Crafting Qualities in Designing QR-coded Embroidery and Bedtime Stories

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Abstract

There is a renewed interest into crafts and what it can mean when integrating new technologies into textiles. This paper proposes to embed craft qualities and sustainable values into designing smart textile projects. Our design iterations *QR-Coded Embroidery* and *Bedtime Stories* combine textiles, augmented reality and a storytelling service. Those concepts were inspired by traditional crafts. We use crafts and craftsmanship as an inspiration for designing due to their long sustainable history and the deep qualities they embed.

In this article we describe our design rationale with a design critique based on our own reflections and on those of five crafting experts. We point out specific craft qualities identified in the original inspiration the Muhu Skirt and the following two design iterations. We reflect on how craft qualities were incorporated, lost or gained in the transfer between the iterations.

In conclusion we reflect on the impact of the used approach to our projects creating the basis for a craftsmanship approach towards the sustainability of smart textile services.

KEYWORDS: craft, design, sustainable, smart textile service.

Introduction

Crafts, with the traditions and rituals surrounding them, have lasted for centuries. First evidence of sewing needles dates back around 30 000 years which proves crafts to be a sustainable practice. The insights about sustainability from those years of practice should be noticed. Handwork used to play an important role in the production chain. Specialized craftsmen had the textile processes embedded into their hand lines. Every bundle of crop was picked and treated by skilled fingers. Each stitch, loop and cut had its order when to be made and the way they were made had grown out from boundaries and reasons set by the material and the item's purpose.

The main reason to look back and take inspiration from strongly built traditional textile crafts for developing smart textile services is the tacit meaning hidden between the material and making; making and using – the sense of transparency throughout the item's full life cycle. It is not merely a technological approach, but an attempt to understand certain behaviors and values; to regain some of the long-lived principles such as quality, individualized approach (tailoring) and value for handwork that got neglected when moving towards efficiency and standardization. We propose

that these behaviors and values need to be present in the design process, or in the service and use.

Smart textiles allow new values and ways of use to emerge into the textile industry. With their dynamic properties and collaborative approach (Bhömer et al. 2012) they call for a radical change in the garment industry. For radical change, paradigms need to change rather than the materials we use, the way garments have been made, or how many times we use one cradle-to-grave item. "There's nothing physical or expensive or even slow about paradigm change. In a single individual it can happen in a millisecond. All it takes is a click in the mind, a new way of seeing." (Meadows, 1997, p. 11) Therefore, it is important to consider the new dimensions the properties of the smart materials open up. In this paper we look into how technique can be considered as cultural issue rather than a mindless procedure. We look at the technique as a way of conducting a particular way of life. (Sennett, 2008)

In this paper we explore the paradigm of having crafts evolving in coherence with new technologies. We look into transferring craft qualities over different iterations of smart textile products, and its implications for the related services. More specifically - a traditional folk costume serves as inspiration for the search of meaning in our projects. We reflect on the craft qualities of our own work as the designers of QR-coded Embroidery and Bedtime Stories. By confronting multiple iterations with crafts experts we find out the craft qualities gained and lost during the process. "While user-driven innovation usually departs from user/market studies and technology-driven innovation departs from technological inventions, design-driven innovation departs from the innovator's culture. The strategy is about taking distance from the user/market and sometimes also about the integration of new or existing technology in a new market or sociocultural regime in order to avoid incremental change and aim for change which is more radical." (Baha et al. 2013)

Craft qualities

We agree with Nimkulrat (2012, p. 7) pointing out the great depth of crafting and its qualities: "Through the skilled hands of a craft practitioner, not only form is given but also meaning is embedded." Sennett (2008) is very clear saying crafts and everything related to them being much more than old techniques. He talks about material-engagement as part of the craftsmanship approach as "basic human impulse, the desire to do a job well for its own sake." According to Nimkulrat (2012), craft also involves direct experience, personal vision and mastery of a medium, and thus is a form of practice applicable to any design or art processes and activities. She refers to them as the objects or outputs of experience. Yuri Na (2012, p. 15) defines craft as a "creative activity by humans whose aim is the aesthetic functional object, realized from its whole life cycle as finished object, practice of making process, and services." She also separates contemporary craft that focuses on the "presentism" of craft and contemporary living (last ten years) and traditional craft that belongs to the past.

Sennett (2008, p. 149) also links innovation to one's personal identity talking about craft as a more advanced level of technique, such that the "technique will be intimately linked to expression." Similarly, S. Bardzell, D. Rosner and J. Bardzell (2012) argue craft not being a dead skill from the past to be preserved, but rather that craft participates in everyday life and evolves over time. There needs to be a certain comparison between the craftsman and the community in order for the work to develop and stand out.

Merzali Celikoglu (2013), Tharakan (2011) and Tung (2012) stress the importance of linking skilled use of community resources to community aesthetic sensibilities. Craft is directly linked to a specific community and place. "Pre-industrial artisans were skilled craftspeople who used locally

available materials to create products and generate income." (Tung, 2012) Craft is also highly cultural and carries an important role in documenting it. Handicraft has been used as information storage telling, stories about the village and histories of the community. "Cultural traditions are a continuation of the past, as well as a projection into the future, actually being elements of the continuity of a society's history. At this point, craft products can be taken as one of the transmitting elements of culture and tradition. Craftsmanship and so, craft products are material beings in the intersection of culture, tradition and society since historical production techniques and rituals generate them." (Celikoglu, 2013) Craft objects are believed to have emotional value for the user in a meaningful way. They carry a story and an identity. (Tharakan, 2011, p. 197)

In this paper the craft related quality of each iteration is described by the designers and analyzed by craft experts, in order to understand the main relations between the craft and its inspired smart textiles development.

Craft-inspired smart textile product design

Talking about the new wave of craftsmanship with the modern technologies, everything - the tools, the techniques, and the way to look at a community - can be reconsidered. It gives great emphasis to the attitude of making things, reevaluation of the time and attention invested into creating more value using fewer resources. It involves the new ways of making things, such as rapid prototyping. The design process described in the current paper draws inspiration from the traditional crafts and uses it to build further on the ever-changing contemporary tradition for smart textiles. The design process can be compared to crafting itself since talking about the two methods that women of the traditional communities use in their handicraft Kärt Summatavet (2005) points out how the artifact is born in the course of its making and the existing example serves only as a source of inspiration and how the details change but the nature and the traditional composition logic of the object are still preserved. Similarly, the process of developing the project has gradually built on material, skill, technique and intuition – much like the craftsmanship approach. Each iteration has aimed for a certain goal. The physical and conceptual result has been confronted with audience in exhibition or presentation scenes – in both academic and artistic venues. The knowledge and feedback gained from potential users, fellow designers and industry representatives have been carried into the next iterations. The direction is adjusted according to the input, feedback and constraints gathered along the way. Short iterations are beneficial to build up limitations and borders to the otherwise open question and prototype. The constant feedback loops from people outside of the project provide insightful information that influences decisions taken along the way. They also reveal how the collaboration within the team is taking place.
Staff (2012) describes the artistic research experience as follows: "During my research process the intuitive, or tacit, knowledge has become essential. Tacit knowledge is experiential and subjective, and it takes form through action, becoming visible and detectable through visual expression. It can be seen as a way to grasp the world in order to understand it." "As an artist doing research, my prior understanding thus includes certain previously learned skills and actions." (Mäkelä, 2006) Therefore designer's and industry partners' backgrounds play significant role in shaping the outcomes of the iterations.

To look for the meaning embedded into a smart textile service inspired by crafts, we point out what aspects within the prototypes changed in the transition from one iteration to another. First from the traditional Estonian Muhu Skirt, which was used as an inspiration for the designer (first author) to create the smart textile concept of the QR-Coded Embroidery. And secondly, how and what changed again when the project was adopted by industry partners with a completely different set of skills and ideas towards the development of the Bedtime Stories.

The outputs from the different iterations were confronted with our own design critique and the opinions of experts from the craft fields. The experts were chosen based on their knowledge and different kinds of expertise on (Estonian) craft and approached through shared contacts. Mirje Sims is the chairman of the board of the Haapsalu Handcraft Association in Estonia. Her main interest lies in Haapsalu scarf preservation and innovation. Katrin Kabun is a wool and knit expert devoted to promote traditional wool. Tuulia Lampinen works mainly with weaving. Marit Ahven is the Fashion Design lecturer in the Estonian Academy of Arts and HULA project manager. Her interest is mainly in sustainable fashion. Nithikul Nimkulrat is a lecturer in TextilesCraft, textiles, practice-led research and experiential knowledge artist and crafts researcher.

The experts were involved by the means of informal conversations, semi-structured interviews and e-mail exchanges. As Merzali Celikoglu (2013) points out, based on Feldman (1999) and Pink (2007): conversation as a cooperative venture has a direction allowing new understanding, the transmission of knowledge through an informal conversation also provides the potential transfer of tacit knowledge. To be able to find new directions for the conversation was the reason to keep the conversations and interviews with open format. During the meetings the prototypes and the rationale behind them were introduced to the experts. Afterwards they were asked to point out craft characteristics in each iteration and find overlapping values in them.

The Muhu skirt: design and craft qualities

The Muhu skirt (Figure 1) is part of a representative folk costume of the third largest island in Estonia lying in the Baltic Sea. The costume originates from the beginning of 20th century and has gone through many changes over the years. Since 1930s the lemon yellow skirt with flower-embroidered border has acquired the status of being the traditional the Muhu skirt. (Puppart, 2011, p. 159) The function and properties made perfect sense. "A woolen skirt is never too hot in summer because a linen underskirt airs it. At the same time *kört* [a type of apron] protects from wind and rain – when the rain stops you just have to shake *kört* dry, because its woolen material does not soak water in." (Summatavet, 2005, p. 92)

Figure 1 shows Mareli Ots wearing a Muhu skirt. Photo Dejan Patic (2012)

For Muhu women, the act of making the textiles and beautiful personalized clothes to wear was more than a merely practical issue. It was also a matter of taking great pleasure in the engagement with materials, and a way to connect to one's self and build character. The first author find personal meaning in the folk skirt, as she wore one as a child, during a folkloric dance celebration. The costume was made by her mother and originated from Pärnumaa region.

Crafts, as a constant process of making, comparing and improving, have closely linked innovation to one's personal identity. Folkloric embroidery, traditional patterns on mittens and socks, the variations of colors on the skirt stripes – they all meant something specific for the family or village producing and wearing them. Traditionally, they used to be taught and developed within the local communities. It used to be a personal story only understood through the knowledge of the local context and an outsider could only see or hear the meaning if she was given the key to it. (Summatavet, 2005)

Crafting is highly defined by the locally accessible materials, and influenced by the surroundings of the community linking skilled use of community resources to community aesthetic sensibilities. Similarly, the Muhu skirt has its material origins explained: "The bright yellow tone that is so characteristic to the Muhu skirt is sometimes also called "mine yellow", because it was from the inside of the sea mines washed up at the local port in 1930 that the Muhu women acquired the necessary yellow tone for the bright yellow skirt yarns." (Puppart, 2011) Sewing and other crafts have been seen as a separate language that is often found by people moving into a community whose language they don't speak. Making things you're your hands bridges the language gap between people. Similarly to learning a new language, practicing a craft opens up a new cultural space for the craftsman.

The aspects pointed put by experts during the interviews and additional communications about the Muhu skirt craft qualities emphasized the long-standing representative role of the garment. It showcases the heritage, traditions and connections to the ancestors' culture. Marit specifically mentioned the value of using the ethnographic frame of reference and bringing it into the present. According to Nithikul, patterns and motives always carry a meaning. They come from what is surrounding their everyday life and what is happening in the community. She also mentioned that those everyday issues get into crafts because people want to keep the stories for the next generations. "The handicraft has been much more before the technology. It's a way to record the important stories." (Nithikul, personal communication) The craft objects say a lot about the surrounding resources available in the community in terms of skills and nature.

The QR-coded embroidery: design

The conceptual and, in some specific cases, the visual similarity between traditional craft items, such as the Muhu skirt, and Quick Response (QR) codes were the starting inspiration of the first explorations. Together with the possibility of keeping technology physically separated from the textile, the dynamic layer of digital technology seemed to play a significant role in moving smart textiles towards more sustainable direction. QR code can reveal a lot of information very similarly to a folkloric garment, accessory or ornament. Both of them also need a key to access that level of information.

QR-coded embroidery groups together a set of prototypes involving Quick Response codes embroidered onto textiles in order to relate the static durable textile with dynamic changeable digital world. While traditional quality-aimed technique, such as embroidery is long lasting and pleasant to touch, the digital layer connected to it provides an opportunity for the textile product to

act in a service system to stay updated and change content throughout time. The first QR-coded embroidery prototype was a textile telling the story of the material's whole life cycle: The Story of a Textile. The second prototype was a pillow showing fairy-tales: QR-coded Traditions. And the third one a groceries bag sharing built up knowledge of a community: Local Wisdoms.

Figure 2: The Story of a Textile

In The Story of a Textile (Figure 2), scanning the QR code with a smartphone provides the user with visual and written information on the material: where is the raw material coming from, where and how is it treated and spun into yarns, how it was woven or knitted into textile, dyed, printed, sewn etc. The smart phone application can furthermore show the material and social traces of the production, use and disposal. Allowing producers and users to grow and use a database of similar information makes the actual value of the textile more visible; showing the steps it has gone through as told by people who have been part of that journey.

Figure 3 shows the QR-coded Traditions

QR-coded traditions (Figure 3) is a set of pillows embedded with embroidered folkloric Quick Response codes that when scanned started showing a video fairy-tale. The fairy-tale originates from the same region as the patterns and colors used as an inspiration in the embroidery design. The garment can become more valuable in time because of the opportunity to change the information referred by the QR code. The concept aims to connect traditions and history through several layers, while encouraging new ways of interaction.
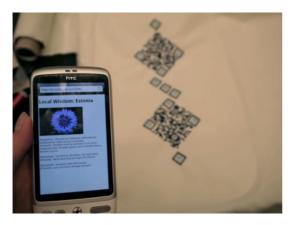
Figure 4 shows the Local Wisdoms

Local Wisdoms (Figure 4) is a groceries bag, embroidered with QR codes inspired by folkloric patterns. The codes link back to sayings, proverbs, and poems by people from the specific region the design of the code is inspired from. The wisdoms of poets, writers, philosophers, elderly neighbors, etc. is to be gathered by the children from the community. Such a garment becomes a link to an always-growing database making it more and more valuable through time.

The QR-coded embroidery: craft qualities

The material struggles were guiding the design process throughout the iteration. The output had to look good and work technologically. A lot of effort was directed into stylizing the code, designing it with vector software and to hide the elements of the code, so that they would be only recognized by the smart-phone and not by the human eye. Over the process it turned out to be more interesting to work with the color variations keeping the original shape of the QR code. The struggles between the maker and the machine, resistance and inspiration ended up forming one another. The result is definitely a combination of the first author's creativity triggered by the machine and material limitations and inspiration through working intensively with it. Letting the machine guide the design process and in some aspects, allow mistakes and difficulties to guide the process had a great impact on the result. Note from the first author's diary "Several tryouts to design a complicated pattern failed whereas the simple change of thread or background color gave a lot of opportunities to play with the looks of the QR codes." (Nimkulrat, personal communication) We experienced what Sennett (2008, p. 113) points out "Machines break down when they lose control, whereas people make discoveries, stumble on happy accidents." Working with resistance means converting boundaries into borders. (Sennett, 2008, p. 229) In this project the boundaries were used as inspiration throughout the design process.

Upon seeing the prototype, Mirje pointed out that the machine embroidery was definitely different from the hand embroidery, visual and tactile result wise. She noticed that some threads were loose, and not all the technique was perfect throughout the work.

The colors used on the QR-coded Traditions are inspired from the region representing the local identity of the designer; they mean certain things to the people of a community who is able to read them. The shapes themselves are reminiscent of the folkloric patterns, which are rich with meanings and vary according to the regions they belong to. Thus, the plain textile is "coded" with traditional craft information through the QR code links. As withdrawn from the researcher's notes "Having no experience with the embroidery previously, helped me to start without thinking too much, since I didn't have any expectations." (Nimkulrat, personal communication) Unconstrained

by specific expectations, the process moved decidedly faster. Instead of thinking about possible solutions, the first concept was tried out in a rough prototype.

The experts valued the new approach taken to translate old textiles into modern contexts, the choice of color according to the cultural heritage. There were also suggestions to improve the conceptual value of making the embroidery by hand together with one's grandmother. They also appreciated the possibility to either change the story or keep it as is, and pointed out that a child might choose a pillow as favorite because of the story embedded into it.

QR coded traditions is related to the community through the practice (making) as well as the concept of storytelling and sharing. The pillow is connected to specific values through fairy-tales.

The experts pointed out the values of this iteration to be the connection with ancestors' culture and modern technology, color selection, choice of technique (embroidery and not print). They underlined the craft qualities being the connection with the ancestors' culture; wide possibilities to further develop the content. "I like the layering, how meaning and visual side come together." (Katrin, personal communication) They also liked that the pillow didn't carry any electronic components. The experts also appreciated the modern-minded language that created interest and provided information in a new way. "The value is for sure approaching young generation through something they understand and getting them introduced to history through an image/language they understand. First glance only historical pattern in a modern decorative way, is actually containing a message that is readable only by the use of technology." (Marit, personal communication)

Limitations on the use of the QR code in embroidering technique didn't appeal to our industry partners. The technology partner suggested trying out image recognition algorithms to achieve more visual design freedom. There were several discussions with our textile partner over the textile technique to use together with the augmented reality ideas. Finally, it was decided that instead of embroidery, to try-out weaving technology which would maintain the feel and look of a traditional cloth as well as allow for it to be mass produced as a high quality long lasting textile.

Woven augmented reality fairy-tale: design

Within the woven augmented reality fairy-tale project (Figure 5) the opportunities lying in the intersection of image recognition technology and traditional textile production were explored.

Figure 5 shows the Bedtime Stories. Screenshot from a video: https://vimeo.com/54711270

"Bedtime Stories is a proposal for a long-lasting - environmentally, economically and societally

sustainable smart textile service. It is a set of woven bed linen with images that can be recognized by a custom made fairy-tale application. This new way of story creation is an opportunity to share personal experiences and pass that wisdom through generations. Therefore contributing to a better quality of life." (Kuusk et al., 2013)

The main focus in Bedtime Stories is on crafting stories in families through the textile. It consist of a pillowcase and a blanket made from a durable textile that is designed and woven in the Netherlands and an accompanying iPad application to see the augmented reality hidden behind the layer of technology. The technology makes use of image recognition algorithms, which make it possible to recognize certain patterns and images in the textile. When moving over the pattern with the iPad, it recognizes and connects to certain objects in the story that are visualized in an augmented layer. This creates interaction possibilities between digital and physical worlds. When a woven symbol (for example a flower, a wolf or a grandmother in the setting of the Little Red Riding Hood fairy-tale) on the fabric is scanned and recognized by the tablet computer held by the storyteller, the child can play with the textile to manipulate the digital visual. A linear way of reading from a book is replaced by customized experiences. The parent can create his own story using inspiration from the fairy-tale but adding his own elements, characters and experiences to it in a digital or physical layer.

Woven augmented reality fairy-tale: craft qualities

The Bedtime stories focused on the material-engagement of interactive storytelling. Technology and textile were completely separated physically but seen as a material to work with for story-creation. Each partner in the project was a professional in their field and the Bedtime Stories prototype brought their expertise together by allowing each to perform at their best. Having a weaver in the team was the reason to change from embroidery technique to weaving. Similarly, with technology, the approach changed according to what intrigued and challenged the partners. As in the previous iterations: the textile product gains a lot of potential towards longer life through the connection between physical and digital layers. It can remain interesting for the users because they can build their own stories with the bed sheet, and also the fairy-tales can be changed or updated over time. As reflected by the first author: "Only after finishing the prototype could we discover that there is an interaction possibility between the textile and digital layer. When textile beneath the iPad is moved or other ways manipulated, also the characters related to the image on the cloth react and move." (Kuusk, personal communication)

The experts found material qualities in the woven prototype saying, "I like especially that it is woven and not printed." (Mirje, personal communication) They found the craft qualities in the possibility to develop and improve the existing product over time. For Tuulia the touch sensation played an important role in the textile quality.

For developing Bedtime Stories the initial one-person identity was replaced with the team identity. The group developing the project grew by three main perspectives, backgrounds, skills and cultures that needed to be merged into one output.

The experts pointed out craft qualities like the possibility of creating new characters, new playing possibilities, and the creation of the bond between the parent and the child. Bedtime Stories was enhancing the community closeness through the concepts of storytelling and bringing families together. The experts appreciated the skillful connection of technologies (textile and IT) and the connection with soft values. They liked the innovative approach and layering, which enables to attract the young generation and give them opportunity to get part of fairy tale knowledge. Also some concerns were expressed, such as "At the same time it bothers me, that to listen one fairy

tale you need so many gadgets: the specific blanket and an iPad and an application. Kids brain could get the same stimuli from reading a book and showing pictures. It disturbs me a bit that iPad comes into the intimate family time." (Marit, personal communication)

The surprise aspect and the possibility to bring fairy-tales back through technology intrigued them. "The value is modern approach and comprehending the behavior patterns of new generation. To create symbols and connections in places that strike as unexpected and stimulate opening of the way of thinking." (Marit, personal communication)

Craft qualities throughout the design process

In the design critique some common craft qualities were identified. In the transfer from one iteration to another some qualities were lost, some were gained throughout the process. The following two paragraphs describe the similarities and differences in craft qualities between the iterations: the Muhu skirt, the QR-coded embroidery and the Bedtime Stories.

As the project develops from the first author's folk minded do-it-yourself embroidery with the simple QR-code technology prototype into a collaborative industrially produced, woven, high quality textile with augmented reality, some of the craft traits weakened along the process. Especially the characteristics related to the Estonian background get replaced with the multi cultural, more generalized characteristics. Mirje, for instance, appreciated the possibility to go back in time and play with one's heritage and roots. Same was noted by Marit, who valued the use of ethnographic frame of reference in a new way and pointed out the layering and multiple meanings as similarities between the Muhu skirt and the Bedtime Stories. "Bedtime stories cloth gets a new meaning through the iPad application." (Marit, personal communication). Katrin also expressed the concerns about the declining presence of the traditional heritage in the project: "The connection with the traditions unfortunately remains less and less each step. If the Bedtime Stories weaving would include motives from the folk embroideries or the color scale would allow us to guess the connection with the Muhu skirt, also the connection would be more visible" (Katrin, personal communication) Katrin liked the storytelling aspect and mother's connection to children. In general, the experts related QR-coded traditions more easily to the original craft item the Muhu skirt, with the emphasis on the color and shape resemblance to the original ornaments. Nithikul stated about The Bedtime Stories: "It's not craft as such when I see this project because it's immediately seen that it's industrially made." (Nithikul, personal communication)

However, some other craft qualities that the experts identified throughout the iterations remained or became stronger in the development of the prototype. For instance "The similarity between all of them is the connection with person's own heritage or to say it better: the possibility to create new codes for defining your heritage." (Mirje, personal communication) Also the storytelling, meaning creation and new interaction language were pointed out. Tuulia was appreciating the story, storytelling and the textile as a medium throughout both of the iterations. She noted the touch being the essential property of the project and all the possibilities the augmented reality technology could add to the story and the playfulness (Tuulia, personal communication) The experts saw the communication as one of the important pillars of the projects. According to Marit both the QR-coded embroidery and the Bedtime Stories were "Creating new meaning and communication language to the future user." (Marit, personal communication) As Nithikul puts it: "The shared element between all these iterations is that there's something more than you can see at first. Also the interactivity or the invitation to interact with it." (Nithikul, personal communication)

The original folk garment and the two compared prototypes are related to crafts in different levels. The Muhu skirt is a traditional folk garment carrying all the craft related qualities. The QR-coded

Traditions is an attempt to embed certain craft related qualities into a combination of textiles and technology. The Bedtime Stories however is a collaboratively developed producible prototype with no craft intentions. The craft qualities we could identify together with the experts passing through all three items were: hidden/layered symbols creating meaning and surprise; textile as a medium: communication system/language of the time; story and storytelling; connection with the heritage; touch as an essential property; responsibility for the product/production; family connection; (open) canvas for communication; changing and developing over time.

Discussion and future work

The consequence of our multi-disciplinary and collaborative approach for smart textiles is that with every next iteration the approach introduces new traditions, techniques and cultures. Each individual member of the team contributes with their own cultural markers, but with each iteration of the process the contributions change form. Individuals in the design process need to adjust their own values, and respect or even appreciate those of the others through the act of making. The focus and awareness on crafting qualities throughout the entire process will build a new culture and a community of crafters of smart textiles. As Sennett (2008, p. 220) points out: "Though much can be lost in moving from one language to another, meanings can also be found in translation."

By using the crafting approach for designing, we also chose a process that did not focus on the users and their values, nor did it concern itself with the financial sustainability of the concept. These aspects need to be, and will be taken into account in the next iteration when the story-telling and service components are being developed.

Through allocating the craft qualities in the different iterations we could already find some implications for the service. The end application has to support the family connection to strengthen. The stories need to be personal and should be able to grow and change in time. All members of the family should be able to design their own elements of the story and should be able to share their unique stories. The experts recognized the high quality materials, storytelling, and textile as a medium as craft qualities in Bedtime Stories. In addition, the Bedtime Stories should be region specific. Stories might be shared in different settings in different cultures. This means, for example, providing default stories, possibilities to repeat stories. The application has to be multiplatform and support different devices. The textile has to be produced locally and support different communities in practice.

These craft considerations would make the service convey sustainable cultural values through the use of present media and way of living. We believe that the combination of the crafting perspective and the service design perspective will contribute to the paradigm shift needed for smart textiles to be ecologically, economically and societally meaningful and sustainable.

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