaiaMotherTree), self-supporting structures that consist of lightweight, modular pieces (ArchiLace), laced pieces mounted on separately designed support structures (the Urchins) and knitted structures that are suspended through combining gravity and tensegrity (Lumen).

Our examples show that textile craft is multifaceted as a source of inspiration and can be employed in distinct ways with varying roles of digital technologies in the realization of the space installations. The cases studied are illustrative of what crafting openwork textiles for spatial surroundings in a digital era embodies. Interestingly, they showcase a continued role for handmade and to varying degrees with the support of digital tools and fabrication technologies. A dynamic interplay between the hand and technologies stands out, both for purposes of concept development and visualizing form and structure as well as for physically constructing the spaces. Let’s briefly see how the interplay between hand and technologies occurs.

Considering crochet and lace as cross cultural design language, Choi+Shine develop computer aided crochet patterns and designs that are subsequently fabricated manually with the support of crochet makers from around the world. Their projects bring together and build community among people that crochet by hand. Parts of the support structure are 3d printed.

Upon conceptualizing the design by means of digital tools, Ernesto Neto employed an indigenous craft technique to hand knot GaiaMotherTree. Elaborating this enormous textile installation by hand, not only meant to be in alignment with the concept and spirit of GaiaMotherTree but also to embrace indigenous cultures and to preserve their textiles.

Jenny Sabin takes the medium of knitting into the digital realm to conceptualize and develop forms inspired by biology and nature. Lumen and other Sabin design projects are robotically fabricated. Once the individual pieces have been knit by robots, they are stitched together by hand so as to compose the large textile membrane.

ArchiLace is an intriguing example of interweaving hand and technologies: traditional bobbin lace making practices have with the aid computer aided design, been transformed into a unique technique to configure self-supporting woven structures, which, in turn, are built by hand. Handmade is fused with computer based design. Cutting edge digital tools in the experience of Loop.pH, do expand the possibilities of handmade rather than limiting them. Moreover, cellular growth and self-organisation found in nature, a source of inspiration for many designers and architects, can best be expressed through the ingenuity of manual craft.

In summary, the case studies have different scopes yet pursue what we may call a hybrid approach with regard to interlacing textile craft techniques and digital technologies: they are demonstrative of implementing dynamic ways in which the hand and technologies can intersect in the realization of textile spaces.
The second part of the thesis focuses on our design proposal for a contemporary space envisioned through textile. Our exploration of the interplay of textile and physical space now takes a practical turn and we set out to design a space, based on and inspired by openwork fabrics. Given the broad spectrum of fibre techniques, for purposes of our proposal we opt to narrow the broader textile scope and focus on an ancient openwork technique that requires no major tools, notably bobbin lace making. In order to gain a basic understanding about lace and why we have chosen to work with lace making, the first chapter of part two will briefly describe what bobbin lace making is and why it matters. Next, by way of interlude, we present a chapter on design considerations highlighting design theory perspectives that help inform our proposal. The following chapter features concept development and details our design proposal named OUT OF HAND. This second part of the thesis closes with a chapter on the design process.
Bobbin lacemaking is an ancient European textile technique with a long and varied history that dates back to the 16th century. Let’s look at what lace construction is and what considerations we have to propose lace as the constructive thread for our design.

**WHAT IS LACE**

Lace historian Rosemary Shepherd (2003) defines lace as a decorative openwork fabric in which the patterns of spaces are as important as the solid areas. There are many definitions of lace. In Italy it is sometimes described as ‘stitches in the air’. In the UK, a Dictionary of Lace defines it as ‘a textile patterned with holes which are created by the manipulation of threads’ (www.lostinlace.org.uk). Another way of describing lace is as a fabric in which the pattern is surrounded by air, with bars of net holding the various elements of the pattern together (Farrell, 2007). The Encyclopaedia Britannica describes lace as: ‘ornamental, openwork fabric formed by looping, interlacing, braiding (plaiting), or twisting threads’ (https://www.britannica.com/art/lace).
Bobbin lace is an intriguing and complex play of multiple threads that lace makers cross over and twist in order to do a variety of operations. The threads are wound on bobbins and each operation is held in place with a pin. A pattern is usually fixed on a pillow which has perforated holes forming the design. When the lace is finished, the pins are removed, and the lace comes away from the pillow. Lace, typically, is a free-standing, transparent fabric. In its many variants and with an evolution in style, design, technique and materials, lace is still true to its initial concept: the contrast between open and closed, which gives rise to transparency (Huts in Bruggeman, 2018). Thus, lace has a unique quality of creating open and transparent designs.

The techniques of bobbin lace are based on two principal actions: rhythmic crossing and twisting, manipulations that are made with two single pairs of bobbins. All other operations are derived from that. In each type of lace, the same major operations recurred constantly in a specific sequence characteristic of the type of lace or motif. The path of the threads and specific technique is drawn on paper in a pattern or working diagram which has become a visual language of lace makers around the world. In the past lace was made without working diagrams, using knowledge and instinct. Now working diagrams (lace patterns) are an indispensable guide for lace makers.
lace making across history

It is assumed that lace was born in Flanders and Italy simultaneously and independently during the 16th century and spread over Europe. The origin of lace is in clothing. Lace evolved from existing craft techniques and was initially applied for undergarments of traditional dress that were given a white edge with lace, which was an expression of the awareness of hygiene. Thanks to portraits it is known that lace appeared as decoration for clothing, collars, humeral veils, handkerchiefs, fans and bedspreads in subsequent centuries (Bruggeman, 2018).

Lace is an unusual textile in that it was only made in Europe, it is a purely European invention that was exported by missionaries to other countries. The other peculiarity about lace is that it was made by the poorest women and worn by the richest men and women in Europe (Reigate, 1986). From the start it was a luxury fabric. Making bobbin lace was the main occupation of the working-class woman in the towns in Flanders for instance and remained so for several centuries. In the 17th and 18th centuries fine lace cost more than jewels and was guarded and prized accordingly. Lace was worn at all levels of society and different qualities were made with variations in quality of threads and skill of the worker (Reigate, 1986).

Lace was made of many different threads, including silk, cotton, wool and even human hair, gold and silver threads were much used for court wear. However, most lace was made of costly flaxen thread with the finest threads ever known produced in Flanders.

An interesting detail worth mentioning is that no machine has ever been made to spin thread as fine as the handmade threads of the early 18th century. This thread was immensely costly and only the best makers have been allowed to use it, the highest quality of lace combining with the best workmanship. Except for laces made of metal thread most fibres were worth little, the cost and the exclusivity of the lace depending on the complexity and fashionability of the pattern and the weeks, months, even years it took to make. The making of lace was so slow that clients had to wait three years for an order to be completed.
The first machine-made net appeared in 1763 destroying the lace market for some time. During the Industrial Revolution, the traditional linen and lace industries (cottage industries based on manual work) collapsed, with the machine being the lace’s biggest competitor. Many girls and women began to work for textile and other factories, and fewer were inclined to make manual bobbin lace resulting in declining quality and relatively high price of handmade lace that customers began to appreciate more and more. The great economic crisis in mid-19th century made that authorities, convent schools and charitable organisations actively encouraged the lace cottage industry in an attempt to alleviate the crisis. Despite attempts to upgrade handmade lace, machine lace would supplant the craft irreversibly.

Toward the end of the 18th century, machine-made thread and machine-made net were made commercially, which at the beginning was exciting and rare. Hand work was, for many years, added to machine-made lace to make the design better as the machines had limitations at first. In 1809 John Heathcoat in Loughborough invented a machine which could make an exact copy of the net of East Midlands laces, leading to the Leavers, Pusher and Curtain machines. From the mid-19th century huge quantities of machine-made lace of all sorts were being made in England and France. The quality had improved to such an extent that machine-made lace was extensively used on dresses made by couture houses. The First World War devastated the European hand-made lace centres. Increasingly other countries, Armenia, India and China, to mention but three, took up lacemaking and it becomes increasingly difficult to tell from the lace itself where it was made. The making of machine lace had recovered by the 1920s and lace was a popular fabric for evening and wedding dresses into the 1950s. The industry contracted after the Second World War.

Image 41: one of the first lace making machines in The Netherlands.
There was an upsurge again in lacemaking at the turn of the 19th/20th century during Art Nouveau with innovations in techniques, materials and colours and new designs. This brought a new vision for lace which was no longer merely seen as craft but as art. Characteristic of the Art Nouveau lace was that the motifs no longer have a decorative function, but they supported the whole. A collar was no longer a net with decorative little flowers but the flower motifs themselves formed the collar and made up a part of its structure. In the second half of the 20th century, people no longer made lace for a living but purely out of interest (Bruggeman, 2018). Today, most dress, lingerie and furnishing laces are made with synthetic fibres nylon and polyester on Raschel machines, especially the computerised Jacquardtronic and Textronic versions (Farrell, 2007).

As was already briefly mentioned in a previous chapter, the ancient craft of bobbin lacemaking is a dying textile tradition in countries like England (http://loop.ph/). In several other European countries, including Croatia, Slovenia and Cyprus, bobbin lacemaking is protected as intangible cultural heritage of humanity of UNESCO. With the exception of Belgium, where lacemaking is still very much alive, the number of people actively engaged in this ancient craft has dwindled significantly in most places. As a member of a Catalonian lacemaking association, I am aware that the vast majority of lace makers in Catalunya are elderly women and that it is increasingly hard to interest the younger generations. Bobbin lacemaking as a living craft is undoubtedly under threat, a consideration that has inspired me to start researching this ancient textile tradition with a view to contributing to its preservation.

As a technique, bobbin lacemaking is structurally complex and versatile at the same time because of managing multiple pairs of threads simultaneously that can create any kind of surface imagery. The delicate and intricate work of lace that borders fragility, goes hand in hand with a strong visual language that knows no boundaries. These characteristics make lacemaking particularly attractive for experimenting with ways to conceive and construct spatial environments.
Lace is continuously evolving. Contemporary lace making emphasizes extensive experimentation with materials and technique innovation characterized by a freedom to use traditional techniques in a novel way as well as the continuous invention of new patterns and lace stitches, something that in Flanders for instance, is referred to as ‘wild’ lacing.

Up to now, lace is more associated with small decorative items, fashion and jewellery than with objects or pieces of big dimensions. Of the contemporary references of textile and space that we reviewed in the previous chapter, one case study specifically deals with handmade lace making, while the rest of the case studies are illustrative of upscaling of other types of openwork fibre constructions. The interplay of specifically lace and space, has not been subject to much exploration, another reason that motivates us to experiment with lace for contemporary ‘soft spaces’.

We close this chapter by featuring the 2011 Lost in Lace exhibition that explored the relationship between space and textiles through dramatic installations and challenged the viewer’s existing notions of space. Professor of Textile Culture and exhibition curator Lesley Millar described that the challenge was to shape the perception of the potentially radical relationship between the structure of lace networks and architectural space (http://www.lostinlace.org.uk). Lace networks are formed by clear structures and spaces; they have the potential to surround but not enclose space; they afford visual access to the spaces beyond; they are complete in themselves and can expand exponentially. Lace also carries strong cultural narratives concerning boundaries, ones that are closely linked to the body, which could be translated into metaphorical and actual descriptors of space (Millar, 2011).
In this chapter we set out to gain more insight in how we might understand and interpret what is meant by ´design´. We will look at different design theories to help us inform our research and clarify our perspective on design.

**DESIGN FOR THE REAL WORLD**

Designer, educator and activist Victor Papanek is one of the 20th century’s most influential pioneers of a socially and ecologically oriented approach to design beginning in the 1960s. He called on designers’ responsibility to deal with real issues in society and strongly advocated for socially and ecologically aware design interventions (Papanek, 1971). Papanek promoted a wider social debate about design. His book ´Design for the real world´ (1971) remains the most widely read book about design ever published. In it, Papanek makes a plea for inclusion, social justice and sustainability. Considered a pioneer of alternative design in those days, he took a critical stand with respect to consumerism and addressed practical issues of everyday life for a great number of people.
He was socially engaged with social minorities and was committed to what was then known as the Third World and ecology, sustainability and DIY ‘maker culture’ (www.design-museum), while advocating against the ‘kleenex culture’ of a society where everything is disposable like kleenex (Papanek, 1971).

Now, half a century later, the question of what design can do for the real world is more relevant than ever. Clearly, the world has problems, challenges and thorny issues in abundance that need urgent attention. The writings of Papanek remain an inspirational reminder to aspire for ‘responsible design’, as he used to call it, and to design for the majority rather than for exclusive and little minorities.

In the context of our proposal we do not zero in on one problem in particular nor pretend to be solving anything. Yet we do care about responsible design and have conceived our proposal of a textile-like space in the light of overriding concern for current problems related to overwhelm, stress and anxiety that more and more people grapple with. These negative and often disabling feelings are experienced by people of all ages and also prominently stand out among young generations as well as growingly in many countries across the world. Information overload, technological overwhelm, anxiety about choices in life, work-related stress, the reasons are varied, wide-ranging and may be context-specific.

Digital addiction has become a real problem and increases loneliness, anxiety and depression, according to a new study in NeuroRegulation. Paradoxically, the high-tech world that we live in has brought about complex contradictions; the need for people to be connected perpetually through digital relationships seems to feed feelings of anxiety and also loneliness. In the face of growing digital distraction, computer science professor Cal Newport (2019) urges people to become more mindful with technologies and consider a path of ‘digital minimalism’.

Our fast-accelerating society is ever changing and evolving at such a high pace, while placing so many demands on people, that a need to pause, slow down, unwind and unplug, has become inevitable.

1 In a survey on digital addiction with students, Pepper (2018) found that students who used their phones the most reported high levels of feeling isolated, lonely, depressed and anxious. They also found that students who are continuously multi-tasking allowed little time for the bodies and minds to relax and regenerate.
People are increasingly seeking out and integrating opportunities for `wellness` into their daily lives. Illustrative of this is the fact that valued at $4.2 trillion in 2017, the wellness economy continues to expand faster than global economic growth (Global Wellness Economy 2018).

While striving for responsible design that attend to real world issues, we will now look at considerations emerging from current design theories that will help shape our thinking about contemporary design.

• • ACTOR NETWORK THEORY AND PERFORMANCE THEORY • •

The Actor Network Theory charts out a perspective that artefacts are deliberately designed to shape or even replace human action. They can mould the decisions we make, influence the effects of our actions and change the way we move through the world. By so doing, they play an important role in mediating human relationships, even prescribing morality, ethics and politics, says scholar Bruno Latour (1991) who developed the Actor Network Theory (ANT). An ANT perspective of design assumes that designed objects or spaces compel actions and can rearticulate new social ties. Albena Yavena (2009) explains that social relations are mediated by the design of spaces. Design is not merely a beautiful aesthetic envelope but has the potential of a social goal to enrich and fortify social bonds.

Design, Yavena (2009) argues, can help us shape the social differently. Design functions socially and is in the object’s world. By way of example she illustrates how the design of an auditorium space impacts teaching and influences teacher-student dialogue. Whether an auditorium is circle-shaped or semi-circled, matters in the way it enables a form of equality and captures everyone’s attention equally while maintaining a column of speech by the lecturer. The script of the conference room creates a specific environment that effects the way one lectures and communicates with students. The designed objects and spaces perform the social as we use them, according to Yavena and connect us in new ways with others.

The ‘social’ is glued together by many other types of connectors, including design clarifies Latour (2005). Design connects in very specific ways and can help make the social durable, together with technical, legal, economic ties. It mediates our communication with other humans. Design, Latour sustains, is a way of producing additional attachments that make a variety of actors congregate, forming different groupings and assembling social diversity. It enacts the social. Design is a type of connector, as a mechanism for energizing and setting the world in motion.

Design as a process of enacting the social can be understood as the way people engage with designed objects and designed space and how they attribute meaning to their actions of engagement. An ANT perspective is experience-based and considers context as variable, that is as something moving, evolving and changing along with the various design objects themselves. An ANT perspective is interested in what users do and how they use design and the content of their actions, more than an overriding concern for particular design philosophies or ideologies. symbolic aspects (that would define an artefact as social, symbolic, subjective and lived).
ANT helps to escape this modernist division and suggests that matter is absorbed into meaning, that design *is in the world* as the ANT terms script and prescription imply it (Yavena, 2009).

ANT offers a method to study how complex actor-networks of humans and non-human things are being constituted, hold themselves together or fall apart (Latour, 2005). Spaces have abilities to ´assemble´ as Latour calls it and new forms of community and new forms of knowledge emerge. Agency, that is the capacity to act in the world, is not limited to intentional human action: ´anything that does modify a state of affairs by making a difference is an actor´(Latour, 2005). By (transformative) co-action, human and non-human actors gather in dynamic networks; what actor-network theorists call assemblages. Things – such as designed objects – are thus a constitutive part of hybrid assemblages and action is distributed and shared among heterogeneous actors (Lieto, Beauregard, 2013). Indeed, artefacts can mould the decisions we make, influence the effects of our actions and change the way we move through the world. By so doing, they play an important role in mediating human relationships (Yaneva, 2009).

![Image 46: Spaghetti Jungle by Venezolean artist Jesus Rafael Soto in Blantum museum Houston, USA, 2013.](image)

Actor-network theory proposes a relational and performative understanding of design work. Relatedly, in a performance understanding of design work, the people who engage, use and perceive the work are conceptualized not as mere ´consumers´ or ´visitors´, but as active constitutors. A performative perspective requires that we abandon the idea of stable meanings and autonomous objects and instead engage a processual understanding of design work, of its possible meanings in relation to the people who experience it (Jalvin quoted in Tietjen, 2017). It means to investigate what the object (or space) does, how it interacts with other objects or beings and how it relates to other objects or beings. Performances exist only as actions, interactions and relationships (Schechner quoted in Tietjen, 2017).
In a world in rapid and profound transformation, we are all designers claims Ezio Manzini (2015). Designers are part of the social change itself because they themselves act in unprecedented ways, but they are also promoters of social change because they collaborate actively in creating conditions that facilitate it. Manzini defines social innovation as new ideas (products, services or models) that simultaneously meet social needs and create new social relationships or collaborations. In other words, they are innovations that are both good for society and enhance society’s capacity to act.

In his book ‘*Design, When Everybody Designs*’, Manzini (2015) offers an unconventional perspective of design and suggests that ‘design is concerned with making sense of things – how they ought to be in order to create new meaningful entities’. Design collaborates actively and proactively in the social construction of meaning and therefore also, of quality, values and beauty. Thus, for Manzini, design is more than a problem solver (as it is widely and conventionally conceived), it is also a sense maker and gives (renewed) meaning to the world as we see and interpret it.

Manzini elaborates on a shift in design culture from problem-solving to sense-making. With complex problems there are always several ways of tackling them and there is not one solution. Discussion therefore cannot be limited to technical grounds and cannot be considered only in terms of problem solving but must also concern the realm of meaning: the meaning of the proposed solution and for whom. Rather than producing a finished product as was traditionally the case, design nowadays is more of an open-ended process that never really finishes as it may evolve and ameliorate through contributions of participants or users. Manzini proposes a new conceptual model for design as a culture and a practice concerning how things ought to be in order to attain desired functions and meanings.

Even though everybody designs and may be actively involved in design processes, the role of design experts is to trigger and support open-ended design processes, using their design knowledge to conceive and enhance focused design initiatives, according to Manzini. In the transition towards a networked and sustainable society, all design is a design research activity and should promote sociotechnical experiments. This transition is a broad, social learning process, by which everything belongs to the mainstream way of thinking and behaving in the old world, will have to be reinvented: from everyday life to the very notion of well-being. Manzini continues to say that in the 21st century, social innovation will be interwoven with design as both stimulus and objective; it will stimulate design as much as technical innovation did in the 20th century. Designers are contributors to the social conversation whereby the design expert contributes ideas and visions, practical design tools (from different disciplines) and creativity within the framework of a design approach. Design experts are not mere facilitators, but people who are trained to transform their creativity, design culture and dialogic capability into visions and proposals that contribute to creating a more favourable enabling ecosystem or social structures.
In this perspective, one moves away from the idea of consumers or users as passive figures waiting for someone or something to satisfy their needs (or wants) toward the image of subject-actors interested in increasing their own capabilities and who, to this end, actively participate in the production of value (Manzini, 2015). In this way of seeing things, the role of design experts is no longer that of designing finished products or services, instead, their task is to design to expand the capabilities of people to lead the kind of lives they value. In that regard, rather than trying to identify needs or design solutions to satisfy them, design experts collaborate to create favourable conditions for people concerned and put into practice ways of living and acting to which they themselves, the protagonists, attribute value. In a way, they create action platforms and sense systems in which people themselves decide how to operate or respond and that give people greater responsibility of being what they want to be and doing what they want to do. The expert designer expands the field of possibility for people to define their life projects. In a rapidly and profoundly changing world, all projects are to varying extents experimental projects (Manzini, 2015).

•••• OUR PERSPECTIVE ON CONTEMPORARY DESIGN ••••

Within the context of responsible design, the conceptualization of our proposal is informed by considerations of the actor network and performance theories as well as ideas of design for social innovation for the real world.

Both the performance and ANT theories reorient the focus from design work as an object or architectural space to articulating the relationships that the work engages with; design is seen by definition as relational and has ‘agency’, that is, it has capacity to act in the world. Design can be an energizing and dynamic connector that sets the world in motion. It takes as a given and constant that contexts are always changing and evolving. Moreover, the users of design are not regarded as passive consumers but as active constitutors of the object, space or experience being designed.

We embrace the wider interpretation of design proposed by Manzini that transcends problem solving and includes sense maker and producer of meaning. In this regard it reminds us of a telling quote by John Tackara (2006): ‘Make sense, not stuff’, he succinctly says in a provoking manner. Problem solving and sense making coexist, interact and influence each other, affecting both the physical world (where it solves a problem) and the social one (where it produces sense). We also base ourselves on Manzini’s broadened notion of design that is open-ended and rather than focusing attention on finished products, is considered a work in progress, an active enabler that sets out to expand the fields of possibility of people and enhances their capacity to act.

In this thesis we examine the relationship of physical space and textile. We are interested in gaining understanding how textile can generate form and shape space and also be a signifier and sense-maker. In the context of our design proposal, we consider why a space envisioned through lace would matter in today’s high paced world that, as we have seen at the beginning of this chapter, begs for moments to slow down and to destress.
... Out of hand design proposal ...

OUT OF HAND is our design proposal representing a series of spatial structures that we would like to refer to as cocoons. These physical spaces are soft spun surroundings that are hand threaded and connote comforting envelops for people to reboot their energies and to cope with hectic demands of modern day living.

out of hand: the concept

OUT OF HAND is born out of concern about the realization that people of all ages experience anxiety and overwhelm to the extent that it affects their enjoyment of daily activities. This problem, as we have observed earlier, is increasingly becoming a global phenomenon. We can affirm that levels of stress, overload and anxiety are getting out of hand. Simultaneously and paradoxically, in our highly connected world characterized by non-stop stimuli, loneliness is on the increase and people are growingly out of touch with face to face interaction.

 cocoons
/kəˈkʊn/ NOUN
1. A silky case spun by the larvae of many insects for protection as pupae.
1.1 Something that envelops someone in a protective or comforting way.
Verb
1. Envelop in a protective or comforting way.
is envisioned as a temporary place for people to disconnect from the hectic world and to unwind, and at the same time to engage through the possibility of hands-on immersion with the space. The cocoons offer a transitory retreat from stressful living and never ending distractions of modern life with the opportunity of engaging manually with one’s space through threading and lacing. People can get involved in actively constituting their space by applying lacing at a big spatial scale and experience the relaxing and energizing benefits of slow time.

Building on the insights about slow rhythmic movements and the connection between making & thinking, intends to inspire and renew peoples’ energy with moments of stillness and relaxation that could be restorative. Hands-on engagement is proposed as a way to help cope with anxiety and stress and develop non-digital and non-virtual ways of doing things alone or together with other people. It is also a way to help shape one’s environment for increased well-being.

 is an open-ended proposal inviting playful engagement of (potential) users who can shape their own interpretation of the cocoon spaces. From a designer standpoint, will be out of our hands from the moment we entrust people with the appropriation, making and unmaking of these spaces.

Taking the basic human hut as a reference, the cocoons are all round shaped and share basic structural features, although each one is unique. Let’s look at the four different types that we have designed.

**time out cocoon:** is a personal space for a moment of alone time, contemplation or meditative practice.
Image 49: Knotting entrance of Time Out cocoon.

**Dimensions**

**Time Out Cocoon**
- Inner diameter: 140 cm.
- Outer diameter: 170 cm.
- Length laced piece: 185 cm.
- Total length: 215 cm.

**Part-Time Cocoon**
- Inner diameter: 180 cm.
- Outer diameter: 240 cm.
- Length laced structure: 190 cm.
- Total length: 210 cm.

**Slow Time Cocoon**
- Inner diameter: 100 cm.
- Outer diameter: 130 cm.
- Length laced shape: 80 cm.
- Total length: 100 cm.

**Time Sharing Cocoon**
- Outer diameter: 290 cm.
- Inner diameter: 100 cm.
- Total length: 250 cm.
**part-time cocoon** is a space where two or three persons can share down time, a place that favours in person and non-digital interaction.

Image 50: part-time cocoon.

Image 51: people lacing around the part time cocoon.
Hanging from cables from the ceiling, the cocoons are composed of a round shape elaborated and laced manually, that is attached to a lightweight metal circle of a much larger radius. The metal circle is perforated with a grid like structure. The roundly woven piece is attached to the inner circle which leaves ample space still around the structure. The outer part of the metal circle is intentionally left open and can be considered an ‘aura’, something like a unique radius around the cocoon that every person that uses and temporarily inhabits the space can radiate with his or her own (creative) energy and engage with the space. These wider circles can have multiple strands for people to explore and experiment with threading, lacing and knotting.

*slow time cocoon* is a private space to regain focus and reboot one’s energy.
*time sharing cocoon* is an open and shared space for people to gather and jointly shape the surrounding through lacing. A special feature of the time sharing cocoon is that the hanging threads in the centre have scaled bobbins so as to add the melodic (and for some meditative) sound of bobbins gently being moved around.
Through a few easy steps, interesting loosely woven patterns can be made by people themselves. As they engage with their hands, they may slow their minds down, unplug and playfully explore a myriad of possibilities to construct, to dismantle and to reconstruct. People may lace on their own and may also join others to collaboratively discover new ways of making. It will always involve some physical movement so it is a kind of kinetic lacing.

Every cocoon is unique with varying dimensions and particular pattern design that span traditional lace design, contemporary free stitch and wild lacing. The display in diversity of lace narratives also reflects a symbolic and non-linear passage through time from past to present and into the future. The shape of the entrance is influenced by and in alignment with the lace design.

Oo DH is not site-specific and suggests an open system that can grow and expand augmenting the number of cocoons. The quantity of cocoons can also be reduced to fit specific space requirements and reduced spatial dimensions. Henceforth, we will look at different options of realizing the proposal in varying contexts and specific environments with a view to demonstrating its multi-functionality and versatility to make sense.

• • • OOH: A CULTURAL INSTALLATION • • •

Bobbin lace making is an ancestral textile technique that nowadays is practiced overwhelmingly by older women and very few men. To attract young generations is a real challenge. With the exception of Belgium perhaps, in most European countries, manual lace making is not very visible anymore and may fall into oblivion. Textiles could be considered an ‘endangered species’, says design educator and trend forecaster Lidewij Edelkoort (quoted in Nimkulrat et al, 2016).

We now imagine Out Of Hand as a temporary space installation that is realized in a museum setting or cultural centre to contribute to the visibility of ancestral textile technique of bobbin lace-making and revitalizing this endangered craft tradition. Visitors can get acquainted with lace in renewed ways and moreover develop a spatial relationship with the different laced structures.

As a cultural space installation, we envision involving groups of proficient local lace makers to participate jointly in the fabrication of cocoons. As mentioned earlier, every cocoon is unique with its own lace design. Usually, each lace maker has her (his) own style, pattern design preference and way to manage multiple thread tension. Conceived as a collaborative and community-driven endeavour, ODH will conceive original patterns and construct each cocoon as one of a kind together with different lace makers who individually or together with a fellow lace maker(s), can bring out their mastery of particular design motifs.
Proposed as a cultural space installation, ooh has a minimum of eight cocoons and occupies an area of approximately 100 m². The images below propose two different lay out possibilities. It is important to note that ooh is a flexible installation that can adapt easily to very different spatial dimensions, meaning more and different lay-out options can be conceived. The spacing between cocoons is disparate and varies between 2 and 2.5 meters of distance between individual structures so as to allow a proper pathway for people to go around.

Image 57: layout proposal for cultural installation.

Image 58: layout proposal two for cultural installation.
In order to deepen the interactive angle, a museum could organize a series of activities associated with the vision and scope of the proposal. For instance, we may contemplate a family activity to appeal to visitors of all ages to experience and engage with the installation jointly and emphasize hand lace and textile making as a connector of generations. Alternatively, we can envisage a cultural activity oriented at schools to spark the interest of students (and teachers) in the future of craft. Additionally, lace demonstrations and workshops conducted by master lace makers from the vicinity or region can be organized to highlight the revival and renewal of ancestral practices and textile techniques.
Image 60: frontview of Out Of Hand as a cultural installation.
Image 61: inside view of Out Of Hand as a cultural installation.
**OUT OF HAND IN A MEDICAL CENTRE**

O\textsuperscript{o}h is conceived as a multi-faceted installation that can adapt to varying spatial contexts and moreover can have relevance in different settings, including a hospital. A medical treatment place is typically an environment where people (visitors, patients, family members or hospital staff) may experience distress, discomfort can be high and uncertainty of what lies ahead may be overwhelming. We imagine that one or two or several cocoons could provide a calming atmosphere and be installed permanently in a hospital or health care setting, for instance in an underutilized corner of a waiting area, as part of a reception area of a specialized department of the hospital or an in between space of a floor for longer term medical care.

As mentioned before, every cocoon is an independent space (personal or shared) and it is feasible to use one only and also conceivable to make any combination of the four types that we have designed. Moreover, the length of the vertical cables that support the cocoons are adjustable to varying heights requirements. For instance, the slow time cocoon can be put lower or higher depending on the people it intends to serve. In the case of teenagers or older children, the slow time cocoon will be hanging lower.
Image 63: slow time cocoon imagined in passage area of Barcelona hospital Sant Joan de Déu.

Image 64: time out cocoon imagined in passage area of Barcelona hospital Sant Joan de Déu.
Image 65: hospital corridor in Sant Joan de Déu, Barcelona.
Out Of Hand in a workplace

Unfortunately, the incidence of work related stress and anxiety is high in many places across the world. Productivity demands and work pressures challenge the well-being of people constantly. Many modern offices are increasingly aware of the negative and unsettling influence of stress and seek to implement policies and practices that make the office environment pleasant and inspiring. It is not uncommon nowadays for companies and start-ups, for instance, to promote a variety of practices for people to unwind and to provide space for employees to feel more comfortable. These may include games like ping-pong, physical work outs, meditative practices or allowing pets to accompany their owners to work.

We imagine in contemporary work contexts that aspire to be motivating and energizing places for people to work and as a restful space that is incorporated within the design of such an office set-up on a permanent basis. As a quiet space, the cocoons are intended for people to unplug. Employees can disconnect or slow down for a while, regain their focus and reboot their energies. They are meant to be reinvigorating for people. The possibility of manual and hands-on engagement is an important add-on feature that can be particularly revitalizing if co-workers opt to involve themselves in a playful manner. The lay-out possibilities in an office set-up are plentiful: one, two or more cocoons can be flexibly adapted to suit particular spatial contexts and can be a relatively small space consisting of one, two or three cocoons. It can also be a bigger space that combines several cocoons of varying types.

Image 66: imagining cocoons in a work-related setting.
The design process of a contemporary space envisioned through open work textile focused specifically on the ancient textile technique of bobbin lace making. To the end of gaining hands-on knowledge and tacit understanding of the versatility of the technique, I immersed in bobbin lacemaking as a novice in one of the Barcelona-based lace making associations where I learned the basic hand movements of lace making and got acquainted with basic lace stitches. In the process, I decided to focus on non-traditional and contemporary patterns (see image of a selection of samples of contemporary patterns that were produced).

The design process that I followed was experimental in nature and can, in retrospect, be described as a continuous interplay of four important aspects or dimensions. Firstly, basic skills acquisition (embodied knowledge) and getting a feel of the possibilities of contemporary and wild lacing. Secondly, a continuous exploration of finding form and experimenting with making a three dimensional shaped structure and bringing it to scale. Thirdly, material exploration and experimentation with different types of yarn to construct a scaled structure. And fourthly, a search for (renewed) signifiers of lacework for a space that would or could make sense in the ‘real’ world, in other words, concept development for our design as a sense maker.

In order to do experiment with finding form and making a three-dimensional shape, several small scales try out pieces were developed, some of which we can see in the images on the next page. To do this, it was necessary to make adaptations in the way lace making is done: instead of using a conventional bobbin lace pillow on a flat surface to mount lacework, a round soft material for construction was used as a support base for lacing around and get a circular shape instead of a two-dimensional flat piece.

![Image 67: selection of samples produced of contemporary lace patterns.](image-url)
The development of physical pieces was complemented with computer based iterations of possible models.

Our design proposal is not meant to be a finished space and suggests an open-ended concept that is now being developed into a working prototype. Once the working prototypes are ready, we intend to conduct experimental testing with people in real life situations, a follow-up phase that is no longer part of this thesis.
Materials proposed for lacing the cocoons consist of a blend of different yarns. The choice of yarn has been based on criteria of lightness, flexibility, suppleness and consistency. Our goal has been to maintain the feature of delicacy and openness that is associated with lace work, while scaling the pieces. Conventional lace work is often made with very thin flax, cotton or bamboo yarns. We tried out several different yarns and wanted to achieve both consistency and obtain a lightweight structure, while also preserving the quality of translucency. For now, we opt to construct the pieces with 1.5 mm. white polyester yarn combined with climbing rope and monofilament tubes, materials that are malleable, light and have firmness.

The search for appropriate materials is on-going and requires more experimentation and testing. We will continue material exploration beyond the scope and timeline of this thesis and intend to experiment with pet yarn (sustainable rPET polymer-based yarns) and electroluminescent high tech fibres and reflective yarns. Our aspiration is to investigate and pursue a hybrid approach of interlacing the human hand and new technologies: we would like to conceive handmade structures elaborated with high tech responsive fibres and sustainable yarns.

The time sharing cocoon has bobbins integrated into the design, which have been enlarged to a much bigger size than is normally the case. Traditionally, bobbins are hand carved of wood such as boxwood, rosewood, amaranth wood and other lightweight types of wood. Nowadays they are even made of plastic. They are available in a great variety of shapes and sizes and can be a product of artistic expression. We opt to have 25 cm. long bobbins hand carved of amaranth wood. This is about double the average length. The bobbins have been incorporated for their aesthetic value and above all for the gentle sound they produce while moving them, a sound that for many people is relaxing.
Our research has found that the interplay of space and openwork textiles articulates a new kind of space, one that is dynamic, never finished and in a continuous state of becoming. Conventional perceptions that people may have about physical space as static and fixed are being challenged and the very notion of boundaries is blurring. Envisioning space through textile, which has been the focus of this thesis, gives rise to strikingly diverse expressions of spatial structures where boundaries are fluid and easily cross over to the surrounding areas: the physical space surrounds but does not enclose. These spaces ‘breathe’: pillars are soft and tactile, surfaces may bounce and react to people’s movements, walls are translucent and maintain a connection with the wider area. These spaces invite interaction of people to engage with the space, appropriate it and even transform the architectural space.

Our research also found that dramatic upscaling of fibre techniques not only reconsiders the relationship of textile with architecture, it also changes the perception that people have of textiles: scale amplifies the very qualities that people across cultures tend to associate with textile, such as intimacy, a sense of belonging and connectedness. By magnifying textile to a spatial scale, people are gently coaxed into seeing things from a different perspective, to pause and reflect and act.

Based on the foregoing, we can conclude that openwork textile renews the notion of physical space as non-static and in a continuous state of flux and accords renewed significance and relevance in today’s world. Different modes of giving shape to space through textile articulate a new dynamic space always in a state of becoming that also embody signifiers and convey values of openness, introspection, belonging and face to face connection between people.

Another finding of our research that stands out is that the role of the hand in shaping spaces through openwork textiles remains significant. Monumental structures are made by hand. Digital tools and fabrication technologies are employed hand in hand with manual textile craft, evidencing a hybrid approach of textile craft and digital technologies. Interestingly, this interlacing of handmade and technologies sparks new dynamics that, no doubt, will continue to evolve. Digital tools expand the possibilities of handmade in some cases and a continuous back and forth and dialogue between handmade and computer design and fabrication technologies gives renewed meaning to the role of handmade in crafting large spaces.
In our design proposal OUT OF HAND we have opted to reimagine the endangered textile of bobbin lacemaking in a spatial realm. The delicate and intricate work of lace that borders fragility, goes hand in hand with a strong visual language and structural versatility. Enlarging the scale of openwork meshwork that lace is, means amplifying its unique qualities that include translucency and the sensation of still being part of a larger whole.

Lace captivates and provides a peaceful space in the hectic, technologically led, stressed and unsure world of today (Bruggeman, 2018), significance that we hope to transmit through OUT OF HAND. Our series of cocoons envelope restful spaces to unplug and unwind from the (overwhelming) demands of the day, in solitude or together with other people. One can be alone for a while always feeling a sense of belonging to a larger whole. OOH also offers the possibility of hands-on engagement with the space so that people can feel sheltered and relaxed on the one hand, and also feel energized through the slow and rhythmic involvement of the hands, on the other.

Our design proposal is open-ended and not finished. In a world that is in constant flux, we are also not seeking finality or closure. We envision OOH as a textile space that will always be in a state of becoming. In order to deepen and refine the concept, we intend to further our practice-based approach to include real time experimentation with potential users in different settings, well beyond the scope of this thesis. We will also continue our on-going experimentation with different materials for constructing the cocoons and are especially interested in exploring the possibility of blending high tech yarns and responsive threads with the ancient craft of bobbin lacemaking.


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Image 9: Lithography of Gottfried Semper, 1848 by Franz Hanfstaengl. Public domain via Wikimedia Commons.


Image 14: Toshiko MacAdam crocheting a large installation. Photo @Masaki Koizum in Archdaily, 2012.

Image 15: The Open Hand Monument in Chandigarh (India) by Le Corbusier, 1954 Source: https://chandigarhbytes.com


Image 19: SpaceLoom of Interlace, textile - tactile research installation by Hella Jongerius in Lafayette Anticipations, 2019, Paris, France. The weft threads form three-dimensional spheres and patterns which take shape within different layers of the building’s vertical space. Photo: author.
Image 24: GaiaMotherTree by Ernesto Neto in Zürich Hauptbahnhof, Switzerland, 2018. Wikimedia Commons.
Image 30: Lumen by Jenny Sabin Studio for The Museum of Modern Art and MoMA PS1’s Young Architects Program 2017, on view at MoMA PS1 from June 29 to September 4, 2017. Images courtesy MoMA PS1 and Jenny Sabin Studio. Photos by Pablo Enriquez and Jesse Winter.
Image 31: Lumen by Jenny Sabin Studio for The Museum of Modern Art and MoMA PS1’s Young Architects Program 2017, on view at MoMA PS1 from June 29 to September 4, 2017. Image courtesy MoMA PS1 and Jenny Sabin Studio. Photos by Pablo Enriquez and Jesse Winter.
Image 33: detail of Lumen by Jenny Sabin Studio for The Museum of Modern Art and MoMA PS1’s Young Architects Program 2017, on view at MoMA PS1 from June 29 to September 4, 2017. Image courtesy MoMA PS1 and Jenny Sabin Studio. Photos by Pablo Enriquez and Jesse Winter.
Image 37: Street art inspired by traditional lace pattern, Bilbao, Spain, 2018. Photo: author.
Image 49: knotting entrance of part time cocoon. Author.
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